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Hunter Transmission Project

Environmental Impact Statement

August 2025

Acknowledgement of Country

We acknowledge that Aboriginal and Torres Strait Islander peoples are the First Peoples and Traditional Custodians of Australia, and the oldest continuing culture in human history.

We would like to respectfully acknowledge the Wonnarua, Awabakal and Darkinjung people as the Traditional Custodians of the land on which we deliver our project to the community. We pay our respects to Elders past, present and emerging and to all Aboriginal people of these communities.

We acknowledge the work that Aboriginal people have done to maintain land and water and will show respect through thoughtful and collaborative approaches to engage with the Aboriginal community to ensure local priorities and values inform and influence decision making.

We reflect on the continuing impact of government policies and practices and recognise our responsibility to work together, with and for Aboriginal and Torres Strait Islander peoples, families and communities towards improved economic, social and cultural outcomes.

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Cover image: View of existing transmission line in forested plateau south of project

More information: energyco.nsw.gov.au/htp

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EIS declaration

EIS declaration	
Project details	
Project name	Hunter Transmission Project
Application number	SSI-70610456
Address of the land in respect of which the development application is made	Between Bayswater and Olney State Forest for a length of approximately 110 km, within the Muswellbrook, Singleton, City of Cessnock, Central Coast and City of Lake Macquarie Local Government Areas
Proponent details	
Applicant name	The Energy Corporation of New South Wales (EnergyCo)
Applicant address	GPO Box 5469, Sydney, NSW 2001
Proponent ABN	13 495 767 706
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Declaration by registered environmental assessment practitioner	
Name	Duncan Peake
Registration number	R80016
Organisation registered with	EIANZ

Declaration

The undersigned declares that this Environmental Impact Statement (EIS):

- has been prepared in accordance with schedule 2 of the Environmental Planning and Assessment Regulation 2021
- contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates
- does not contain information that is false or misleading
- addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project
- identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments
- has been prepared having regard to the Department's State Significant Development Guidelines – Preparing an Environmental Impact Statement
- contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development
- contains a consolidated description of the project in a single chapter of the EIS
- contains an accurate summary of the findings of any community engagement
- contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.

Signature

Date 6 August 2025

Glossary

Term	Definition
Access tracks	Temporary and permanent tracks used to access the project. See *Chapter 4 (Project description)* of the EIS for further details.
Annual exceedance probability (AEP)	The frequency of flood events is generally referred to in terms of their AEP or average recurrence interval (ARI). For example, for a flood magnitude having 5% AEP, there is a 5% probability (or 1 in 20 chance) that there would be floods of greater magnitude each year. As another example, for a flood having a 20-year ARI, there would be floods of equal or greater magnitude once in 20 years on average.
Asset protection zone (APZ)	A bushfire protection measure, providing a buffer around assets. APZs are designed and maintained to reduce fuel near assets, and to reduce the potential for damage from direct flame contact, smoke, radiant heat, and ember attack. The dimensions for APZs are designed in line with Planning for Bush Fire Protection: A guide for councils, planners, fire authorities and developers (NSW RFS, 2019), and are determined by surrounding vegetation type, slope, and the type of asset/development.
Australian Energy Market Operator (AEMO)	The AEMO manages electricity and gas systems and markets across Australia.
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.
Bushfire Attack Level (BAL)	A way of measuring the severity of potential ember attack, radiant heat, and direct flame contact, to a building. The BAL is used to specify the construction requirements necessary to protect buildings from bushfire in accordance with AS3959:2018 Construction of Buildings in Bushfire-Prone Areas and the National Construction Code.
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).

Term	Definition
Construction support site	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 *section 4.3.5*of the EIS.
Critical State significant infrastructure (CSSI)	Infrastructure that is declared to be critical State significant infrastructure under section 5.13 of the EP&A Act.
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.
Disturbance area	This is used primarily to assess potential impacts on biodiversity values in *Technical Report 1 – Biodiversity development assessment report*. 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 towers (including tower pads and batters), stringing sites, laydown areas, switching stations, substation 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.

Term	Definition
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.
Ecologically sustainable development (ESD)	Development that meets the needs of present generations while not compromising the ability of future generations to also meet their needs.
Electric and magnetic fields (EMF)	EMF are part of the natural environment and are present in the earth's core and the atmosphere. These fields are also produced wherever electricity or electrical equipment is used.
Electricity Infrastructure Roadmap	The NSW Government's 20-year plan to coordinate investment in transmission, generation, storage and firming infrastructure to transform the electricity sector into one that is cheap, clean and reliable as coal-fired plants retire.
EnergyCo	The Energy Corporation of New South Wales constituted by section 7 of the NSW *Energy and Utilities Administration Act 1987* as the NSW Government-controlled statutory authority appointed as the infrastructure planner under the NSW *Electricity Infrastructure Investment Act 2020* responsible for the delivery of NSW's REZs. The proponent for the HTP.
Environmental management strategy	Provides the overall strategic framework for environmental management during detailed design and construction of the HTP.
Environmental management system	An accredited system that provides for environmental management during operation of the HTP.
Eraring Power Station	Existing power station at Eraring operated by Origin Energy.

Term	Definition
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.
Greenhouse gases (GHG)	Gases that absorb infrared radiation emitted from the earth's surface and re-radiate it back to earth, contributing to the greenhouse effect.
Hazard tree	Hazard trees are those that have the potential to pose a risk to safe operation of the transmission line by falling onto the transmission line towers, conductors and associated infrastructure within the easement.
Historic item	An item that is of historic heritage significance. Historic heritage is non-Aboriginal heritage.
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 m wide.
HTP North, HTP Central and HTP South	3 geographical zones defined as: • HTP North – Bayswater to Broke includes the Bayswater Power Station, major coal mining complexes in the Upper Hunter Valley, Mount Thorley Industrial Estate, Singleton Military Area, and several rural properties generally on the alluvial floodplains of the Hunter River • HTP Central – Pokolbin to Corrabare includes the Pokolbin and Corrabare State forests and the rural residential areas between these forests at Cedar Creek, Millfield and Laguna • HTP South – Olney to Eraring includes the Watagan and Olney State forests, Watagans National Park, the residential areas in Martinsville and Cooranbong, and Eraring Power Station.
Hunter Transmission Project (HTP) or project	The HTP as described in *Chapter 4 (Project description)* of the EIS and identified in the overview figures of the EIS.
Hunter region	The region within which the project would be located. It includes the 5 local government areas that the project would run through, as well as the Newcastle, Maitland City, Midcoast, Port Stephens, Upper Hunter and Dungog Shire LGAs (Hunter Joint Organisation, 2024). The region is defined by large mining, agriculture and viticulture industries.

Term	Definition
Hydrology	Assessment of rainfall and runoff processors in a catchment area.
Landscape	All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.
Landscape character	The combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place.
Landscape character zone	An area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately nearby.
Landscape values	Any aspect of landscape or views people consider to be important. Landscape and visual values may be reflected in local, state or federal planning regulations, other published documents or be established through community consultation and engagement, or as professionally assessed.
Laydown areas	Established to allow for flexibility in construction and to minimise the need for vehicle movements to and from the construction support sites. These would act as temporary staging, storage, and complex plant/equipment setup areas. They would also act as traffic control nodes during construction of the HTP.
Level of service	A measure of the performance of a road network which typically considers an assessment of various factors including speed, volume of traffic, geometric features, traffic interruptions, delays, and freedom to manoeuvre.
Locality	The project footprint and surrounds, nominally a 10km buffer from the edge of the project impact areas. The locality is predominantly used in reviewing available data, existing reports, and database searches for the biodiversity assessment.
National Electricity Market (NEM)	The NEM is both a wholesale electricity market (operated be AEMO) and the physical power system.
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 10 m 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.
Obstacle limitation surface (OLS)	Defines the airspace surrounding an airport that must be protected from obstacles to ensure aircraft flying in good weather during the initial stages and final stages of a flight, or in the vicinity of the airport, can do so safely.
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.

Term	Definition
Oversize and/or over mass load carrying vehicle	A heavy vehicle carrying, or designed for the purpose of carrying, a large item that cannot be divided without extreme effort, expense or risk of damage to it, or cannot be carried on any heavy vehicle without contravening a mass requirement or dimension requirement.
Particulate matter	A category of airborne particles which is classified in relation to its size as either: • PM_{10} particles which are sufficiently small enough to penetrate the large airways of the lungs • $PM_{2.5}$ particles which are generally small enough to be drawn in and deposited into the deepest portions of the lungs.
Pre-construction minor works	Activities with a low potential to impact the environment that may be permissible in advance of construction and without the requirement for an approved environmental management strategy/construction management plan.
Priority transmission infrastructure project (PTIP)	This is a transmission infrastructure project that — (a) is located in the State, and (b) is identified in or forms part of an infrastructure project identified in — (i) the most recent integrated system plan published by AEMO under the National Electricity Rules, or (ii) a project assessment draft report or project specification consultation report prepared under the National Electricity Rules.
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.
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.
Registered Aboriginal Party (RAP)	Aboriginal people, organisations, or their representatives who have registered an interest in being consulted in accordance with *Aboriginal cultural heritage requirements for proponents 2010.*
Renewable energy	Energy from a source that is not depleted when used, such as solar or wind power.
Renewable Energy Zone (REZ)	A geographic area identified and declared by the NSW Government as a Renewable Energy Zone.
Singleton Military Area (SMA)	An Australian military training ground which covers around 4000 ha in the Hunter Valley.
Social locality	A social study area has been defined based on the scale and nature of the predicted social impacts of the project and the considerations in the SIA Guideline. The social study area may also be referred to as the 'social locality' as indicated in the SIA Guideline.

Term	Definition
Stringing site	Used for the preparation, assembly and operation of stringing equipment to connect the transmission line to the towers. Stringing sites would be positioned along the HTP corridor. On other transmission projects, they may be referred to as 'brake and winch' sites.
Study area	Relates to the assessment area for technical assessments – generally an area that extends beyond the project impact area and is specific to the methodologies of the assessment (e.g. for database searches, or areas of influence due to nature of the impacts (e.g. area of social influence)). In these instances, each specialist clearly defines the study area in the technical report methodology, including a figure.
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.
Threatened ecological community	An ecological community that is at risk of extinction. There are varying levels of threatened including vulnerable, endangered, or critically endangered.
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 500 kV 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.
View	Any sight, prospect or field of vision as seen from a place, and may be wide or narrow, partial or full, pleasant or unattractive, distinctive or nondescript, and may include background, mid ground and/or foreground elements or features.' (Australian Institute of Landscape Architects.
Viewpoint	The specific location of a view, typically used for assessment purposes.
Volt	A measurement of the electric potential or pressure that drives electricity through a circuit.
Watt	A unit of power that measures the amount of electricity an electric device consumes.
Work site	A general word to describe a defined construction location.

Introduction

1

1 Introduction

This chapter provides an overview of the Hunter Transmission Project (HTP, 'the project') and the proponent of the project, the Energy Corporation of New South Wales (EnergyCo). It also outlines the purpose and structure of this environmental impact statement (EIS).

1.1 Background

The HTP is both a critical State significant infrastructure (CSSI) project and a Priority Transmission Infrastructure Project (PTIP). As the remaining coal-fired power stations close, the HTP is critical for energy security in New South Wales (NSW).

The NSW energy system is undergoing a once-in-a-generation transformation as we move from reliance on coal-fired power to renewable energy to meet our daily needs.

Coal-fired power stations currently provide most of NSW's electricity supply as well as the firming capacity that keeps the grid stable during peak periods such as summer heat waves. Most of these power stations are reaching the end of their life and are due to shut in the next 10 years.

At the same time, our electricity demand is increasing as our population grows and we electrify our vehicles, homes, businesses and industry.

This means NSW needs new electricity supply and required associated infrastructure urgently.

The NSW Government has developed the NSW Electricity Infrastructure Roadmap (the Roadmap) to transition NSW to a cleaner future and ensure this new supply of electricity can be reliably distributed to consumers.

EnergyCo is responsible for coordinating the delivery of the Roadmap.

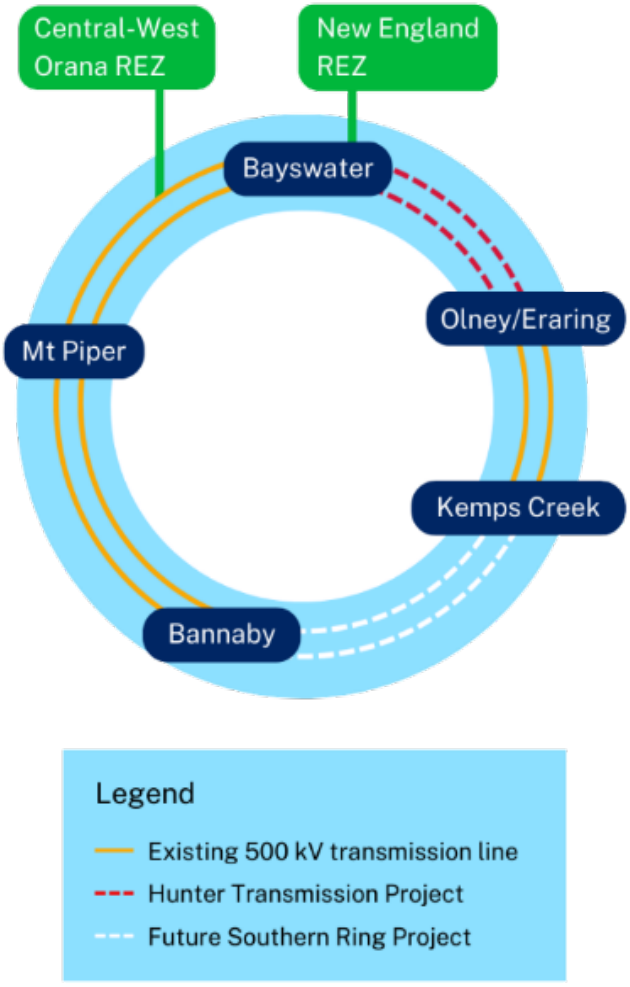


Figure 1-1 The 500 kV Ring

To maintain the energy supply to the Hunter, Sydney and Illawarra regions, 500 kilovolt (kV) transmission connections are required between Bannaby substation in Marulan south of Sydney and Bayswater Power Station in Liddell in the Upper Hunter Valley. These 500 kV transmission connections and existing 500 kV transmission lines in NSW are referred to as the '500 kV Ring' (see Figure 1.1).

The HTP would close the northern gap of the 500 kV Ring, connecting Bayswater to a new switching station in the Olney State Forest near Eraring.

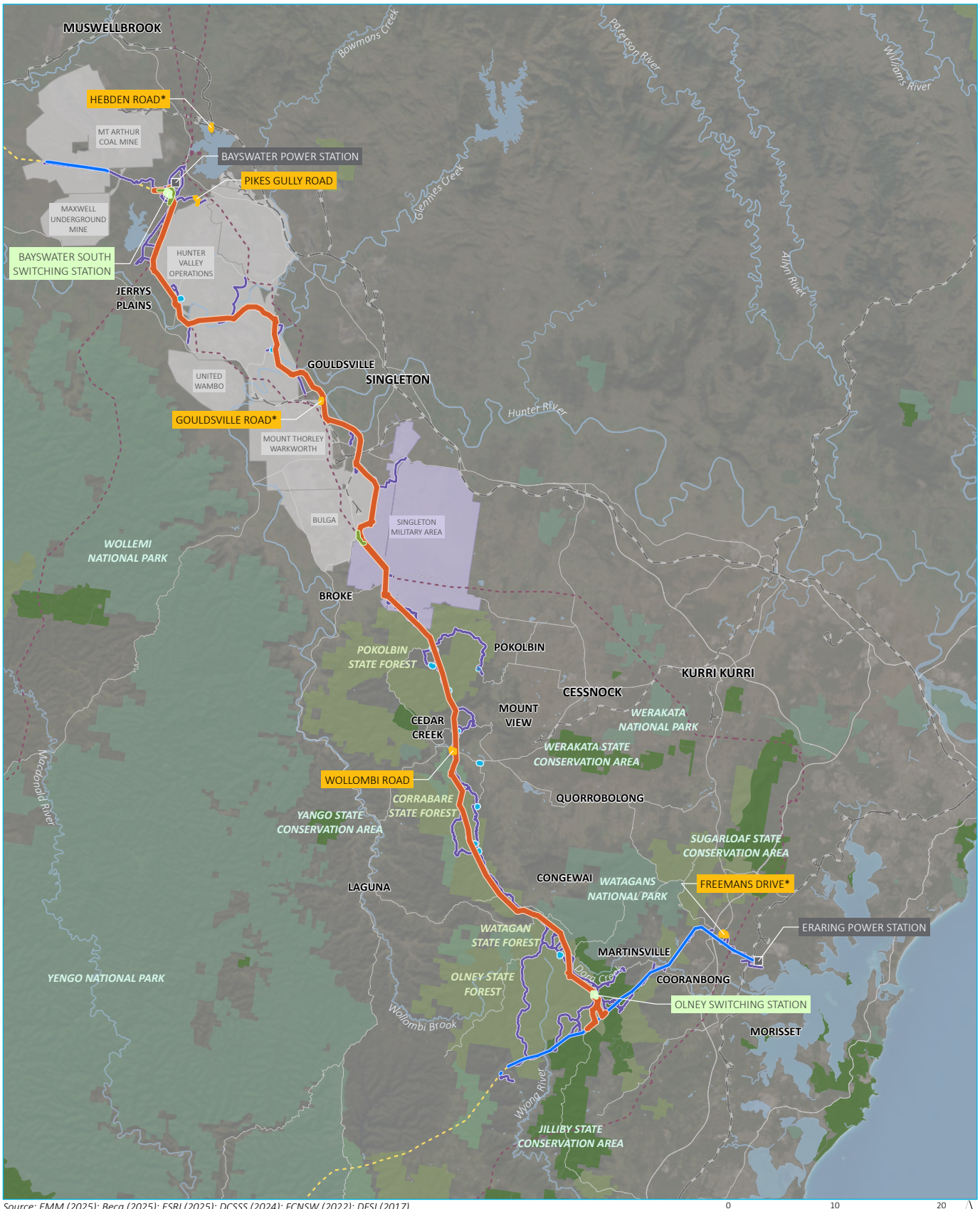
1.2 The Hunter Transmission Project

The key elements of the HTP are shown on Figure 1.2 and include:

- a new overhead 500 kV double circuit transmission line of around 110 kilometres
- two new switching stations (Bayswater South and Olney)
- upgrades to the existing Bayswater and Eraring substations
- adjustments and upgrades to existing transmission lines
- property adjustment works to facilitate access to the transmission lines and switching stations
- utility adjustments required for the construction of the transmission network infrastructure
- 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 HTP corridor runs mostly though power station, mining and government land between Bayswater and Broke. It then traverses the Pokolbin, Corrabare, Watagan and Olney State forests where it joins the existing 500 kV transmission line running between Eraring and Kemps Creek in western Sydney (see Image 1.1).

Using land that has been subject to previous disturbance and the State forests was a key strategy to avoid and minimise impacts on private properties and residential communities. The HTP corridor also avoids sensitive land uses including vineyards, tourist areas, and the Watagans and Werakata National parks.



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

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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

Project overview

Hunter Transmission Project
Environmental Impact Statement
Figure 1.2

EMM
creating opportunities

Image 1.1 Existing Eraring to Kemps Creek 500 kV (Line 5A1 and 5A2), Martinsville

Since selecting the HTP corridor, EnergyCo has continued to refine the project impact area in consultation with, and in response to, stakeholders and field-based investigations. (see *Chapter 3 (Alternatives and options)*). This exercise of refinement, to avoid and minimise impacts to people and the environment, will continue throughout detailed design and construction of the HTP.

It is expected that construction of the HTP will start in 2027 and take around 2.5 years to complete with operation starting the end of 2029, thereby meeting critical requirements for energy security for consumers.

The HTP is expected to operate for at least 50 years.

The objectives of the HTP are to:

- provide 5 gigawatts (GW) of additional transfer capacity between Bayswater and Eraring
- cost effectively enable the supply of electricity from the Central-West Orana and New England Renewable Energy Zones (REZs)
- strengthen the supply of clean and reliable electricity to consumers – particularly in the Hunter, Sydney and Illawarra where 80% of the State's electricity is used
- avoid breaches of the NSW Energy Security Target as outlined in the NSW *Electricity Infrastructure Investment Act 2020* (EII Act)
- harness and build on the region's diverse skill base and provide opportunities for the community to share in the project's benefits
- start operation by the end of 2029 providing reliable electricity to consumers at a reasonable cost
- avoid and/or minimise impacts on people and the environment.

1.3 Related development and infrastructure

Related development or infrastructure is development or infrastructure that is required for a project or may be developed because of a project. Related development/infrastructure projects are subject to separate planning and approval(s).

At this stage there is no related development or infrastructure required for the HTP.

The HTP provides the critical link to enable the continued development of the Central-West Orana REZ and the proposed development of the New England REZ. The HTP would enable the delivery of an additional 5 GW (to a total of around 8 GW) of renewable electricity from the Central-West Orana and New England REZs.

HTP Stage 2 is a 'Plan for the Future' project identified in EnergyCo's *Network Infrastructure Strategy* (2023a). HTP Stage 2 may be required after 2033 to provide an additional 6 GW of network capacity to unlock further generation capacity from the Central-West Orana and New England REZs. If required, HTP Stage 2 would be subject to separate planning and approval(s).

1.4 The proponent

1.4.1 The proponent

The Energy Corporation of New South Wales (EnergyCo) (ABN 13 495 767 706) is a NSW Government agency established under the NSW *Energy and Utilities Administration Act 1987*. The role of EnergyCo is to maximise the opportunities created by the transformation of the NSW electricity network by planning REZs and associated infrastructure across NSW to facilitate coordinated investment in transmission and generation.

In 2022, the NSW Minister for Energy declared the HTP to be a PTIP under the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) and appointed EnergyCo as the Infrastructure Planner for the project. As the Infrastructure Planner, EnergyCo is the proponent of the project and is responsible for carrying out detailed planning and design of the HTP, selecting a network operator for the project, consulting with the local community and key stakeholders, and securing the necessary approvals for the project under the EII Act and NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

EnergyCo's postal address is GPO Box 5469, Sydney NSW 2001.

1.4.2 The network operator

In January 2025, Transgrid was appointed as the preferred network operator for the HTP.

Subject to ministerial authorisation or direction, Transgrid would be network operator responsible for delivering, operating and maintaining the project. Network operator appointment would occur after receipt of State and Commonwealth planning approvals.

Transgrid is working collaboratively with EnergyCo during the planning approval process and on the procurement of construction contractors.

1.5 Purpose of this environmental impact statement

The HTP needs approval from both the NSW Government and Australian Government before it can proceed. Due to its strategic importance, the NSW Minister for Planning and Public Spaces has declared the HTP to be CSSI. Accordingly, approval for the project is required under Part 5, Division 5.2 of the EP&A Act.

The HTP has also been declared a controlled action by the Australian Minister for the Environment and Water under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This is because it could have a significant impact on matters of national environmental significance and Commonwealth land.

Under the existing NSW Bilateral Agreement, the NSW Department of Planning, Housing and Infrastructure (DPHI) will coordinate a detailed assessment of the impacts of the HTP under both the EP&A Act and EPBC Act. This will happen in a single, integrated approvals process that includes extensive community consultation before both ministers make a final decision on the HTP.

EnergyCo submitted a request for the Planning Secretary's environmental assessment requirements (SEARs) to DPHI in May 2024. The request was accompanied by a Scoping Report. SEARs for the HTP (SSI-70610456) were issued on 13 August 2024.

Assessment requirements (EPBC 2024/09874) were issued by the Australian Government on 14 March 2025.

This EIS has been prepared in accordance with the SEARs and the Australian Government's assessment requirements (see *Appendix A (Assessment requirements compliance)*).

The EIS has also been prepared with reference to the *State significant infrastructure guidelines* (DPHI 2024c) and *State significant infrastructure guidelines – preparing an environmental impact statement, Appendix B to the State significant infrastructure guidelines* (DPIE 2022a), the *Transmission Guideline* (DPHI 2024a), and addresses the requirements of Division 5, Part 8 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation).

1.6 Structure of this environmental impact statement

The structure of this EIS is presented in Table 1.1 and Table 1.2.

Table 1.1 Structure of HTP EIS: Main report

Executive summary	Provides an overview of the environmental impact assessment of the HTP.
Chapter 1: Introduction	Provides background to the project and an overview of the proponent and the HTP. Outlines the purpose and structure of the EIS.
Chapter 2: Strategic context	Explains the strategic need for the HTP. Outlines the project's consistency with key strategic government policies and plans. Provides the regional context of the project and considers relevant projects for the cumulative impact assessment presented in the EIS.
Chapter 3: Alternatives and options	Outlines the alternatives and options considered during development of the HTP. Provides an overview of how the project was developed to avoid and minimise impacts to people and the environment.
Chapter 4: Project description	Provides a detailed description of the HTP. Includes a description of the key components of the project and how the project would be constructed, operated, and decommissioned and rehabilitated. Presents the key inputs and outputs during construction and the timing of the HTP.
Chapter 5: Statutory context	Provides the statutory context of the project, including an outline of the relevant legislation applicable to the HTP.
Chapter 6: Engagement	Discusses engagement undertaken with the community and other stakeholders including government agencies. Outlines how the engagement aims have been addressed, the key issues raised by the community and other stakeholders, and the proposed future approach to engagement.
Chapter 7: Approach to assessment	Provides an overview of the study areas used in the assessment of impacts and further information regarding the definition of the project impact area and disturbance areas used in the impact assessments.
Chapter 8 to Chapter 22: Assessment of impacts	Provides an assessment of impacts during construction and operation of the HTP. Issues assessed include biodiversity, heritage, traffic and transport, water, social impacts, landscape character and visual amenity, land use and property and other issues.
Chapter 23: Cumulative impacts	Provides an assessment of the potential of the HTP to generate cumulative impacts in the Hunter region.
Chapter 24: Environmental management	Provides a description of the proposed approach to environmental management for the HTP.
Chapter 25: Justification of the project	Provides an overview of the conclusions from the environmental impact assessment and discusses the project's justification on balance of environmental, social and economic considerations, including ecologically sustainable development (ESD).
References	Provides a list of references used throughout the EIS.

Appendices	Appendix A: Assessment requirements compliance Appendix B: Schedule of utility adjustments and crossings Appendix C: Statutory compliance Appendix D: Community engagement outcomes Appendix E: Proposed mitigation measures

Table 1.2 Structure of HTP EIS: Technical reports

Technical Report 1	Biodiversity development assessment report
Technical Report 2	Aboriginal cultural heritage assessment
Technical Report 3	Landscape character and visual impact assessment
Technical Report 4	Traffic and transport impact assessment
Technical Report 5	Agriculture impact assessment
Technical Report 6	Social impact assessment
Technical Report 7	Historic heritage impact statement
Technical Report 8	Noise and vibration impact assessment
Technical Report 9	Soils and land impact assessment
Technical Report 10	Surface water impact assessment
Technical Report 11	Groundwater impact assessment
Technical Report 12	Flooding impact assessment
Technical Report 13	Contamination preliminary site investigation
Technical Report 14	Bushfire risk assessment
Technical Report 15	Preliminary risk screening
Technical Report 16	Aviation impact assessment
Technical Report 17	Electric and magnetic fields assessment
Technical Report 18	Air quality and greenhouse gas impact assessment
Technical Report 19	Economic impact assessment

Strategic context

2

2 Strategic context

This chapter describes the need for the Hunter Transmission Project (HTP, 'the project'), including the relevant Australian and New South Wales (NSW) Government policies that support the HTP. This chapter also provides a regional context for the HTP.

2.1 Project need

2.1.1 Overview

Our energy system is undergoing a once-in-a-generation transformation as we move from reliance on coal-fired power to renewable energy to meet our daily needs.

Coal-fired power stations currently provide most of our electricity supply however most of these power stations are reaching the end of their life and are due to close in the next 10 years (Liddell Power Station closed in April 2023 with Eraring Power Station to potentially close by 2027 and Bayswater Power Station to close by 2033). At the same time, electricity demand is increasing due to population growth, and increased electrification of vehicles, homes, businesses and industry. This means new electricity supply and the required associated transmission infrastructure is needed urgently.

The NSW Government has developed the *NSW Electricity Infrastructure Roadmap* (the Roadmap) to transition NSW to a cleaner future and ensure this new supply comes from renewable energy. The Energy Corporation of New South Wales (EnergyCo) as infrastructure planner under the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) is responsible for coordinating the delivery of the Roadmap, including building new transmission lines, like the HTP, to connect renewable energy generation in Renewable Energy Zones (REZs) to the electricity grid.

The existing 500 kilovolt (kV) transmission lines in NSW are built around the coal-fired power stations in the Hunter Region with 2 lines to the east connecting Eraring substation to Kemps Creek substation and 2 lines in the west connecting Bayswater Power Station via Wollar substation to Mount Piper Power Station and Bannaby substation. The HTP would close the northern gap between these existing 500 kV transmission lines. It would connect Bayswater to a new switching station in the Olney State Forest near Eraring. From there it would continue to the existing 500 kV line between Eraring and Kemps Creek.

Renewable electricity from the Central-West Orana and New England REZs would be delivered to the core grid via the HTP. It could then be delivered to NSW consumers particularly in the Hunter, Sydney and Illawarra where 80% of the State's electricity is used.

As coal-fired power stations close, the HTP is critical for energy security in NSW.

2.1.2 Net zero emissions targets

Australia is a party to the Paris Agreement, a global commitment to a goal of holding the increase in global average temperatures to well below 2°C of warming and achieving net-zero greenhouse gas emissions by 2050. Australia's emissions reduction targets (reduction of net greenhouse gas emissions to 43% below 2005 levels by 2030 and to zero emissions by 2050) have been legislated in the Commonwealth *Climate Change Act 2022*.

The NSW Government has committed to a whole-of-government climate action by legislating emissions reduction targets for NSW in the *Climate Change (Net Zero Future) Act 2023*. These targets are:

- 50% reduction on 2005 levels of net greenhouse gas emissions by 2030
- 70% reduction on 2005 levels of net greenhouse emissions by 2035
- net zero by 2050.

The NSW Government's approach to reaching these emissions reductions targets is set out in the *Net Zero Plan Stage 1: 2020-2030* (DPIE 2020a) which includes facilitating a transition to renewable energy generation by fast tracking the development of REZs.

2.1.3 Supply and demand pressures of the National Electricity Market

Operating in NSW and other eastern and south-eastern states of Australia, the National Electricity Market (NEM) is a wholesale market through which generators and retailers trade electricity. The NEM is undergoing an unprecedented transformation in the way electricity is generated and as Australia moves towards a net zero emissions future, with coal-fired and other fossil fuels generation being replaced by renewables, energy storage and other forms of firming capacity.

The existing transmission network in NSW comprises 4 key zones, being Northern NSW, Central NSW, Southern NSW and Sydney, Newcastle and Wollongong areas. The State's major load centres of the Hunter, Sydney and Illawarra use around 80% of the State's electricity. For that reason, most of the large-scale thermal generators in NSW were built in the Hunter Region to service these load centres. These power stations currently provide around three quarters of NSW's electricity supply and two thirds of the firming capacity required during summer heat waves. All are due to close between 2025 and 2040, with all but one closing by the end of 2033.

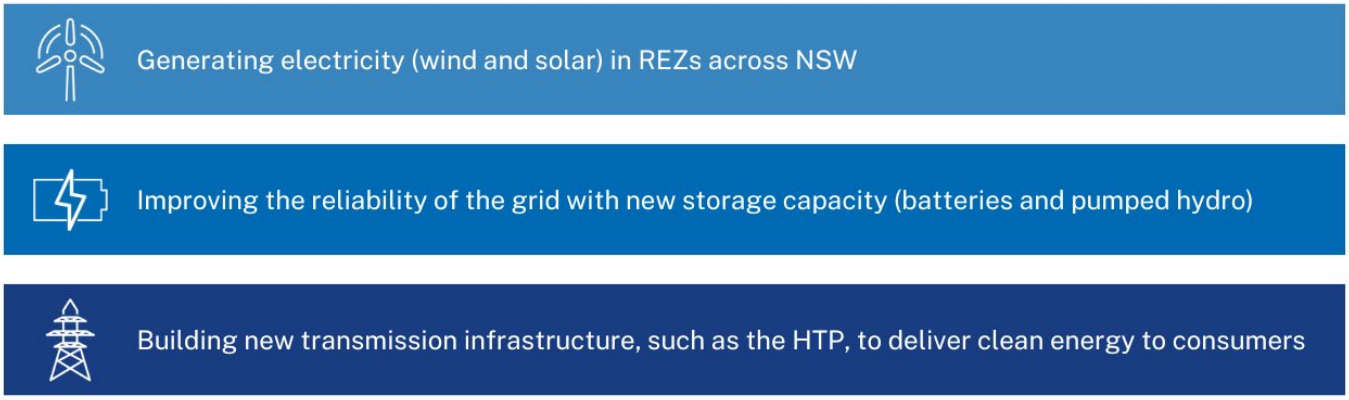
The changes in energy supply will occur at the same time as increases in demand from load centres due to electrification, population growth and increased industrial activity, with significant load growth forecast over the next couple of decades.

Failure of the NEM to provide secure and reliable electricity supply in the future may have significant negative economic and social impacts. The Hunter Region in NSW is particularly vulnerable due to its position and role in the State's electricity grid.

To maintain reliable electricity supply into the load centres of the Hunter, Sydney and Illawarra as power stations close, significant additional transfer capacity into these areas will be needed.

2.1.4 Transition to renewable energy – the NSW Electricity Infrastructure Roadmap

The NSW Government has developed the *NSW Transmission Infrastructure Strategy* (DPE 2018), the *NSW Electricity Strategy* (DPIE 2019a) and, most recently, the Roadmap to deliver affordable, sustainable, and reliable electricity to consumers in NSW. The Roadmap aims to transition NSW to a cleaner future with new supply coming from renewable energy generation, supported by energy storage, largely concentrated within REZs in regional NSW. This involves:



EnergyCo is responsible for coordinating the delivery of the Roadmap, minimising impacts on people and the environment, and maximising the benefits for regional communities including income and employment opportunities. The *Network Infrastructure Strategy* (EnergyCo 2023a) is a 20-year strategy for coordinating connection of new generation in the REZs and to meet the objectives of the EII Act.

The establishment of REZs has been a fundamental component of the Australian Energy Market Operator (AEMO), the organisation responsible for managing the NEM's Integrated System Plan since it was first released in 2018. The Integrated System Plan provides guidance for both the public and private sector about investments needed to improve the security, affordability, and reliability of the electricity traded on the NEM.

The Roadmap aims for at least 12 gigawatts (GW) of new renewable electricity generation to be developed by 2030. EnergyCo's (2023a) *Network Infrastructure Strategy* also targets delivery of 14 GW by 2033. A large majority of this generation (10 GW or more by 2030) is expected to be supplied from the Central-West Orana and New England REZs (AEMO ISP 2024). The HTP would enable the delivery of an additional 5 GW (to a total of around 8 GW) of renewable electricity from the Central-West Orana and New England REZs.

Subject to a separate planning approval(s), the Hunter-Central Coast REZ and related transmission infrastructure would generate and transfer an additional one GW of network capacity, delivered predominantly by network upgrades between Muswellbrook and Liddell.

2.1.5 Creating the 500 kV Ring

The development of large-scale transmission infrastructure is necessary to ensure the viability of the REZs. The REZs are not located in the immediate vicinity of load centres and, in many cases, existing transmission infrastructure is not equipped to carry the amount of energy expected to be

generated. For this reason, the creation of additional transmission infrastructure is required if the REZs are to meet the aims of the *NSW Electricity Strategy* (DPIE 2019a).

The existing transmission network in the Hunter, Sydney and Illawarra areas was designed in large part to connect the large coal generators in the Hunter Region to load centres. The current 500 kV network supplying the Hunter, Sydney and Illawarra areas consist of 2 corridors:

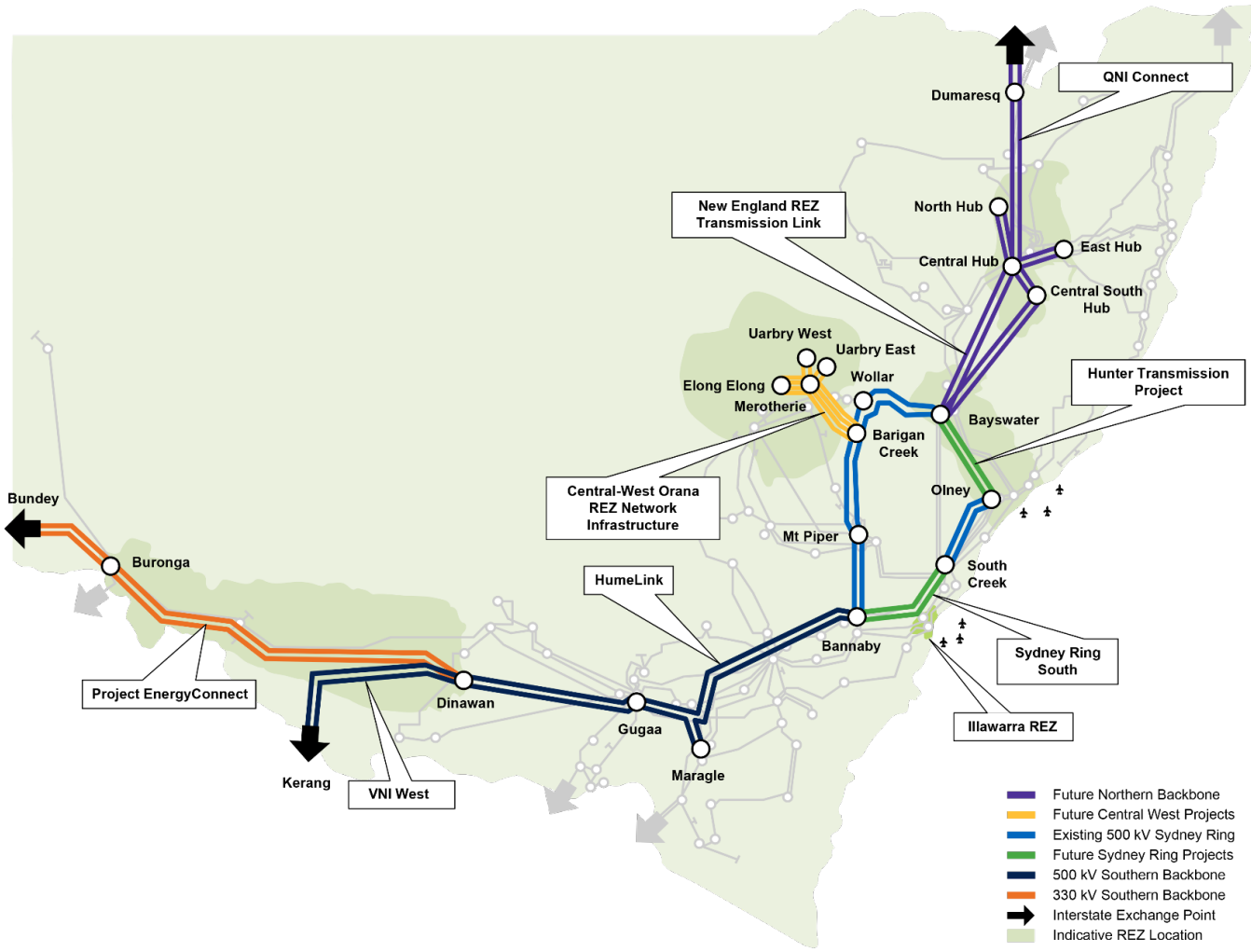
- the 'eastern corridor' – 2 existing 500 kV transmission lines connecting the power stations on the Central Coast (Eraring and Vales Point) via Eraring to the Kemps Creek substation in Western Sydney
- the 'western corridor' – 2 existing 500 kV transmission lines connecting Bayswater Power Station (in the Upper Hunter Region) via Wollar substation (that connects to the Central-West Orana REZ) to Mount Piper Power Station (in the Central Tablelands) and Bannaby substation (in the Southern Tablelands).

To maintain the energy supply to these key load centres, the Integrated System Plan identified, as early as 2020, the need for 500 kV transmission connections between these 2 corridors both in the north and in the south. These connections, in addition to existing lines, would create a 'Ring' of 500 kV transmission lines in NSW. The HTP would provide the northern transmission connection in the 500 kV Ring by connecting Bayswater Power Station to a new switching station on land presently within the Olney State Forest and then connecting to Eraring Power Station via the existing 500 kV line between Eraring and Kemps Creek.

The existing and planned 500 kV transmission lines, including the 500 kV Ring, that would connect REZs and other renewable energy sources to load centres in NSW are shown in Figure 2.1.

The 500 kV Ring would increase the power system's capability to supply the Hunter, Sydney and Illawarra load centres, replacing supply capacity that will be removed on the closure of coal-fired power stations in the Hunter Region with renewable electricity from the Central-West Orana and New England REZs. Renewable electricity would be delivered to the core grid via the 500 kV Ring where it could then be delivered to NSW consumers.

EnergyCo, as infrastructure planner, has engaged in planning activities since October 2022 to define and develop the scope of the HTP. While up to 2, 500 kV double circuit lines have been identified for the northern link of the 500 kV Ring, it was determined that the urgent need is for one transmission line (the HTP) to be in operation by the end of 2029, in line with the Integrated System Plan, with a second line to be delivered later, if required, and as recommended in the *Network Infrastructure Strategy* (EnergyCo 2023a).



Source: New South Wales Transmission Annual Planning Report 2024 (Transgrid 2024)

Figure 2-1 Transgrid network development plan

2.1.6 Strategic importance of the HTP

Both the NSW Government and the Australian Government recognise the strategic importance of the project and require it to be built as quickly as possible and in a way that minimises impacts to people and the environment. The proposed 500 kV transmission lines enable the transmission of large amounts of energy over long distances.

The crucial role of transmission infrastructure in the energy transition was identified by AEMO in its first Integrated System Plan in 2018. The specific requirement for the 500 kV Ring, including the HTP, was identified in the second Integrated System Plan in 2020. Since then, all major electricity strategic planning reports – at Australian and State levels – have highlighted with increasing urgency the critical need for the HTP to be progressed as soon as possible to avoid expected breaches of energy system security (see *section 2.2*).

In particular, the HTP:

- is an urgent NSW Actionable Project under the AEMO's *2024 Integrated System Plan* for the transition of the NEM to renewable energy over the next 20 years
- would receive part of the $4.7 billion allocated to the NSW Government to modernise the electricity grid under the Australian Government's Rewiring the Nation program
- is a 'Deliver Now' project under the *Network Infrastructure Strategy* (EnergyCo 2023a) to support the delivery of the *NSW Electricity Infrastructure Roadmap* (the Roadmap)
- is a Priority Transmission Infrastructure Project (PTIP) under the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) because it is essential for energy security and avoiding breaches of the NSW Energy Security Target.

There are currently 2 projects being progressed as PTIPs for the 'Sydney Ring Project' (the 500 kV Ring), which is identified as an urgent Actionable Project under AEMO's *2024 Integrated System Plan* to avoid breaches in the NSW Energy Security Target. These are the HTP and the Waratah Super Battery.

2.1.7 Relationship to other critical energy projects

To bring renewable energy generation from the Central-West Orana and New England REZs to the Bayswater substation for distribution to the load centres, two other critical transmission projects are required. These are as follows:

- Central-West Orana REZ Transmission Project – a 500 kV transmission line from the Central-West Orana REZ to Wollar substation. New 330 kV lines would also connect proposed switching stations and energy hubs within the Central-West Orana REZ. Energy would then be supplied from Wollar to Bayswater via the existing 500 kV lines which will connect into the Bayswater South switching station. This project was approved in June 2024 (SSI-48323210)
- New England REZ Transmission Project – dual 500 kV transmission lines from New England REZ to the existing Bayswater substation. New 500 kV and 330 kV lines would also connect proposed energy hubs within the New England REZ. The Planning Secretary's environmental

assessment requirements (SEARs) for this project were issued by the NSW Government in September 2024 (SSI-74175972).

The HTP would provide the necessary transmission infrastructure to connect renewable energy generation projects in the Central-West Orana and New England REZs into the NEM.

Located in the same general vicinity as the HTP, the Hunter-Central Coast REZ would provide an additional one GW of network capacity. In addition, transmission network upgrades between Muswellbrook and Liddell are proposed by Ausgrid to support the Hunter-Central Coast REZ. EnergyCo is working with Ausgrid to finalise the scope to design, build, finance, operate and maintain the Hunter-Central Coast REZ.

2.2 Project consistency with key strategic policies and plans

The Australian and NSW Governments have developed several policies and plans to support the energy market transition. An overview of how the HTP would be consistent with the aims and objectives of these strategic policy and planning documents is provided in Table 2.1 and Table 2.2.

Table 2.1 Relevant policy/plan – Australian Government

Policy/plan	Project consistency with policy/plan
2024 Integrated System Plan **(ISP) (AEMO 2024):** An actionable roadmap for eastern Australia's power system to optimise consumer benefits through a transition of the energy market. Forecasts that close to 10,000 km of transmission will be needed by 2050, with around 5000 km of this transmission delivery needed in the next decade. Includes around 4000 km of new transmission corridors and upgrades to around 1000 km of existing lines.	The HTP is identified as an 'Actionable Project' in NSW in the 2024 ISP. This means that it is required to be delivered urgently to contribute to the optimal development path towards a cleaner energy market recognised in the 2024 ISP.
2023 Infrastructure Investment Objectives Report **(AEMO Services Limited 2023):** Sets out the NSW Consumer Trustee's 20-year development pathway for the construction of electricity infrastructure in NSW to achieve the infrastructure investment objectives included in the EII Act. The development pathway recognises that transmission and distribution network infrastructure is critical to facilitating the development of new renewable generation and long-duration storage infrastructure. As such, it considers how new infrastructure and upgrades to the existing network might best support the delivery of the required renewable energy developments.	The HTP is recognised as one of the most critical energy projects in NSW in the *2023 Infrastructure Investment Objectives Report*. It acknowledges that the project would unlock up to 5 GW of additional transfer capacity, which is essential to meeting energy demands into the future. The project is consistent with the development pathway prescribed in the report as it would provide the necessary transmission infrastructure that would connect renewable energy generation projects from the Central-West Orana and New England REZs into the NEM.
Australia's Nationally Determined Contribution Communication 2022 **(DISER 2022):** Sets out the nationally determined contribution under the Paris Agreement and makes a commitment to an emissions reduction target of 43% below 2005 levels by 2030.	The HTP would facilitate the longer-term transition to low emission energy sources as it involves the construction of new transmission infrastructure between Bayswater and Eraring, which would enable the connection of new renewable energy projects in the Central-West Orana and New England REZs into the NEM. This would lead to the lowering of Australia's greenhouse gas emissions from the energy sector and would therefore contribute to the Australian Government's nationally determined contribution under the Paris Agreement. It is therefore consistent with *Australia's Nationally Determined Contribution Communication 2022.*

Policy/plan	Project consistency with policy/plan
Australia's Long-Term Emissions Reduction Plan **(DISER 2021):** A whole-of-economy plan that aims to achieve net-zero emissions by 2050.	The HTP would facilitate the longer-term transition to low emission energy sources as it would enable the connection of new renewable energy projects in the Central-West Orana and New England REZs into the NEM. It is therefore consistent with the priorities in *Australia's Long-Term Emissions Reduction Plan*.

Table 2.2 Relevant policy/plan - NSW Government

Policy/plan	Project consistency with policy/plan
NSW Network Infrastructure Strategy **(EnergyCo 2023a)**: A 20-year plan for the coordination of NSW transmission network infrastructure to connect new generation and storage in NSW's 5 REZs and meet the EII Act objectives, to enable the most cost-effective building of renewable energy generation. Proposes options that add between 14 GW and 24 GW of network capacity over the next 20 years under the 3 modelled scenarios of 'Deliver Now', 'Secure Now' and 'Plan for the Future'. Supports recent modelling by AEMO Services Limited (as the Consumer Trustee under the EII Act) in its 2023 Infrastructure Investment Objectives Report (AEMO 2023) showing more network capacity is needed to meet NSW's future energy needs as coal-fired power stations progressively retire.	The HTP is recognised in the *Network Infrastructure Strategy* as a 'Deliver Now' project, meaning it is required to be developed in the near-term to support grid-scale generation and storage in REZs and to maintain the supply of electricity as coal-fired power stations close in NSW. The HTP is recognised as adding 5 GW of network capacity and as a key project for the connection of the Central-West Orana and New England REZs to the NEM. The HTP is noted as being essential to alleviate downstream network constraints when the total power from these REZs exceeds 3 GW.

Policy/plan	Project consistency with policy/plan
Hunter Regional Plan 2041 (DPE 2022j): A 20-year plan that sets the strategic land use framework for continued economic growth and diversification in the Hunter region. Draws on the strategic planning statements and common interests of 10 local councils across the Hunter region (including Muswellbrook, Singleton, Cessnock and Lake Macquarie). An objective of the plan is to diversify the Hunter's mining, energy and industrial capacity, which includes renewable energy production and the development of transmission infrastructure.	The plan recognises the importance of transmission infrastructure within the Hunter region for the transformation of the electricity sector into one that is cheap, clean and reliable. The HTP would involve the construction and operation of new transmission infrastructure within the Hunter region, which would enable connection of renewable energy projects in NSW, including in the Central-West Orana and New England REZs, to homes and businesses in the Hunter Region and beyond. The plan also recognises the potential for new employment in related manufacturing and energy intensive industries as a result of greater electricity capacity, which would result from the HTP. The HTP is consistent with the *Hunter Regional Plan 2041*.
Staying Ahead: State Infrastructure Strategy 2022-2042 (SIS) (Infrastructure NSW 2022): Establishes the strategic directions, projects and initiatives to meet the infrastructure needs of a growing population and a growing economy. An objective of the SIS is to achieve an orderly and efficient transition to net zero, which includes the strategic directions to 'ensure that the clean energy transition is orderly and cost effective' and to 'support a new wave of transmission infrastructure in a manner consistent with community expectations'.	The HTP would provide the increased transmission capacity that is required for the orderly clean energy transition in NSW and to connect renewable energy generation projects to consumers via the NEM. The project is aligned with the strategic objectives for the energy sector within the 2022-2042 SIS.
NSW Government's Net Zero Plan Stage 1: 2020 – 2030 (Net Zero Plan) (DPIE 2020a): Sets the foundation for action on climate change and the goal to reach net zero emissions by 2050. Identifies the economic opportunities presented by solar panels and wind turbines that – in combination with firming technologies, such as gas, batteries and pumped hydro – are now the cheapest forms of new, reliable electricity generation. Also explains that delivery of the REZs will involve expanding transmission infrastructure into regions to open new parts of the grid for renewable energy projects.	The HTP would support the transfer of energy generated within the Central-West Orana and New England REZs. This would encourage the continued expansion of renewable energy generation within these REZs and help to facilitate the transition of the NEM to energy sources with lower greenhouse gas emissions. The HTP would align with and contribute to the Net Zero Plan.

Policy/plan	Project consistency with policy/plan
NSW Electricity Strategy (DPIE 2019a): Outlines a plan for a reliable, affordable and sustainable electricity system for NSW. Identifies the need to connect new generation projects to the existing transmission network to meet NSW's future energy needs, making it critical to efficiently develop transmission to these new generation projects.	The HTP would contribute to the delivery of the aims of the strategy through the provision of regional investment in new transmission infrastructure. It would connect new generation projects to the existing transmission network and is consistent with the *NSW Electricity Strategy*.
NSW Transmission Infrastructure Strategy (DPE 2018): Identifies the NSW Government's plan to unlock private sector investment through priority transmission infrastructure projects, which can keep downward pressure on electricity prices for customers through to 2050. Forms part of the NSW Government's broader plan to make energy more affordable, secure investment in new generation sources and network infrastructure, and ensure new technologies deliver benefits to consumers.	The HTP would enable the connection of renewable energy projects in the Central-West Orana and New England REZs to the NEM, which would provide certainty to private sector investors and cost savings to energy consumers. The HTP is therefore consistent with the aims of *the NSW Transmission Infrastructure Strategy* (DPE 2018).

2.3 Regional context

2.3.1 Communities

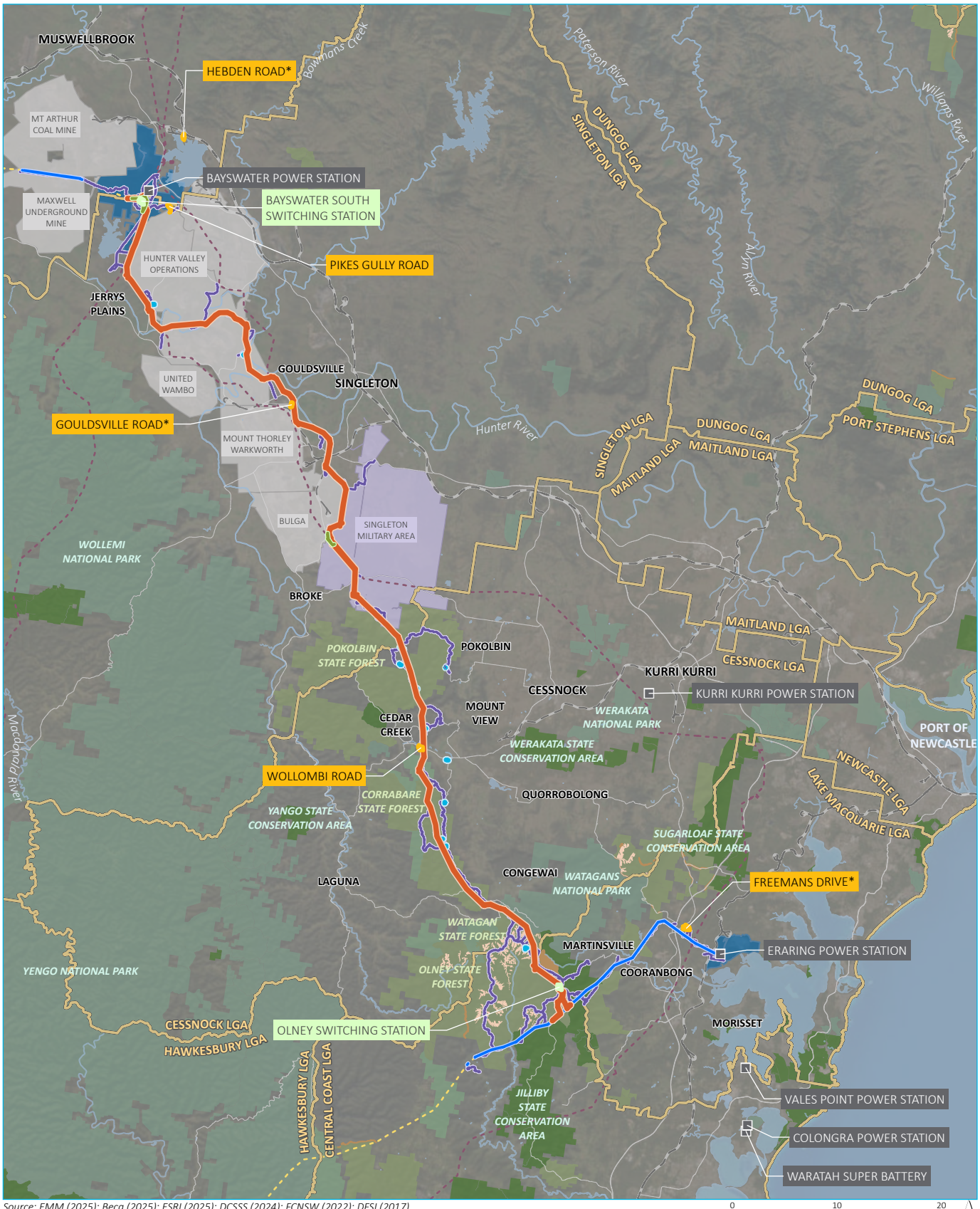
The HTP corridor is located across 5 local government areas: Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie (see Figure 2.2). Collectively, these areas have a population of around 655,000, including around 40,000 people identifying as Aboriginal or Torres Strait Islander. The population is expected to increase to more than 800,000 by 2041.

The region comprises a predominantly working-age population of 15 to 54 years (62%). The region also has a high proportion of children under 15 years (20%) relative to the NSW average (18%), reflecting the presence of families with children that require access to childcare, schools and recreational facilities.

Settlement across the region reflects diverse historical, economic, and geographic influences. The region's population lives in a range of regional centres, including Muswellbrook, Singleton, Cessnock, Maitland and Newcastle, as well as smaller towns and rural localities, such as Broke, Millfield, Cooranbong and Martinsville. Most people live in or around the regional centres, with people from the surrounding communities drawn to the regional centres for employment, services, education and social networks.

Aboriginal communities in the region retain a strong link with Country and include Traditional Owners and Custodians of the Wonnarua, Awabakal and Darkinjung nations. Natural features within the region are important to the cultural heritage of these Aboriginal communities because of their traditions, customs, beliefs and history, and include major promontories, watercourses, rockshelters and grinding grooves.

The region's broad range of industries and its proximity to the major centres of Newcastle and Sydney provide a foundation for a diverse regional economy. The regional economy is a net exporter, with exports out of the region totalling around $47 billion per year. The largest industries by value from the regional economy are coal mining, manufacturing, electricity generation, residential care and social assistance, and insurance and superannuation funds. The top sectors for employment in the region are coal mining, hospitals, supermarkets and grocery stores.



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

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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
- Harwood plantation
- Recreation area
- Energy
- Defence
- Mining
- Local government area

Regional context

Hunter Transmission Project
Environmental Impact Statement
Figure 2.2

EMM
creating opportunities

2.3.2 Land use

The Hunter Region is a diverse region covering over 22,500 square kilometres with a broad mix of land uses including:

- an urban corridor stretching from Singleton to Newcastle and along the coast
- extensive rural and rural-residential areas
- major coal mines in the Upper Hunter Valley such as Hunter Valley Operations, Mount Thorley Warkworth, Bulga and Mount Arthur
- critical industry clusters including the equine and viticulture industries
- Mount Thorley Industrial Estate
- Singleton Military Area
- several State forests such as Pokolbin, Corrabare, Watagan and Olney which are also used for public recreation

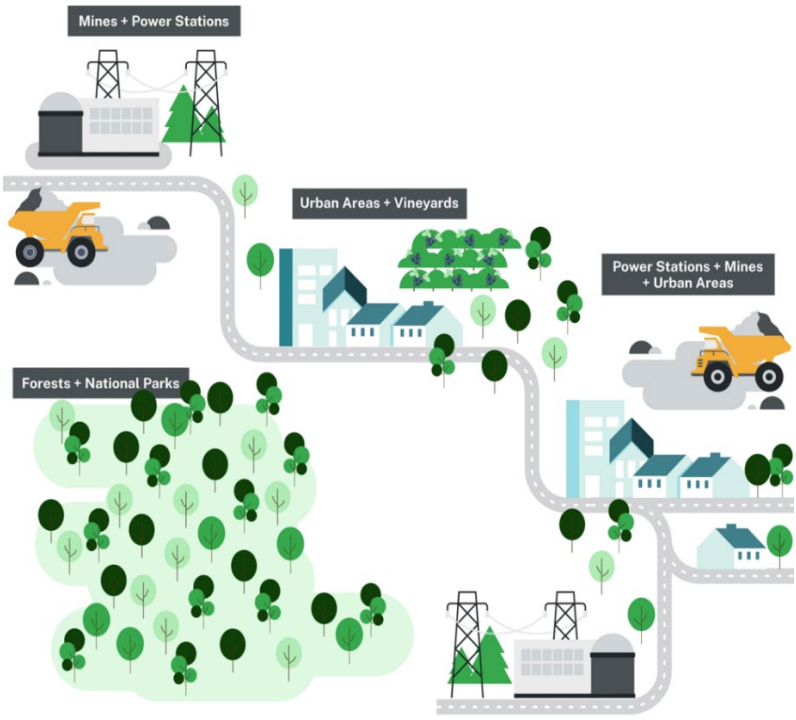


Figure 2-3 Broad land uses in the vicinity of the HTP

- large conservation areas such as the Werakata and Watagans National parks, the Greater Blue Mountains World Heritage Area, and the Mount Sugarloaf and Jilliby State Conservation Areas.

These land uses are shown in Figure 2.2 and conceptually in Figure 2.3.

Using land that has been subject to previous disturbance and the State Forests was a key strategy to avoid and minimise impacts on private properties and residential communities in the Hunter Region. The HTP corridor also avoids sensitive land uses including vineyards, tourist areas, and the Werakata and Watagans National parks.

2.3.3 Key infrastructure

Existing key infrastructure in the Hunter Region relevant to the HTP includes:

- the Port of Newcastle
- major roads such as the M1/Pacific Motorway, Hunter Expressway, New England Highway and Golden Highway
- Hunter Valley rail network that connects the coal mines to the port, and passenger services across the State
- Bayswater, Eraring, Vales Point, Colongra and Kurri Kurri power stations and the Waratah Super Battery

- the existing electricity transmission network (including 500 kV, 330 kV and 132 kV transmission lines).

This key infrastructure is shown in Figure 2.2.

2.3.4 Biodiversity

The Hunter Region forms part of the Sydney Basin bioregion and has 2 distinct landscapes: the Hunter Valley floor and the forested plateau.

The valley floor has been heavily cleared over the last 200 years. Consequently, remnant vegetation is highly fragmented and has a high conservation value. It includes several threatened ecological communities as well as important habitat for critically endangered species such as the swift parrot and regent honeyeater (see Image 2.1).

The forested plateau has a lower conservation value compared to the valley floor vegetation. It provides significant habitat for threatened species but is relatively common in NSW. It is also highly protected in National Parks and State conservation areas.

In selecting the HTP corridor, impacts to biodiversity have been avoided and minimised where possible however some vegetation must be cleared from both landscapes to build the HTP (see *Technical Report 1 – Biodiversity development assessment report*).

To enhance conservation values in the Hunter Region, EnergyCo is committed to a strategic approach to the delivery of biodiversity offsets developed for HTP in collaboration with the NSW Conservation Programs, Heritage and Regulation (CPHR). This will be in the form of a Strategic Offset Delivery Agreement (SODA).

Image 2.1 Example of Hunter Valley floor

2.3.5 Water

Most of the HTP is located in the Hunter River catchment (21,500 square kilometres) but the southern end of the HTP corridor extends into the Lake Macquarie and Tuggerah Lakes catchments (1630 square kilometres).

Between Bayswater and Broke, the HTP crosses the Hunter River and associated tributaries including Wollombi Brook, and traverses at least 15 kilometres of the Hunter River floodplain. Work has been undertaken to avoid and minimise impacts on these watercourses and flooding risks have been assessed for the HTP (see *Technical Report 10 - Surface water impact assessment* and *Technical Report 12 – Flooding impact assessment*).

The Hunter Region forms part of the Permian-Triassic Sydney Basin, which has 3 main groundwater systems: shallow alluvial groundwater, and the regional groundwater systems associated with the Triassic-aged and Permian-aged porous sedimentary rock units. The extraction of groundwater for construction would be minor and temporary, and subject to water access license(s), so there are unlikely to be any adverse impacts on these groundwater systems or any associated groundwater dependent ecosystems (see *Technical Report 11 – Groundwater impact assessment*).

2.3.6 Landscape

The Hunter Region landscape is characterised by undulating coastal plains and rugged terrain associated with exposed Hawkesbury sandstone outcrops (see Figure 2.2 and Image 2.2).

The Hunter Valley floor is relatively wide with rolling hills carved by watercourses such as the Hunter River. While it was originally dominated by open woodland it is now a highly modified landscape with extensive coal mining, industrial, agricultural and urban development.

The southern edge of the Hunter Valley is defined by forested sandstone plateaus intersected by steep ravines and gorges, which form part of the Hunter Region's State forests and National parks.

EnergyCo has sought to minimise impacts on the Hunter Region's landscape by maximising the use of:

- power station, mining and government land on the valley floor
- the State forests on the plateau.

Landscape character and visual impacts are discussed in *Chapter 10 – Landscape and visual.*

Image 2.2 Ridgetop in the Pokolbin State Forest overlooking the forests plateau

2.3.7 Risks or hazards in the Hunter region

Flood prone land

The project is located in areas of flood prone land associated with the Hunter River, Lake Macquarie River and Wyong River catchments. The project is expected to have only a minor and localised impact on peak flood levels and flow velocities during flood events.

Hazards/risks from flooding is discussed in *Chapter 19 (Flooding).*

Contaminated land

Most areas in the vicinity of the project have a low contamination risk. The highest potential for soil contamination to be encountered is in the north at Bayswater Power Station and in the vicinity of the mining complexes (Hunter Valley Operations, Mount Thorley Warkworth and Bulga). In the central and south, the project is generally located in undisturbed dense bushland, with no evidence of significant ground disturbance or land use observed.

Hazards/risks from contamination is discussed in *Chapter 20 (Soils and contamination).*

Mine subsidence prone land

The project is located within the West Lake Mine Subsidence District in the south between the M1/Pacific Motorway and Eraring Power Station and the Patrick Plains Mine Subsidence District in the north around Putty Road to the eastern boundary of the Hunter Valley Operations (HVO) mining complex.

Approval would be required from Subsidence Advisory NSW (SANSW) under section 22 of the *Coal Mine Subsidence Compensation Act 2017* for the HTP. The approval would be processed under a SANSW Development Application – Merit Assessment Policy prior to the commencement of construction.

Hazards/risks to the project from mine subsidence is discussed in *Chapter 12 (Land use and property)*.

Bushfire prone land

The project is located in areas of bushfire prone land. Effective, reliable and proven risk controls would be applied during construction and operation to prevent accidental fire ignition and spread. In Australia, the history of bushfire ignitions from electrical infrastructure is overwhelmingly associated with distribution network infrastructure rather than transmission network infrastructure (such as the HTP). In NSW, 500 kV transmission lines have been operating for more than 42 years with no incidence of bushfire ignition.

Risks to project infrastructure from bushfire during operation are also anticipated to be low – 500 kV transmission line infrastructure and easements are designed to achieve high network resilience to bushfire impact.

Hazards/risks to/from the project related to bushfire is discussed in *Chapter 21 (Hazards and risks)*.

2.3.8 Other relevant projects in the Hunter Region

EnergyCo has identified key projects either in planning or in construction that may interact with the HTP and may result in cumulative impacts and benefits (see Table 2.3).

A detailed assessment of cumulative impacts is provided in *Chapter 23 (Cumulative impacts)*.

Table 2.3 Key projects for cumulative impact assessment

Project	Location	Key matter(s) to be assessed for cumulative impacts/benefits
New England REZ Transmission Project	Muswellbrook	Landscape and visual, traffic and transport, land use and property, social and economic
Liddell Future Land Use and Enabling Works	Muswellbrook	Traffic and transport, land use and property and social
Bayswater Power Station Upgrade	Muswellbrook	Biodiversity, landscape and visual and noise and vibration
Hunter Valley Operations (HVO) continuation projects (North and South)	Liddell, Howick, Lemington, Warkworth	Biodiversity, Aboriginal heritage, traffic and transport, land use and property, social, noise and vibration, air quality and economic
Maison Dieu Solar Farm	Maison Dieu	Biodiversity, landscape and visual, traffic and transport, land use and property, social and economic
Hunter-Central Coast REZ Transmission Project	Between Muswellbrook and Kurri Kurri	Aboriginal heritage, landscape and visual, traffic and transport, land use and property, social, noise and vibration, air quality and economic
Muswellbrook Solar Farm	Muswellbrook	Land use and property, social and economic

Project	Location	Key matter(s) to be assessed for cumulative impacts/benefits
Bowmans Creek Wind Farm	Muswellbrook	Land use and property, social and economic
Central-West Orana REZ Transmission Project	Cassilis to Wollar (north to south) and Cassilis to Goolma (east to west)	Social and economic
Edderton Solar Farm	Denman and Jerrys Plains	Land use and property, social and economic
Intertrade Project	Newcastle	Traffic and transport and economic
Muswellbrook Pumped Hydro Energy Storage Project	Muswellbrook	Traffic and transport, social and economic
Mandalong Road Upgrades	Lake Macquarie	Traffic and transport, social

Alternatives and options

3

3 Alternatives and options

The need for additional capacity in the New South Wales (NSW) electricity distribution network, specifically the need to complete the missing part of the 500 kilovolt (kV) Ring, led to consideration of potential alternatives and options to address the need for additional network capacity.

Strategic alternatives were identified and assessed against strategic objectives (i.e. the outcomes the Hunter Transmission Project (HTP, 'the project') must achieve to address the project need).

Three strategic corridors were selected (North, Central, South) with 19 route options identified. Route option South A was selected as the preferred route for the HTP.

Further refinements were made in response to stakeholder feedback, design development (including constructability review) and environmental and social investigations and the final HTP corridor was adopted as the basis for this environmental impact statement (EIS).

3.1 Strategic project alternatives

Four strategic alternatives were investigated for the HTP. These were:

- **Strategic alternative 1** - Do nothing. This option involves doing nothing to the existing transmission network, relying on the existing transfer capacity of the network and other augmentations by Transgrid. This option would not unlock the supply of electricity from the Central-West Orana or New England Renewable Energy Zones (REZs) or provide the required capacity increase to meet the energy demands of the Hunter, Sydney and Illawarra (AEMO 2022).
- **Strategic alternative 2** - Non-network solutions. This option involves using battery storage and/or system integration protection schemes. These non-network solutions on their own would not unlock the supply of electricity from the Central-West Orana or New England REZs or fully provide the required capacity increase to meet the energy demands of the Hunter, Sydney and Illawarra (AEMO 2022).
- **Strategic alternative 3** - Network solutions (optimisation and modification of existing transmission line infrastructure). This option involves upgrading existing transmission line infrastructure. These upgrades would not fully unlock the supply of electricity from the Central-West Orana or New England REZs. These upgrades would increase the transfer level by about 200 megawatts (MW) to one gigawatt (GW), but not the 3 to 4 GW required to meet the energy demands of the Hunter, Sydney and Illawarra (AEMO 2022 and Transgrid 2023).

- **Strategic alternative 4** - Network solutions (new transmission line infrastructure). This option involves constructing new 500 kV double circuit transmission lines (and switching station/substation upgrades as needed) from Bayswater to Eraring or Bayswater to Kemps Creek. This solution would unlock the supply of electricity from the Central-West Orana and New England REZ and increase the transfer level by about 3 to 4 GW meeting the energy demands of the Hunter, Sydney and Illawarra (AEMO 2022 and Transgrid 2023).

The strategic alternatives were assessed against the strategic objectives for the HTP (see Table 3.1).

Table 3.1 Summary of strategic alternatives assessment against strategic objectives

Strategic objective	Strategic alternative 1	Strategic alternative 2	Strategic alternative 3	Strategic alternative 4
Close the northern gap in the 500 kV Ring, creating the backbone of the State's electricity grid for generations to come	✗	✗	✗	✓
Provide 5 gigawatts (GW) of additional transfer capacity between Bayswater and Eraring	✗	✗	✗	✓
Unlock the supply of electricity from the Central-West Orana and New England REZs	✗	✗	✗	✓
Strengthen the supply of clean and reliable electricity to consumers – particularly in the Hunter, Sydney and Illawarra where 80% of the State's electricity is used	✗	✗	✗	✓
Avoid breaches of the NSW Energy Security Target	✗	✗	✗	✓

Network solutions (in the form of new transmission line infrastructure, strategic alternative 4) met all the strategic objectives and was selected as the preferred strategic alternative for the HTP.

3.2 Overhead and underground transmission infrastructure

Typically, 500 kV transmission infrastructure is constructed above ground comprising up to 85-metre-high steel towers located within a 70-metre-wide easement and conductors (transmission lines) strung from tower to tower. The benefits of undergrounding compared to overhead transmission infrastructure can typically include:

- reduced visual and noise impacts
- no impacts on aerial operations
- generally lower electric and magnetic fields
- lower risk of damage to the transmission lines due to external factors (e.g. extreme weather, falling trees, wildlife, bushfires, vehicles).

Options to underground the transmission lines for HTP were considered as a potential way to help minimise the social and environmental impacts of the project.

A comparison between the key considerations of both overhead and underground transmission lines is provided in Table 3.2. A comparative analysis was undertaken using a traffic light system where:

- green means the overall outcomes are better relative to the other alternative
- amber means the overall outcomes are similar relative to the other alternative
- red means the overall outcomes are worse relative to the other alternative.

Table 3.2 Overhead and underground transmission lines comparative analysis

Key considerations	Overhead	Underground
Constructability	• Construction practices well suited to steep terrain with the ability to readily span rivers and large gullies • Suited to poor geological conditions – ability to minimise structures required in poor geological conditions (limited to tower structures only)	• Underground cable routes not suitable due to terrain and physical obstacles. Cable routes need to follow contours and require cable joint bays every 500 to 700 m for each core. For a double circuit – 8 cable joints every 500 to 700 m • Not suited to poor geological conditions – continuous excavation of multiple trenches/tunnels required
Environmental considerations	• Partial vegetation clearing would be required along the transmission line easement (e.g. in gullies that can be spanned), which would reduce impacts on biodiversity • Potential for direct and indirect impacts to Aboriginal and historic heritage items where vegetation clearing and tower construction is required in the easement. Impacts would be reduced through tower micro-siting • Potential for visual impacts on nearby sensitive receivers where towers and transmission lines are visible	• Full vegetation clearing would be required along the transmission line easement for an underground cable, which would increase the extent of impacts on biodiversity • Potential for unavoidable direct impacts to Aboriginal and historic heritage items where these intersect the vegetation clearing and cable trenching within the easement. Lower potential for indirect impacts, such as visual impacts on heritage items • Underground cabling would minimise potential visual impacts on nearby sensitive receivers
Reliability	• Susceptible to inclement weather (e.g. high wind, storm, lightning and heat waves)	• Not susceptible to weather conditions • Physical issues (digging, water pipe failure, land slip, etc.) can result in cable failures • Generally higher reliability with the highest risk around joints and joint failures (quality related) outside of a cable strike (below ground) by boring machinery or digging over the life of the asset

Key considerations	Overhead	Underground
Operations and maintenance	• Routine maintenance is required on the line (patrolling), easement, vegetation, non-invasive inspections and condition assessments • Minor damage to overhead lines is easy and quick to repair • Forced outages due to protection initiation or manual switching can be fixed within 24 hours • Major damage to overhead lines may result in longer power outages	• Routine maintenance is required on the cable (ground patrolling), transition stations, annual sheath testing and condition assessments • When there is a damage to the cables (e.g. inadvertent excavation or premature failure), a repair would have significantly more ground disturbance and would take a significantly greater amount of time (from several days to several weeks) as compared with overhead lines • There is no existing underground 500 kV cable system in Australia, so skilled workforce and spares may not be immediately available. In addition, the technical feasibility of a 110-km underground cable is unknown • Pinpointing the cable fault takes larger time than locating faults on overhead lines
Easement requirements	• For a double circuit 500kV transmission line and associated towers, the easement width requirement is generally around 70 m	• The width of an underground cable easement is dependent on voltage, and number of cable cores per phase. For a double circuit underground cable (4 sets of cables), the easement width requirement is between 42 and 48 m
Vegetation management	• Routine and significant vegetation maintenance is required to prevent bushfire hazards and faults • Overhead lines can leave ground cover to allow low level cover and roots in the ground • Trees and shrubs of a height of less than 2 m are permitted, allowing for more varied agricultural practices, with grazing and cropping typically permitted, and encouraging biodiversity recovery following construction	• Less vegetation maintenance is required as all vegetation is removed from the easement during construction • Vegetation above and below ground is removed and the backfill prevents regrowth (of tree roots) • Deep-rooted vegetation not permitted within the easement to avoid damage to the cables. This inhibits biodiversity recovery following construction, and prevents agricultural cropping

Key considerations	Overhead	Underground
Ground disturbance	• Less ground disturbance during construction. The disturbance is at tower locations where footings would require excavation between 3 m and 10 m in depth per footing (4 tower legs = 4 footings) • Vegetation clearing would be required along the transmission line easement, which has the potential to result in ground disturbance • Nearby areas used for materials storage; temporary haul roads and temporary accommodation would also be disturbed	• During construction there would be significant ground disturbance as soil would be dug out to build trenches. The easement for an underground transmission line typically comprises 8 x 1 m-deep trenches for the entire length of the cable • Significant amounts of spoil would require disposal • Nearby areas used for materials storage, temporary haul roads and temporary accommodation would also be disturbed • Joint bays are typically every 500 to 700 m and typically 10 m long and 5 m wide and 2 m deep • Limited opportunity for regrowth due to thermal backfill requirements over buried conductors • Maintenance and repairs of underground cables requires excavation and significantly more ground disturbance
Effective circuit length	• Proven effectiveness over hundreds of kilometres	• Limited effectiveness to less than 100 km
Charging current	• The capacitance of an overhead line (the ability of the overhead line to collect and store energy in the form of an electrical charge) is determined by the conductor size, the spacing (between conductors and between a conductor and ground) and the total length of the line	• For long length of cables, reactive compensation such as shunt reactors are required to be installed aboveground at effective locations to reduce the high capacitive charging of the cables
Construction time	• Shorter duration due to comparatively limited excavation requirements • Greater availability of skilled workforce to construct transmission lines within Australia	• Longer duration due to significant excavation requirements • Availability of skilled personnel to perform cable jointing can be a limiting factor at the voltage level 500 kV

Key considerations	Overhead	Underground
Value for money	• Overall costs significantly lower that an underground alternative, presenting lower overall costs passed on to consumers	• Overall costs significantly higher that an overhead alternative, presenting higher overall costs passed on to consumers (ranging from 3 to 19 times higher with REZ projects expected to land at the higher end of this range (EnergyCo 2023b)

On balance, an overhead transmission line solution was preferred as it is:

- more flexible to respond to the significant changes in terrain
- better suited to span multiple water crossings rather than the need to provide a submarine cable
- better suited to minimise the structures required within poor geological conditions, this would be limited to tower structures only rather than a continuous excavation of multiple trenches or tunnels
- easier and faster to repair than an underground option in the event of damage
- less intrusive than an underground option, with ground disturbance required at tower footings and where vegetation is required to be cleared in the transmission line easement
- more effective over hundreds of kilometres than an underground option
- significantly lower in cost, reducing overall costs for the community and consumers
- faster in construction timeframes, reducing the impacts associated with construction on the community and delivering this critical infrastructure as soon as possible to benefit consumers.

3.3 Identifying potential corridor alternatives

EnergyCo has developed a set of key planning pillars and corresponding planning principles to guide the corridor selection process. These pillars and principles, which align with the requirements of the NSW *Electricity Infrastructure Investment Act 2020*, are outlined in Table 3.3.

Table 3.3 EnergyCo planning pillars and related planning principles for corridor selection process

Planning pillar	Definition	Planning principles
People	Positive benefits and negative impacts on people's wellbeing, amenity and quality of life	• Minimise negative impacts on the visual amenity of residences and landscapes • Minimise negative impacts on residential areas and rural residences • Maximise opportunities to deliver positive community benefits
Environment	Impacts to natural and cultural environments	• Minimise negative impacts on biodiversity values • Minimise negative impacts on cultural heritage values • Maximise the use of available industrial and mining land
Economic	The cost of the option and its impacts on key industries	• Deliver energy infrastructure that is in the long-term financial interests of NSW energy consumers • Minimise negative impacts on high value agricultural land, including critical industry cluster (CIC) land and biophysical strategic agricultural land (BSAL) • Maximise the use of suitable public land

Planning pillar	Definition	Planning principles
Strategic	The consistency of the option with the Electricity Infrastructure Roadmap (see section 2.1.4)	• Deliver energy infrastructure that meets the objectives and timing requirements of the Electricity Infrastructure Roadmap • Maximise co-location with existing transmission infrastructure • Maximise co-location with existing and proposed energy projects
Technical	The technical efficiency and reliability of the option in meeting electricity demand	• Maintain energy security and reliability, ensuring resilience of the power system • Optimise electricity infrastructure and power system development over the long term

Objectives were identified for the development and analysis of corridor options for the HTP. These were:

1. maximise use of mines, suitable public land and electricity easements
2. minimise significant land use conflicts and impacts on people and environment
3. minimise hazards and risks
4. build community support
5. deliver project on time at reasonable cost for consumers.

When considering the preferred connection for a new transmission line, a new connection between Bayswater and Eraring was preferred due to the high transfer level that could be achieved and the relatively short transmission line distance (AEMO 2022 and Transgrid 2023). In addition, the Bayswater to Eraring connection would complete the 500 kV Ring (see *Chapter 2 (Strategic context)*).

Potential corridor alternatives were therefore identified with Bayswater Power Station and Eraring Power Station as the 2 anchor points for the transmission line.

A series of considerations based on the corridor objectives and preliminary stakeholder feedback were compiled to support the identification and evaluation of potential corridors (see Table 3.4). These considerations included opportunities to be maximised and adverse impacts to be avoided. Adverse impacts were classified into tiers based on their significance. This method of sorting enabled the considerations to be integrated into corridor planning software for analysis.

Table 3.4 Key considerations graded by significance

Tier	Feature	Relevant strategic objective
Opportunities	Minimising corridor length	1. Maximise use of mines, suitable public land and electricity easements
	Paralleling existing transmission lines	2. Minimise significant land use conflicts and impacts on people and environment
	Where 2 lines are needed, running 2 lines in parallel where network requirements allow	5. Deliver project on time at reasonable cost for consumers
	Targeting areas of existing disturbance, such as cleared land or land with poorer habitat, existing roads, tracks, property boundaries and other utility services, suitable public land, mining and industrial land	1. Maximise use of mines, suitable public land and electricity easements
Tier 1 – Priority to avoid	World heritage properties	2. Minimise significant land use conflicts and impacts on people and environment
	Ramsar wetlands	4. Build community support
	Areas subject to conservation agreements	5. Deliver project on time at reasonable cost for consumers
	Declared wilderness areas	
	National heritage places	
	Commonwealth heritage places	
	Town centres and settlements	
	Schools, hospitals and churches	
	Aerodromes and their surrounding area	3. Minimise hazards and risks

Tier	Feature	Relevant strategic objective
	Large waterbodies	5. Deliver project on time at reasonable cost for consumers
	Active mining voids	
	Mine subsidence zones	
	Operational Defence land	
Tier 2 – Avoid if possible	Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) listed threatened species and and ecological communities	2. Minimise significant land use conflicts and impacts on people and environment
	NSW *Biodiversity Conservation Act 2016* (BC Act) listed threatened species and ecological communities	4. Build community support
	National parks	5. Deliver project on time at reasonable cost for consumers
	Nature reserves	
	Land subject to Native Title determination with 'exclusive use'	
	Land where Native Title has not been extinguished	
	State heritage listed items and properties	
	Significant Aboriginal sites	
	Critical industry clusters	
	Biophysical strategic agricultural land (BSAL), notably land used for viticultural or equine purposes	
Tier 3 – Impacts to be minimised	Area of EPBC Act listed threatened species and ecological communities already impacted or cleared	2. Minimise significant land use conflicts and impacts on people and environment

Tier	Feature	Relevant strategic objective
	Area of BC Act listed threatened species and ecological communities already impacted or cleared	
	Area of National Park land already impacted or cleared	
	Area of nature reserve land already impacted or cleared	
	Key fish habitat	
	Local environmental plan sensitive mapped land (e.g. scenic protection, habitat corridors or biodiversity)	
	Koala habitat	
	Aboriginal sites directly impacted	
	Non-State listed heritage sites directly impacted	
	Biophysical strategic land already impacted	
	Intensive cropping land already impacted	
	Critical industries land already impacted	
	Town centres or settlements	
	Flood prone land	3. Minimise hazards and risk
	Steep slopes	
	Certain soils	
	Bushfire prone land	
	Mining lease areas	2. Minimise significant land use conflicts and impacts on people and environment

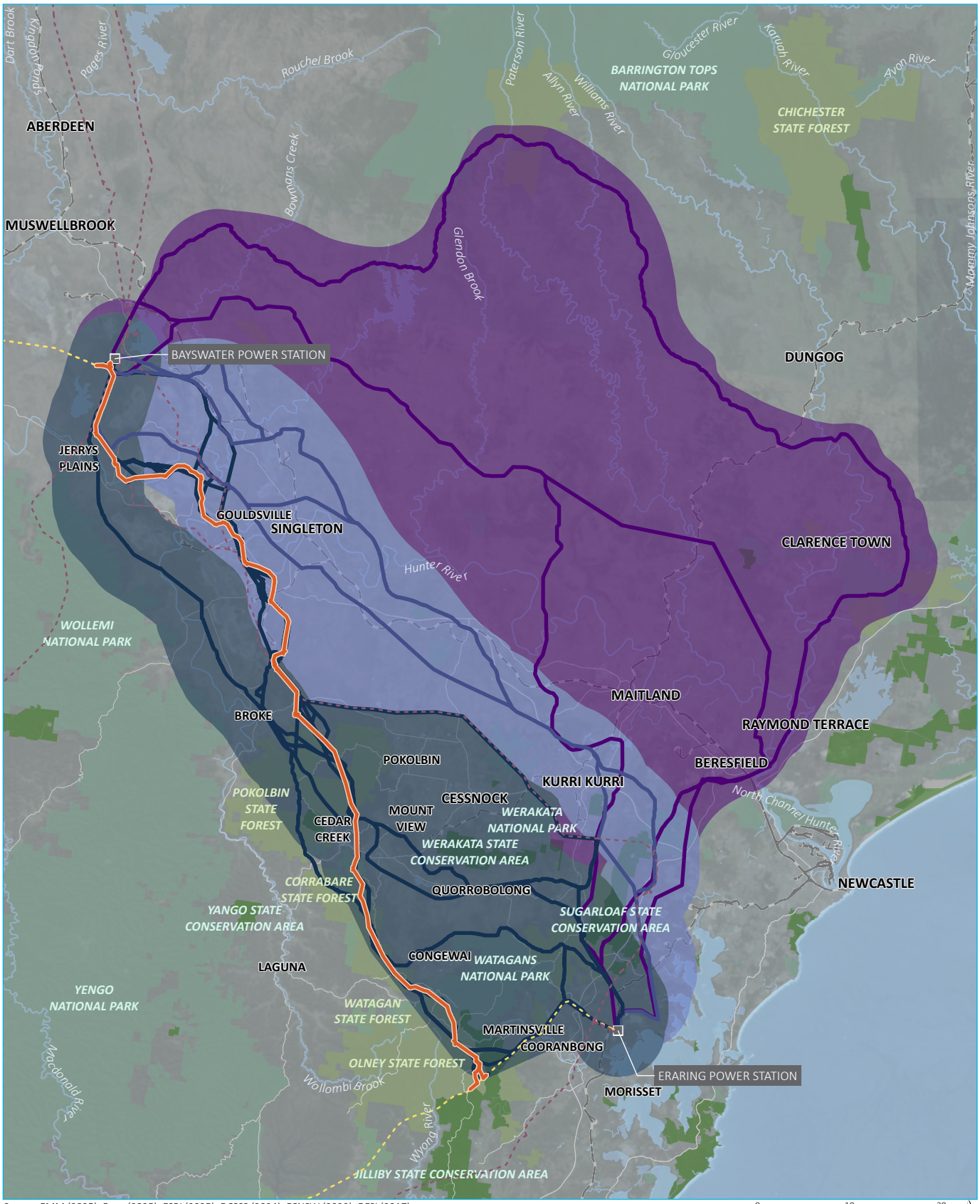
Tier	Feature	Relevant strategic objective
	Residential land (one km buffer)	
	Commonwealth owned land	
	High usage Defence areas	
	Proposed mines	
	Renewables projects	
	Major developments	

Spatial modelling identified 19 potential route options for the HTP. These route options were grouped into 3 strategic corridors (North, Central and South), as shown in Figure 3.1.

The 19 route options were explored and evaluated in depth. The most suitable route option from each strategic corridor was then selected by assessing their respective strengths and limitations with regard to the corridor objectives. The preferred route option from each strategic corridor (North, Central and South) was named as route A (e.g. North A, Central A, South A).

A summary of the evaluation of the preferred route options within each strategic corridor is provided in Table 3.5 and shown in Figure 3.2, Figure 3.3, Figure 3.4.

The route option analysis concluded that the South A route option was preferred and would be taken forward for further development and investigation.



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

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GDA2020 MGA Zone 56

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KEY

HTP corridor

Corridor line option
- North
- Central
- South

Strategic corridor
- North
- Central
- South

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

Broad strategic corridors assessed for the HTP

Hunter Transmission Project
Environmental Impact Statement
Figure 3.1

EMM
creating opportunities

Table 3.5 Summary of preferred route options evaluation

Strategic corridor	Preferred route option	Advantages	Disadvantages	Conclusion
North (4 route options identified)	North A - length of 139 km, is the longest of the route options. It extends north and east from Bayswater, avoiding developed areas and mine sites, and heading south to Eraring via Richmond Vale.	Avoids all identified Tier 1 constraints with some interactions with Tier 2 constraints (biodiversity, broad-scale agriculture and designated biophysical strategic agricultural land). Around 32% of the North A route is within one km of existing electricity transmission infrastructure with use of potentially inactive and available mining and industrial land and public and Crown Land being some 19 km (14% of its length) and 10 km (7% of its length), respectively.	Introduction of new electricity transmission infrastructure into rural areas which results in impacts on rural residences (in areas where there is no existing electrical infrastructure). Given the overall length of North A, it is likely to have a larger number of interactions with individual landowners. The Lambs Valley section is considered to have moderate visual amenity as it is a narrow valley with large open unvegetated areas. The low-lying floodplain areas between Lambs Valley and Bishops Bridge are likely to have a large visual catchment for residential areas including new subdivision and land release areas.	Due to its overall length, this option passes a greater number of visual receivers than other options considered, especially residential areas between Glendon Brook and Brunkerville. This option is not able to use mining, public or Crown owned land to the same extent as the other options. Only a small portion of its path goes through identified opportunities.

Strategic corridor	Preferred route option	Advantages	Disadvantages	Conclusion
Central (6 route options identified)	Central A - total length of 114 km, initially heading south from Bayswater and passing through Lemington, Maison Dieu, Rothbury, Heddon Greta, Kurri Kurri and Richmond Vale before connecting with Eraring.	A very high rate of co-location with existing electricity transmission infrastructure (around 94% of its length) and its comparatively small impact on communities and sensitive visual receivers. Around 52 km traverse existing mining and industrial land consistent with the corridor objectives. All Tier 1 constraints are avoided.	Around 16.2 km traverses the well-established Hunter Valley wine region, a critical industry cluster of viticulture, presenting potential for significant land use conflict. The area north of the Singleton Military Area has high visibility to residential areas of Singleton and outer areas given it is a low-lying floodplain. Potential impacts to irrigated properties, including large, irrigated properties at Hambledon Hill and Maison Dieu.	Central A must pass a series of constraints in the Long Point to Rothbury section of the corridor. The BSAL surrounding the Hunter River, Singleton Military Area and its adjacent rural residential areas, large areas of threatened ecological communities, viticulture industry clusters, an obstacle limitation surface area surrounding Cessnock airport, and proposed residential and conservation areas around North Rothbury.

Strategic corridor	Preferred route option	Advantages	Disadvantages	Conclusion
South (9 route options identified)	South A – total length of 114 km, South A passes through the localities of Lemington, and Mount Thorley, then passes through several State forests (Pokolbin, Corrabare, Watagan and Olney), before reaching Eraring.	High degree of co-location with existing transmission lines in the northern half and southern end (some 63% of its length). Around 49 km traverse existing mining and industrial land. Around 37.5 km traverse densely vegetated areas of Pokolbin State Forest, Corrabare North Flora Reserve, Corrabare State Forest, Watagan State Forest, Olney State Forest and Jilliby State Conservation Area in the southern half reducing visual impacts. All Tier 1 constraints are avoided.	Introduction of new electricity transmission infrastructure through densely vegetated areas of Pokolbin State Forest, Corrabare North Flora Reserve, Corrabare State Forest, Watagan State Forest, Olney State Forest and Jilliby State Conservation Area would result in impacts on biodiversity (although less than North A and Central A which impact the Hunter Valley floor vegetation communities). The Bayswater to Singleton Military Area sections use land owned by the mining operations and Department of Defence (Singleton Military Area) which would have complex stakeholder interfaces.	Fewer impacts to people as South A crosses less private land and is situated further away from residential dwellings and suburbs within valley landforms. Greater capacity for co-location with existing transmission lines and the utilisation of large amounts of public land and potentially available mining land. Lesser impacts to viticulture industry cluster. No disturbance within National parks.

1 Maximise use of mines, suitable public land and electricity easements

- 1a Minimal use of mining land (11.5 km)
- 1b Minimal use of suitable public land (10.8 km)
- 1c Lowest opportunity to co-locate with suitable existing electrical infrastructure
- 1d Route connects to Richmond Vale and Kurri Kurri

2 Minimise significant land use conflicts and impacts on people and environment

- 2a Moderate to high potential for land use conflicts through traversing of broad scale agricultural land
- 2b Highest number of receivers (690) and high visual amenity impacts to communities in several locations
- 2c No intersection with National Parks, reserves or State Conservation Areas

3 Minimise hazards and risks

- 3a Minimal amount within mining and exploration licence areas
- 3b Minimal amount within mine subsidence areas
- 3c Low amount of Category 1 Bush Fire Prone Land traversed

4 Build community support

- 4a Community support likely to be affected due to potential land use conflicts, high number of private land holdings to be affected and the significant visual amenity impacts to communities

5 Deliver project on time at reasonable cost to consumers

- 5a Longest line length therefore potentially highest cost to consumers
- 5b Potential for significant delays to approvals and acquisition due to significant potential impacts to communities and number of private landholders to be affected

LEGEND

- Strategic objective is achieved
- Strategic objective is not achieved, but is unlikely to be a significant risk for the Project
- Strategic objective is not achieved and is likely to have significant risks for the Project

Existing transmission line

Main road — Railway

North A

N

20 km

Figure 3.2 Key outcomes of route options analysis – North A

1 Maximise use of mines, suitable public land and electricity easements

- 1a Significant use of mining land (52 km)
- 1b Marginal use of suitable public land (15 km)
- 1c Majority of route co-located with existing electricity infrastructure (almost 94%)
- 1d Route connects to Richmond Vale and Kurri Kurri

2 Minimise significant land use conflicts and impacts on people and environment

- 2a Significant land use conflicts with alignment traversing viticulture industry (critical industry cluster) (16 km) and numerous present and planned residential communities
- 2b Large number of receivers (423) and with high visual amenity impacts to communities and limited ability to mitigate due to key infrastructure and residential pinch points
- 2c No intersection with National Parks; 3.2km of the alignment within Sugarloaf State Conservation Area; potential for greatest biodiversity impact due to clearance of critically endangered Hunter Valley floor vegetation communities

3 Minimise hazards and risks

- 3a Moderate amount within mining and exploration licence areas
- 3b Minimal amount within mine subsidence areas
- 3c Moderate amount of Category 1 Bush Fire Prone Land traversed

4 Build community support

- 4a Community support likely to be affected due to potential land use conflicts, high number of private land holdings to be affected and the significant visual amenity impacts to communities

5 Deliver project on time at reasonable cost to consumers

- 5a Lower line length compared to Northern Corridor, though potential for significant biodiversity offset costs to be incurred due to clearing of significant Hunter Valley floor vegetation communities
- 5b Potential for significant delays to approvals and acquisition due to significant potential impacts to communities and number of private landholders to be affected

LEGEND

- Strategic objective is achieved
- Strategic objective is not achieved, but is unlikely to be a significant risk for the Project
- Strategic objective is not achieved and is likely to have significant risks for the Project
- Existing transmission line
- Main road
- Railway
- Central A

N

20 km

Figure 3.3 Key outcomes of route options analysis – Central A

1 Maximise use of mines, suitable public land and electricity easements

- 1a Significant use of mining land (52 km)
- 1b Significant use of suitable public land (10.8 km)
- 1c Significant amount of route co-located with existing electricity infrastructure, in particular co-location with 330 kV or higher infrastructure (39 km)
- 1d No connection to energy projects

2 Minimise significant land use conflicts and impacts on people and environment

- 2a Moderate potential for land use conflicts with broad scale agriculture traversed (40.9 km); No traversing of viticulture critical industry cluster
- 2b Least amount of receivers of all options, with the least amount of land owned by private individuals of all options (11.6 km) *NOTE: Increases to moderate should Defence land alignment not be feasible and route re-aligned to pass to the east of Broke township*
- 2c No intersection with National Parks; passage through several State Forests containing native vegetation and small section of Jilliby State Conservation Area

3 Minimise hazards and risks

- 3a Moderate amount within mining and exploration licence areas
- 3b Low amount within mine subsidence areas
- 3c Moderate to high amount of Category 1 Bush Fire Prone Land traversed due to State Forests

4 Build community support

- 4a Community support more likely to be achieved due to the lower impacts to people compared with the other options

5 Deliver project on time at reasonable cost to consumers

- 5a Lower line length compared to Northern Corridor so lower construction cost. Potential for moderate biodiversity offset costs to be incurred due to clearing within State Forests, though this would be lower than the Central Corridor
- 5b Highest certainty for delivering project on time due to least amount of private landholders to be affected

LEGEND

- Strategic objective is achieved
- Strategic objective is not achieved, but is unlikely to be a significant risk for the Project
- Strategic objective is not achieved and is likely to have significant risks for the Project
- Existing transmission line
- Main road
- Railway
- South A

N

20 km

Figure 3.4 Key outcomes of route options analysis – South A

3.4 Preferred route option

Following identification of the preferred route option (South A), targeted ground truthing activities were carried out to further assess the South A route option. Where possible, key areas were accessed to gain a greater understanding of the land use and how it may be affected by the construction of a high voltage transmission line and easement.

Further project development was undertaken to support the identification and evaluation of potential alignments along the South A route option. The key inputs for this work included:

- consultation with key stakeholders to understand potential constraints
- design development within the preferred route option that considered constructability, value for money, impacts to environment and community
- preliminary environmental investigations within the preferred route option.

Investigations found the following key challenges and constraints within the preferred route option:

- significant changes in elevation - the preferred route option is characterised by undulating topography between Bayswater and Broke, and then steep sandstone escarpments across the State forest land to Eraring. The section between Bayswater and Broke is generally the flattest part of the preferred route option however, elevation levels still range between around 20 metres and 200 metres. From Broke, there is a significant steep climb travelling southeast into the Pokolbin State Forest with ridgelines sitting around 500 metres elevation and gullies at around 400 metres elevation. After a sharp descent at Cedar Creek to around 100 metres, there is another rapid climb into the Corrabare State Forest, with ridgelines of up to 450 metres and gullies down to around 250 metres. The preferred route option then passes through the Watagan and Olney State forests before heading into Martinsville, where there is another significant drop down to around 30 metres elevation and some further undulations up to around 90 metres prior to entering Eraring at around 20 metres
- multiple river crossings - the Bayswater to Gouldsville section of the preferred route option requires multiple crossings of the Hunter River and associated streams. At least 4 crossings are anticipated within private property, which would limit the locations that a river crossing would be feasible
- traversing through previously or actively mined land - the Bayswater to Broke section of the preferred route option and the final section of the preferred route option at Eraring are located within current or previously mined land. In particular, the preferred route option traverses through Hunter Valley Operations (HVO), Warkworth Mine and Bulga Coal Mine in the northwestern portion and former underground mining operations at Eraring. This increases the likelihood that the transmission alignment would traverse reclaimed land or mining subsidence areas, presenting the need to minimise the structures located within these areas
- location of receivers - the preferred route option includes interaction with receivers at Pokolbin, Cedar Creek, Martinsville and Cooranbong. These areas vary in terms of levels of population and density and would require additional consideration in terms of visual impacts and amenity

- **impacts to sensitive environmental areas** - preliminary environmental studies indicated that there are both biodiversity and heritage constraints that need to be considered. These include the presence of critically endangered ecological communities through the northern section of the preferred route option such as the Warkworth Sands Woodland community and habitat for the Swift Parrot, as well as both known and potential objects and sites of Aboriginal cultural heritage significance
- **consideration of bushfire risk** - there are densely vegetated areas that the preferred route option traverses, generally these areas increase the potential risk of damage to transmission line infrastructure due to bushfires.

Considering these inputs, detailed consideration was given to:

- location of potential transmission line alignments along the preferred route option
- selection of the preferred transmission line alignment for the HTP.

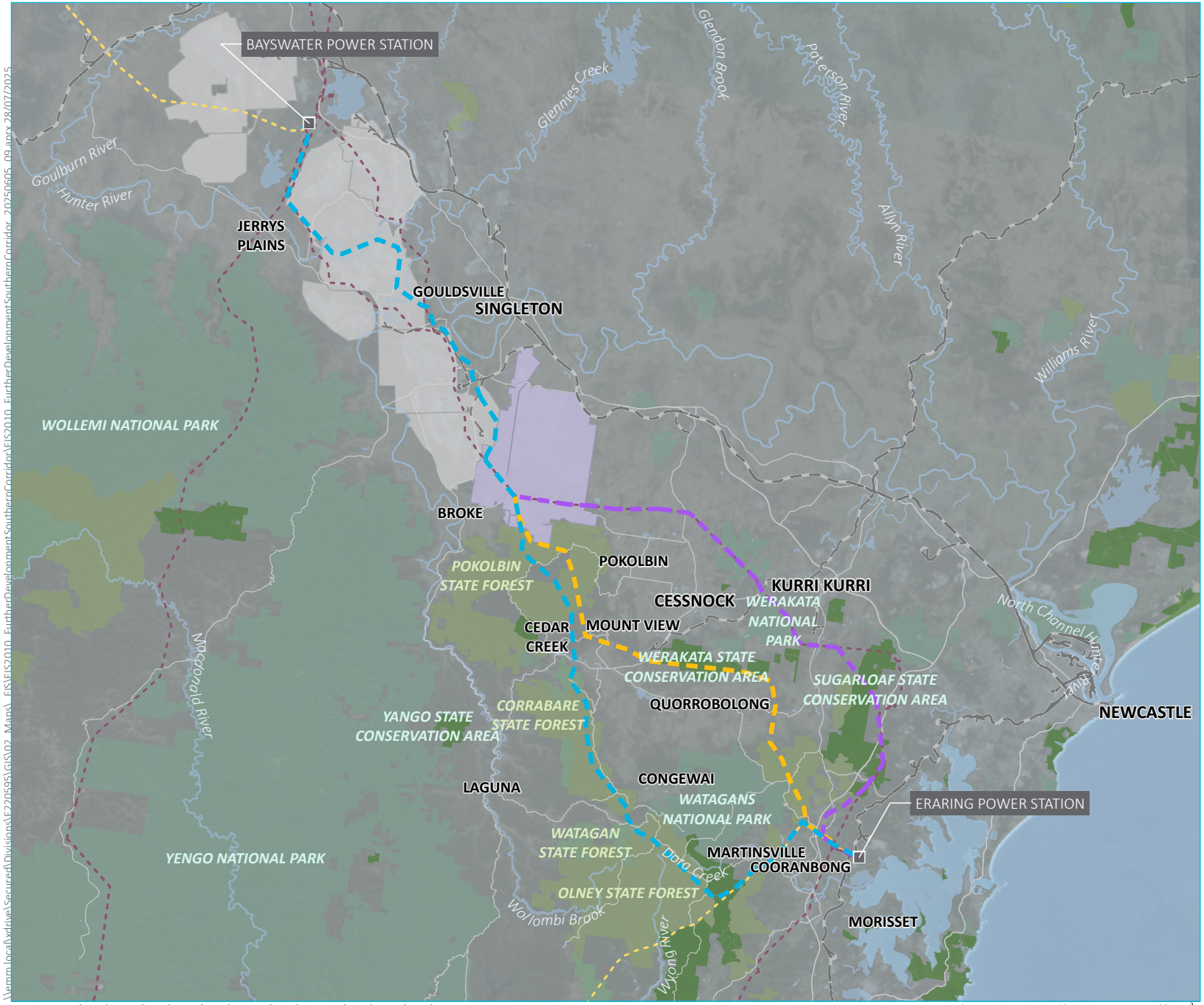
3.5 Preferred transmission line alignment

With the confirmation of the preferred route option, and overhead transmission lines the preferred arrangement, 3 transmission alignment alternatives were identified, as shown in Figure 3.5.

All 3 transmission alignment alternatives shared the following assumptions:

- new switching stations would be required at either end of the transmission line (in the vicinity of Bayswater Power Station and Eraring Power Station)
- the same alignment is adopted for the Bayswater to Broke section (over around 50 kilometres) to:
  - maximise the use of open cut mining areas
  - manage the constraints and potential significant impacts associated with this heavily developed part of the Upper Hunter Valley.

Given that the 3 transmission alignment options shared a common alignment between Bayswater and Broke the comparative analysis of the options focussed on the section between Broke and Eraring.



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

Alignment alternatives for preferred route

Hunter Transmission Project
Environmental Impact Statement
Figure 3.5

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Corridor objectives and key considerations for relevant technical, environmental, community and economic factors were developed to evaluate the 3 transmission alignment alternatives for the section between Broke and Eraring (see Table 3.6). The criteria expand on the EnergyCo planning pillars outlined in
Table 3.3.

Table 3.6 Objectives and evaluation considerations for preferred transmission alignment

Corridor objectives
Maximise use of mines, suitable public land and electricity easements
Minimise significant land use conflicts and impacts on people and environment
Minimise hazards and risks
Build community support
Deliver the project on time at reasonable cost for consumers

Key consideration	Criteria
Technical	• Optimise network efficiency and mitigate hazards and risks • Support the implementation of REZs in the Central-West Orana and New England regions • Co-locate with existing infrastructure where practicable • Follow alignments that are technically viable and constructable • Maximise the efficiency of easements and substation locations (including proximal connections to high-volume generators and industry consumers) • Minimise the number of required outages to the existing electricity network
Environmental	• Minimise impacts on unique or sensitive biodiversity and cultural values and offset unavoidable biodiversity impacts
Community	• Maximise the use of available mining and industrial lands • Minimise direct interactions with town centres, residential areas, and sensitive community locations • Minimise visual amenity impacts through thoughtful design and application of mitigation measures • Maximise the use of public land where practicable • Seek to microsite infrastructure in consideration of landowner preferences and land practices
Economic	• Deliver cost effective solutions for energy consumers • Support the future economic development of the Hunter, Sydney and Illawarra load centres • Minimise direct interactions with critical industries and prime agricultural land where possible and seek to locate infrastructure in consideration of agricultural practices

Key features of the transmission alignment options are provided in Table 3.7.

Table 3.7 Key features of the transmission alignment options between Broke and Eraring

Alignment alternative	Key features
Alignment A	• Broke to Eraring section of alignment travels a length of around 63 km • High use of public land. Alignment runs mainly through Pokolbin, Corrabare, Olney and Watagan State Forests which are managed by Forestry Corporation of NSW (FCNSW) • Uses land primarily in the Pokolbin, Corrabare, Olney and Watagan State forests, and a small section of land in the Jilliby State Conservation Area to then co-locate with the existing 500 kV Kemps Creek to Eraring line to connect into the existing substation at Eraring Power Station • Moderate to high bushfire risks • Limited access points to the transmission alignment – new and upgraded tracks required • Total length through the forests is around 58 km. This is likely to require a significant amount of clearing of native vegetation • Moderate to high risk of encountering areas and objects of Aboriginal heritage significance. Aboriginal heritage values likely associated with ridgelines, sandstone cliffs and caves (rock shelters) so design should consider avoidance and mitigation options through setback from the ridgeline and micro-siting of towers • Low risk of impact to historic heritage items and areas • Potential for visual, traffic and recreational impacts both in construction and operation – further design avoidance and mitigation required • Around 30 landowners impacted • Avoid direct impacts to major local economy industries including viticulture
Alignment B	• Broke to Eraring section of alignment travels a length of around 63 km • The alignment primarily uses land in existing Transgrid and Ausgrid easements and adjacent to existing 330 kV and 132 kV assets from Broke to Richmond Vale and then runs the transmission lines adjacent to existing 330 kV lines from Richmond Vale to Eraring, including through the Sugarloaf State Conservation Area • High bushfire risk due to substantial amount of the alignment traversing forested areas • Risk to security of core energy supply due to lack of diversity in line routes where the 2 x 330 kV and a 500 kV line share the same easement • Outages for the existing 330 kV lines would be required to enable works • Public road access to this area is well established and existing Transgrid access roads are available • Although half of the transmission alignment is located within the existing cleared easement, impacts to critically endangered ecological communities would be significant given the scarcity of these communities in the region • Crosses Sugarloaf ridgeline, an area of Aboriginal cultural heritage significance • Around 60 landowners impacted • Significant visual impacts likely

Alignment alternative	Key features
Alignment C	• Length of around 55 km, using land primarily in the Pokolbin and Olney State forests, through the Ellalong Valley, the Werakata National Park and State Conservation Area • Large amount of private property acquisitions compared to alignments A and B. Limited access points to the transmission alignment • High bushfire risk • 16 km of National Park and likely to require extensive clearing of Hunter Valley floor critically endangered ecological communities • Traverses major towns in the area including Millfield and Ellalong • Potential for high visual amenity impacts • Around 50 landowners impacted

The evaluation of the alignment options against the corridor objectives and key considerations is provided in Table 3.8.

Table 3.8 Evaluation summary of alignment options between Broke and Eraring

Strategic objective	Alignment A	Alignment B	Alignment C
Maximise use of mines, suitable public land and electricity easements	Significant use of mining land in common Bayswater to Broke section.	Significant use of mining land in common Bayswater to Broke section.	Significant use of mining land in common Bayswater to Broke section.
	Significant use of suitable public land through State forests.	Low use of suitable public land.	Minimal use of suitable public land.
	Low amount of co-location with suitable existing electrical infrastructure.	Majority of route from Broke to Eraring section is co-located with existing electricity infrastructure.	Low amount of co-location with suitable existing electrical infrastructure.
Minimise significant land use conflicts and impacts on people and environment	Low to moderate potential for land use conflicts through traversing of outskirts of Defence land and through State forests.	High potential land use conflicts with alignment traversing viticulture industry (critical industry cluster).	Moderate potential for land use conflicts with traversing of communities and broadscale agriculture.

Strategic objective	Alignment A	Alignment B	Alignment C
	Lowest number of private landowners and receivers with opportunities for the alignment to be visually shielded by topography.	Significant interaction with receivers where the alignment is located within existing easement. Significant visual impacts associated with new higher towers located within the existing easement.	Significant interaction with receivers where the alignment is located within the Ellalong Valley and therefore significant visual impacts for numerous receivers in this area.
	Clearing of native vegetation through State forests and State conservation area required. Lowest biodiversity impact of all alignments due to avoidance of scarce valley floor communities. Substantial biodiversity offsets package required.	Intersects with Sugarloaf State Conservation Area, potential for high biodiversity impact due to clearance of scarce, critically endangered ecological communities of the valley floor. Substantial biodiversity offsets package required.	Intersects with and would require clearing through Werakata National Park and State conservation area. Potential for highest biodiversity impact of all alignments due to clearing of scarce, critically endangered ecological communities of the valley floor. Unlikely to be supported by regulators due to potential environmental impacts.
Minimise hazards and risks	No significant impacts to energy security associated with outages of existing lines.	Significant impacts to energy security associated with outages to the existing 330 kV lines to enable the project to proceed.	No significant impacts to energy security associated with outages of existing lines.
	Low amount within mine subsidence areas.	Minimal amount within mine subsidence areas.	Low amount within mine subsidence areas.

Strategic objective	Alignment A	Alignment B	Alignment C
	Bushfire risk due to passage through State forests and National park reserve.	Bushfire risk due to passage through State forests and State conservation areas.	Bushfire risk due to passage through National park reserve and State conservation areas.
Build community support	Community support more likely to be achieved due to the lower impacts to people and the environment compared with the other options.	Community support likely to be affected due to potential land use conflicts, high number of private landholdings to be affected and the significant visual amenity impacts to communities.	Community support likely to be affected due to potential land use conflicts, high number of private landholdings to be affected, significant visual amenity impacts to communities and significant impacts to biodiversity.
Deliver project on time at reasonable cost for consumers	Lowest number of landowners and highest use of suitable public land, leading to lower cost to consumers compared to Alignment B and Alignment C.	Most expensive alignment alternative, due to the need to demolish and rebuild 330 kV lines in addition to the HTP 500 kV line.	Comparatively cheaper than Alignment B, due to reduced requirements for additional infrastructure, though significant biodiversity offset costs would be incurred.
	Approvals likely to be obtained to enable the project to be constructed on time due to lower overall impacts to the people and the environment.	Potential for delays to construction and risk of delivery date not being achieved due to significant outage requirements for existing lines.	Potential for delays to approvals and acquisition due to significant potential impacts to communities and number of private landholders to be affected.

The 3 alignments were evaluated to identify the alignment that met the strategic objectives and balanced technical, environmental, community and economic outcomes. Based on the outcomes of the transmission alignment options evaluation and feedback from the preferred network operator, Alignment A was identified as the preferred alignment for the HTP. This is because it:

- is the fastest way to secure critical transmission capacity for the Hunter, Sydney and Illawarra regions

- avoids any potential disruption to the operation of the existing 330 kV transmission lines in the existing easements, which currently play a critical role in delivering electricity to the major load centres
- has the lowest number of impacted landowners as it avoids most of the Hunter community, including major towns (Singleton, Cessnock, Maitland) and villages (Jerrys Plains, Broke, Millfield, Ellalong)
- avoids impacts to Watagans and Werakata National parks
- avoids the Pokolbin wine and tourist area (critical industry cluster) and other strategic agricultural land
- maximises the use of coal mining and power station land
- maximises the use of suitable public land by traversing the Pokolbin, Corrabare, Olney and Watagan State forests
- has less impacts on vegetation communities and species with significant conservation value on the valley floor, compared to other alignment alternatives
- strikes a reasonable balance across all the key considerations within a constrained and complex regional context.

A buffer area of one kilometre was applied to the preferred alignment to enable flexibility for the development of the concept design to adapt to further community and stakeholder engagement and environmental surveys and investigations. This wider area was termed the 'preliminary HTP corridor'.

The preliminary HTP corridor was presented in the Scoping Report submitted to the NSW Department of Planning, Housing and Infrastructure (DPHI) in May 2024 and Referral to the Australian Government Department of Climate Change, Energy, the Environment and Water in July 2024.

3.6 Refinements to the HTP

In response to early community feedback and further technical and environmental investigations, several adaptations and improvements were made to the HTP.

Project refinement sought to avoid and minimise potential impacts to critical land use and environmentally sensitive areas.

EnergyCo published feedback reports *Shaping the Hunter Transmission Project* in May 2024 and an updated report *Refining the Hunter Transmission Project* in December 2024 to outline the refinement process for the HTP.

3.6.1 Switching stations

The project requires switching stations to be constructed at both ends to allow connection into the existing electrical grid. The northern (Bayswater) and southern (Eraring and surrounds) areas have numerous large-scale developments and natural features which constrain the available land for 500 kV transmission line alignments and 500 kV switching stations.

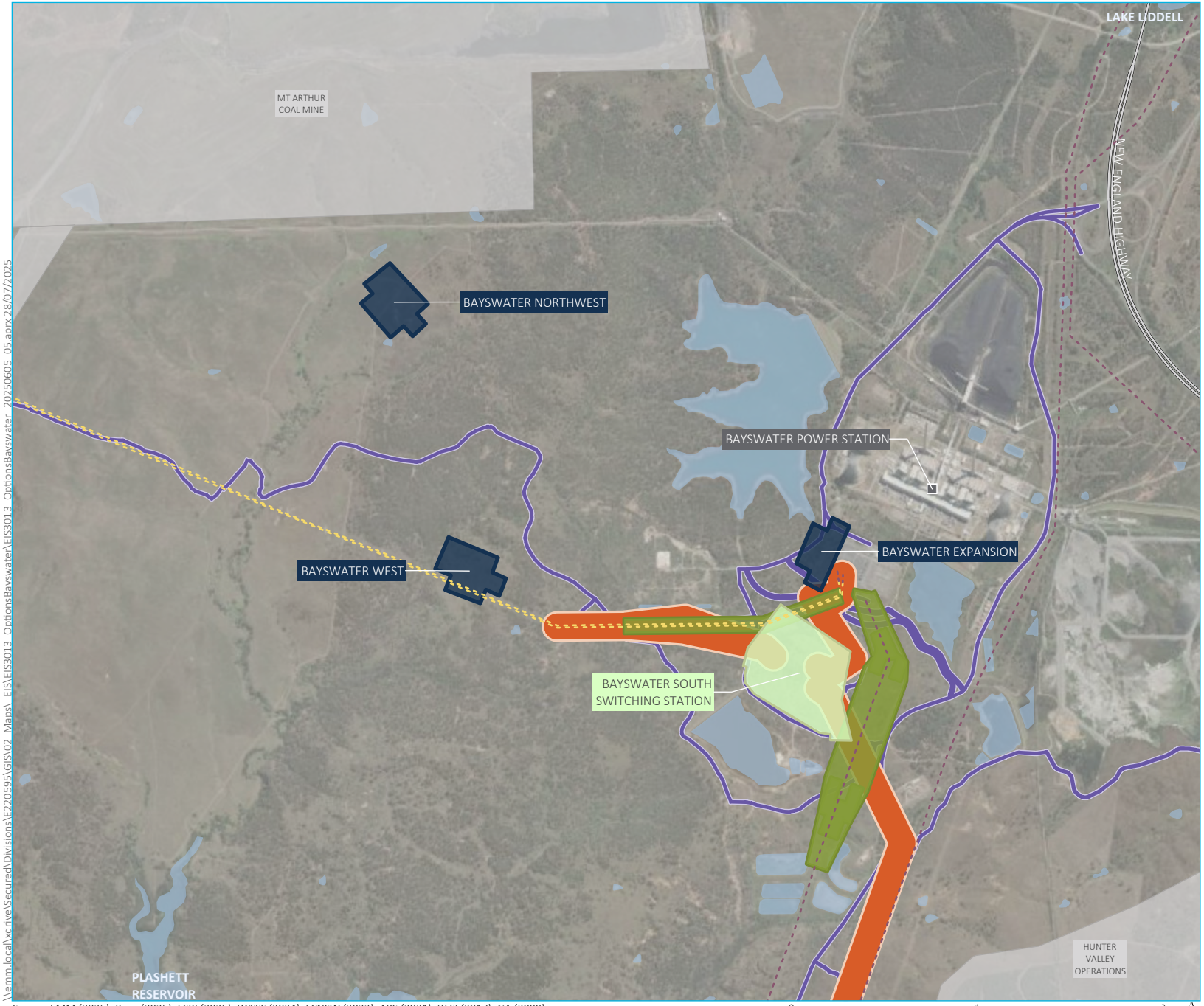
Northern switching station

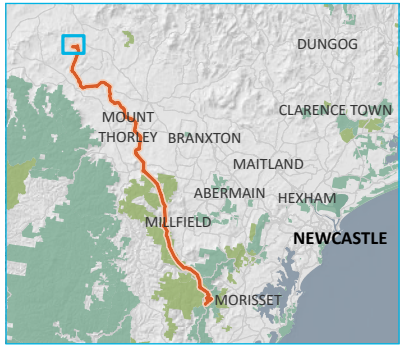
The following switching station sites (and associated staging allowing for future overhead line connections) were considered at Bayswater:

- Option 1 – Bayswater South
- Option 2 – Bayswater Expansion
- Option 3 – Bayswater West
- Option 4 – Bayswater Northwest.

The locations of the northern switching stations are shown in Figure 3.6.

Option 1 – Bayswater South was selected as the preferred option for the northern project connection point, based on the outcomes of site selection and resilience workshops, consultation with the landowner AGL, and costing evaluation of the options.





KEY

Project impact area

- HTP corridor
- Bayswater South switching station
- Adjustment to existing transmission line (lines 31 and 32)
- Access track
- Discontinued Bayswater switching station

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Major road
- Waterbody
- Mining

Northern switching station options

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Environmental Impact Statement
Figure 3.6

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

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Southern switching station

Eight potential sites for the southern switching station were identified, as shown in Figure 3.7 and summarised in Table 3.9. The sites were located at various points along Transgrid's existing 500 kV Kemps Creek to Eraring line where connection into this existing line would be a technical requirement for the HTP. The greater the distance from the Eraring transition point at the existing Eraring substation, the earlier the project could connect to the existing transmission lines. This allowed for the construction of the 500 kV line for the project to be terminated at this earlier point.

Table 3.9 Southern switching station location options

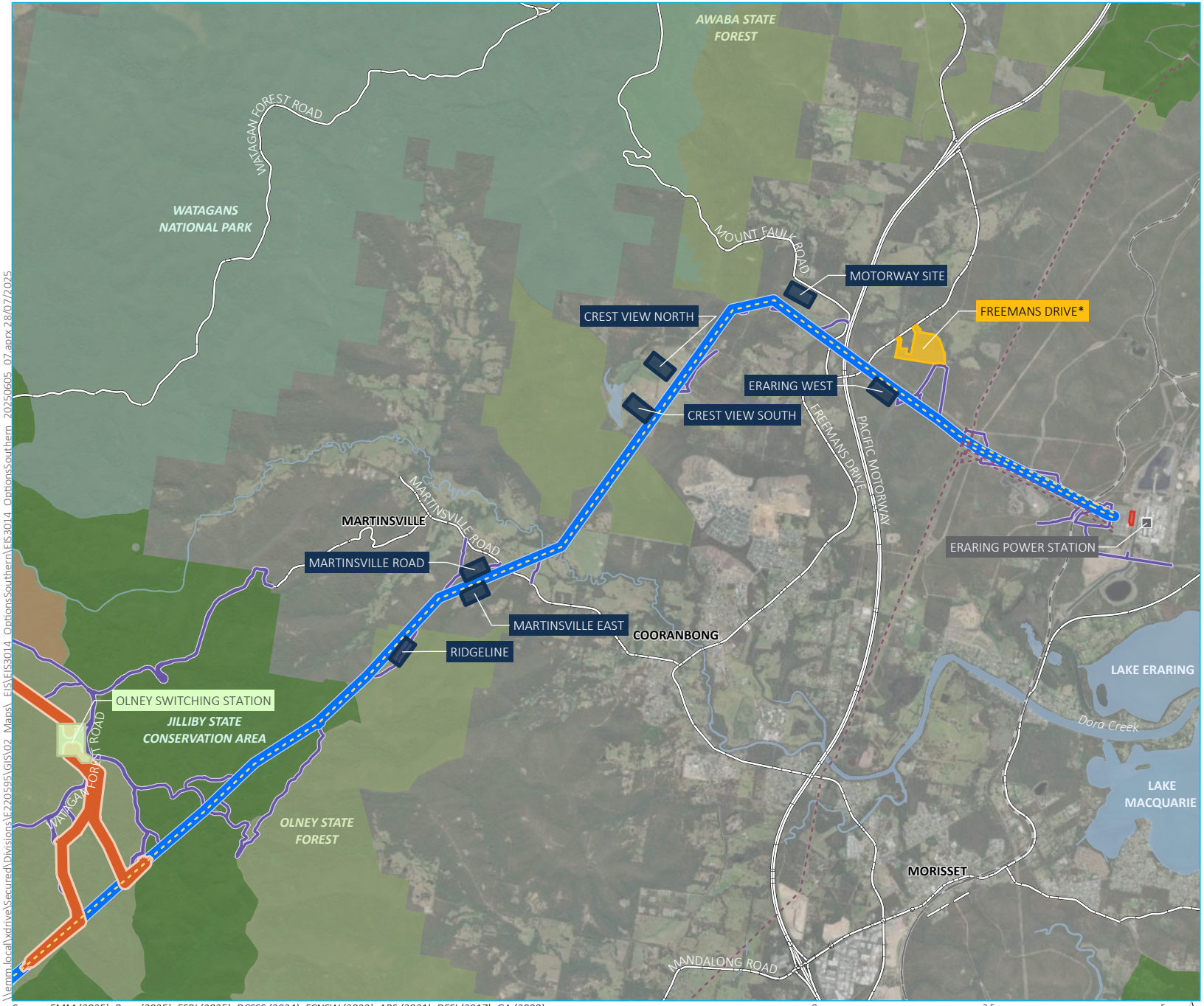
Option no.	Location	Distance to Eraring transition point
1	Olney State Forest	12.6 km
2	Ridgeline	10.8 km
3	Martinsville East	9.5 km
4	Martinsville Road	8.9 km
5	Crest View South	5.5 km
6	Crest View North	4.9 km
7	Motorway Site	3.0 km
8	Eraring West	1.2 km

Of the 8 options, 3 were shortlisted due to reasonable technical, environmental and cost benefits, being:

- Option 1 – Olney State Forest
- Option 3 – Martinsville East
- Option 8 – Eraring West.

All 3 sites identified were technically feasible to host the southern switching station for the project, however, there were some key differences between the options, in particular the levels of impact to the community and environment.

Option 1 – Olney State Forest located on the site on an old commercial timber plantation was selected as the preferred option due to the likely significant community benefits. This option does not require the 500 kV transmission line to be constructed through the communities of Martinsville and Cooranbong. These social benefits are combined with reasonable technical, environmental and cost benefits. It is noted key issues associated with this option include bushfire and access.



KEY

- Discontinued southern switching station option

Project impact area

- HTP corridor
- Olney switching station
- Construction support site (*with temporary worker accommodation)
- 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

Southern switching station options

Hunter Transmission Project
Environmental Impact Statement
Figure 3.7

EMM
creating opportunities

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

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3.6.2 Transmission line

As the project design commenced and engagement occurred with landowners and the community, more information was obtained in relation to local constraints and opportunities. Concurrently, key environmental investigations (notably biodiversity and Aboriginal heritage) were undertaken to support the early design development. In some sections of the preliminary HTP corridor, changes were considered to the transmission line alignment to avoid specific property and environmental impacts and minimise the project's overall impacts on people and the environment.

Further details on the transmission line refinements incorporated into the HTP corridor (the basis of the EIS) to avoid constraints are provided below by major land use type.

Mining, energy and industrial land

The transmission line alignment has been strategically refined to utilise existing inactive or non-operational mining land and transmission line infrastructure reducing potential social and environmental impacts, as shown in Figure 3.8.

South of Bayswater switching station, the transmission line alignment was refined to minimise impacts on high-quality remnant Central Hunter Grey Box-Ironbark Woodland and Central Hunter Valley Eucalypt Forest and Woodland threatened ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) by prioritising areas of grassland and low-quality vegetation areas.

Near Gouldsville, the transmission line alignment was located to avoid impacts on high-quality remnant Warkworth Sands Woodland threatened ecological community listed under the BC Act through co-location with existing electrical infrastructure easements and access tracks.

Between Bulga and Mount Thorley, the transmission line alignment was adjusted to utilise mining-owned land wherever feasible and avoid the designated conservation offset area associated with Bulga Mine.

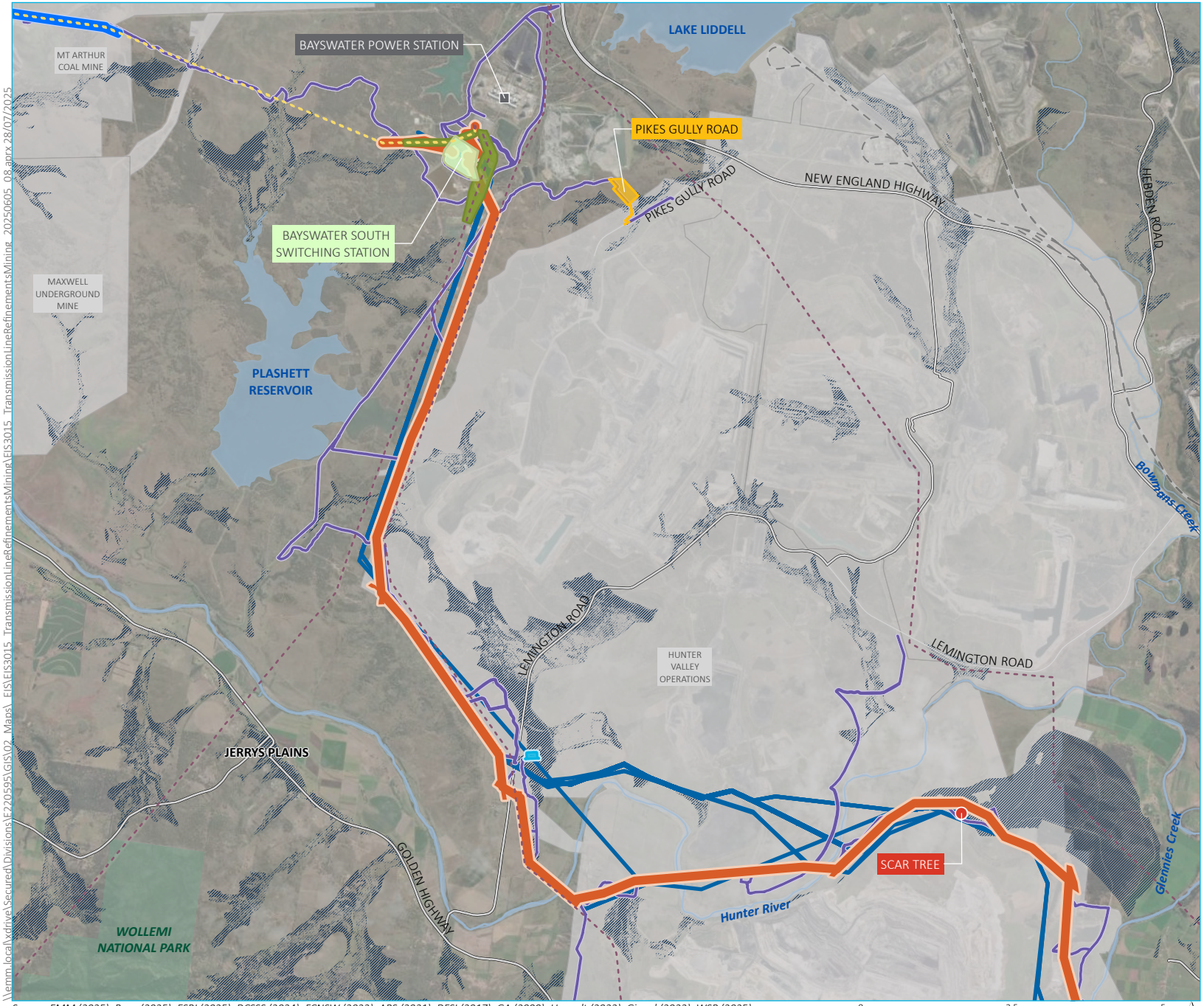
In the HVO South area, the transmission line alignment was altered to parallel existing transmission infrastructure, ensuring minimal interference with future mining operations, such as the proposed Lemington rail loop and road realignments. South of Lemington Road, further refinements were made to avoid interactions with HVO's proposed levee and water management infrastructure, and potential future extraction areas. These adjustments also kept the transmission line alignment west of HVO's approved pitshell boundary, allowing compatibility with ongoing and planned mining activities.

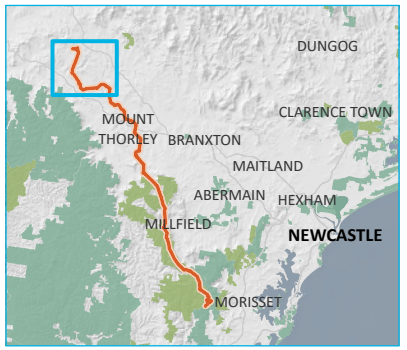
Near HVO South the transmission line alignment was adjusted to the north of the proposed Lemington Road realignment to avoid a culturally modified scar tree (see Figure 3.8), identified as a significant heritage item in the HVO Continuation Project. South of Bulga Mine, the transmission line alignment avoids heritage sites by co-locating with the existing disturbed transmission easement. This approach also maintained appropriate distances from the documented Vere rock shelter within the Singleton Military Area, ensuring minimal disturbance to these sensitive sites. Additionally, existing tracks and disturbed areas near the confluence of the Hunter River and Wollombi Brook River were used to minimise disturbance to the potential heritage features of the Warkworth sand system, a high potential archaeological area.

South of Old Lemington Road near HVO North, the transmission line alignment was refined to cross the Hunter River further west, taking advantage of floodplain areas with lower peak flood depths (2 to 5 metres) and reduced peak flood velocities (0.6 to 1.6 metres per second). Where higher peak flood velocities (greater than 3 metres per second) and depths (greater than 10 metres) are unavoidable, such as at the Hunter River crossing near HVO North and the confluence of Wollombi Brook and the Hunter River, transmission tower foundation designs have been updated to address these conditions. These include above-ground piers with scour protection caps and grouped reinforced bored piles, ensuring structural stability and minimising flood-related risks.

To address safety concerns related to major hazardous facilities, the transmission line alignment was shifted eastward to follow Broke Road and realigned around Mount Thorley, establishing a safe minimum distance from facilities (Enaex and Dyno Nobel) in Mount Thorley Industrial Estate, and at Gouldsville Road to maintain a 700-metre buffer from the Dyno Nobel facility in Warkworth.

Further refinements within Mount Thorley-Warkworth Mine land, adjacent to the Golden Highway, shifted the transmission line alignment away from the Hunter River, further west. This adjustment allowed tower foundations to be sited in areas with reduced peak flood depths and velocities, improving resilience during flood events. Similarly, refinements at Putty Road avoided the high flood depths and velocities associated with the confluence of Loder Creek and an unnamed third-order Strahler stream. In this area, tower foundations have been sited in conditions of minimal flooding, with peak flood depths and velocities of 0 to 0.8 metres and 0 to 0.8 metres per second, respectively.





KEY

- Discontinued alignment option
- Key Aboriginal sites and places avoided
- Potential Warkworth sand system Archaeological deposits

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining

Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); Umwelt (2023); Gippel (2023); WSP (2025)

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Transmission line refinements- mining, energy and industrial land Map 1 of 2

Hunter Transmission Project
Environmental Impact Statement
Figure 3.8

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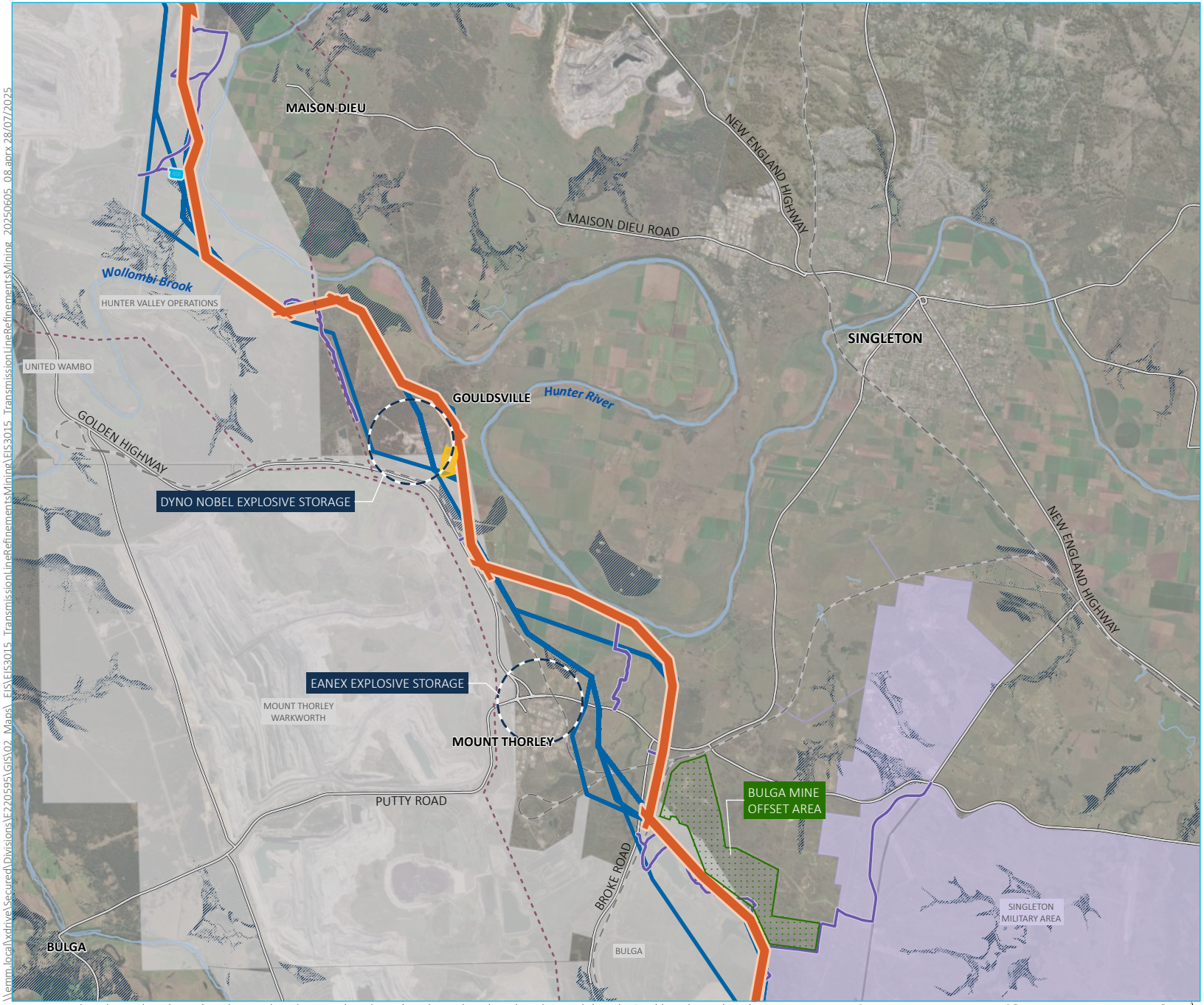

KEY

- Discontinued alignment option
- Potential Warkworth sand system Archaeological deposits
- Explosive 700 m radius
- Bulga mine offset area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Defence
- Mining

Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); Umwelt (2023); Gippel (2023); WSP (2025)

0 2.5 5 km

GDA2020 MGA Zone 56

N

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Transmission line refinements- mining, energy and industrial land Map 2 of 2

Hunter Transmission Project
Environmental Impact Statement
Figure 3.8

EMM
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Singleton Military Area

EnergyCo commenced discussions with the Department of Defence in March 2024 to determine the feasibility and possible locations of a transmission line alignment through the Singleton Military Area.

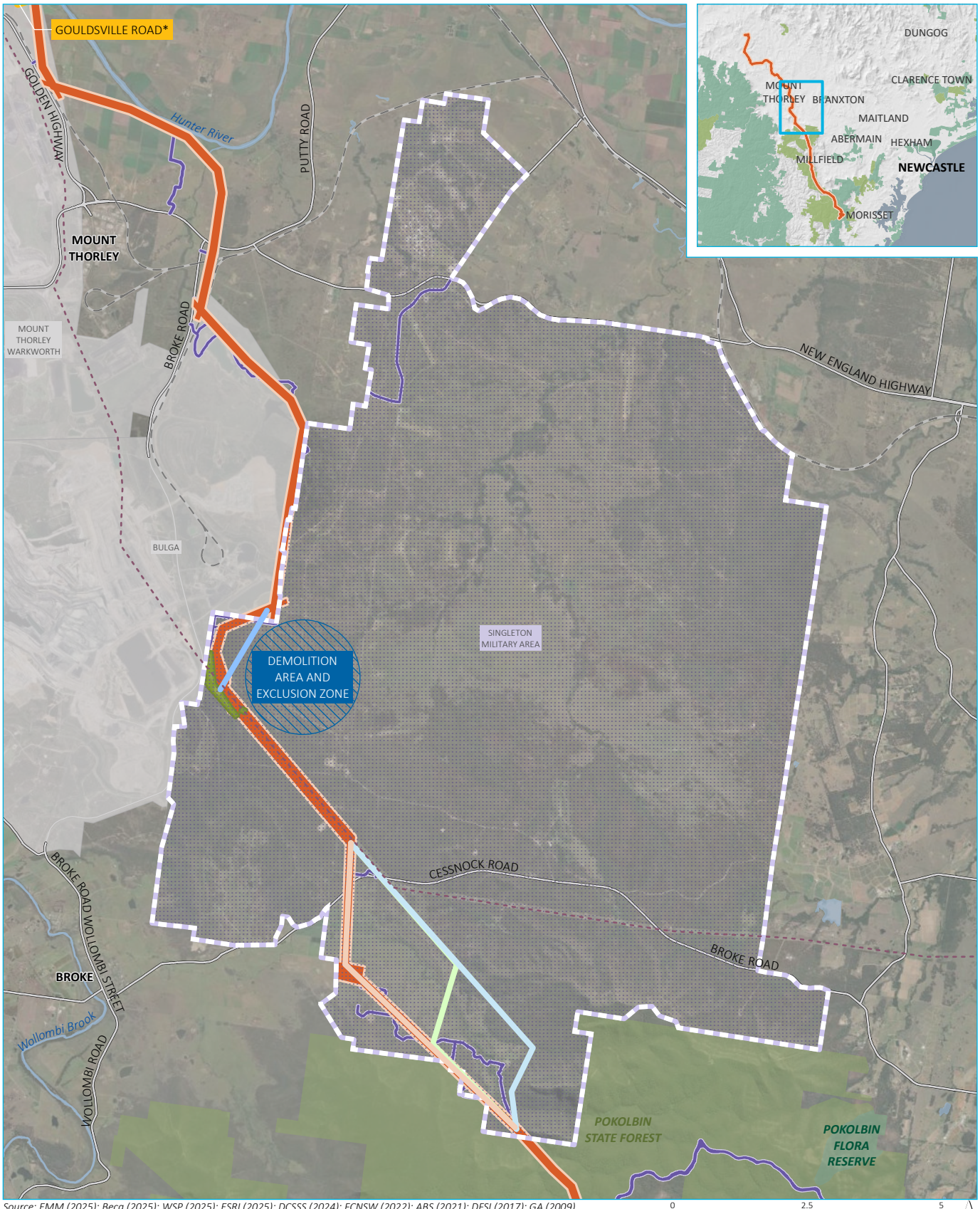
EnergyCo, in consultation with the Department of Defence, identified 3 potential transmission line alignments. The 3 options shared a common alignment that entered the Singleton Military Area from Bulga coal mine land on the northwestern boundary of the Singleton Military Area and then co-located with the existing 330 kV easement to Cessnock Road (see Figure 3.9).

The options then deviated into an eastern, central and western alignment which all terminated at the saddle into the Pokolbin State Forest on the southern boundary of the Singleton Military Area. The eastern and western options sought to push the transmission line alignment as far away as possible from the existing operations and facilities in the Singleton Military Area, while the central option was a composite of these alignments that sought to reduce the impacts of the project on the private residences on the western boundary of the Singleton Military Area.

All options were estimated to have low impacts on existing Defence operations within the Singleton Military Area, including aviation, security activities, and explosive and weapons safeguarding, with the exception of anticipated medium risks for a camp south of Cessnock Road associated with the central and eastern options.

All options were sited to avoid and minimise impacts on the environmental and heritage values of the Singleton Military Area. Nevertheless, all options would require the removal of some native vegetation, mostly in the common alignment adjacent to the existing 330 kV transmission easement:

- western option - this option would clear about 102.3 hectares of native vegetation and habitat. This includes around 56.1 hectares of vegetation from 3 threatened ecological communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Central Hunter Valley Eucalypt Forest and Woodland; Coastal Swamp Oak Forest of NSW and South East Queensland; and River-flat Eucalypt Forest on Coastal Floodplains of Southern NSW and Eastern Victoria)
- central option - this option would clear about 115.3 hectares of native vegetation and habitat. This includes around 68.9 hectares of vegetation from 3 threatened ecological communities listed under the EPBC Act, like the western and eastern options
- eastern option - this option would clear about 115.9 hectares of native vegetation and habitat. This includes around 72.6 hectares of vegetation from the threatened ecological communities listed under the EPBC Act, like the western and central options.



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

0 2.5 5 km

GDA2020 MGA Zone 56

N

KEY

- Key Aboriginal sites and places avoided
- Exclusion zone

Indicative transmission line option

- Central option
- Eastern option
- Western option
- Exclusion zone alternative option

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
- Minor road
- Named watercourse
- Named waterbody
- State forest
- Mining
- Defence

Transmission line options - Singleton Military Area

Hunter Transmission Project
Environmental Impact Statement
Figure 3.9

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EnergyCo undertook an evaluation of the options in line with considerations stipulated by the Department of Defence. A summary of the results is provided in Table 3.10.

Table 3.10 Evaluation of transmission line alignment options in Singleton Military Area

Consideration	Western option	Central option	Eastern option
Onsite considerations (for Defence)			
Potential impact on use			
Aviation (including helipads)			
Military quarters			
Dedicated impact areas			
Demolition range and exclusion zone			
Open training areas/ranges			
Military camp south of Cessnock Road			
Electromagnetic fields (EMF)			
Security			
Explosives and weapons safeguarding			
Property management			
Potential impact on infrastructure/services			
Services (power, water and sewer)			
Information, communication and technology systems			
Stormwater and drainage			
Waste			
Potential impact on environment and heritage			
Biodiversity			
Built heritage			
Natural heritage			

Consideration	Western option	Central option	Eastern option
Aboriginal cultural heritage			
Contamination			
Bushfire risk from the project			
Water (surface water, groundwater and flooding)			
Subsidence			
Offsite consideration (for community)			
Noise and vibration			
Visual amenity			
Traffic (use of Oakley Lane)			

Notes: Green = low risk, Amber = medium risk

In December 2024, EnergyCo presented the options and analysis to a Site Selection Board of the Department of Defence for selection of the preferred transmission line alignment. Considering existing zone plan requirements, the impacts that the project would have on the immediate location, surrounding land uses and/or users, as well as the potential impacts that the surrounding land users/land uses may have on the project, the western alignment was selected as preferred by Department of Defence in March 2025 to be used for the project.

The western alignment option has residual risks in relation to visual amenity, traffic and transport, biodiversity and heritage which are addressed further in this EIS and in accordance with the controlling provisions of the EPBC Act.

Private land

The transmission line alignment has been refined to minimise impacts on private landowners while considering environmental, social, cost and technical factors. Where possible, alternative routes were developed to bypass private properties entirely. Where the alignment avoids being placed on private land, further measures have been taken to refine the visual impact for properties with a line of sight to potential tower locations.

The key refinement to the HTP that resulted in minimising impacts on private land was the selection of the Olney switching station site. This involved moving the southern switching station from adjacent to the existing Eraring substation site to the Olney State Forest, on the site of an old commercial timber plantation (see Figure 3.10). The switching station would then connect into the existing 500 kV line from Kemps Creek to Eraring. Some upgrades to this line to provide communication and earth wire infrastructure to the new switching station are required.

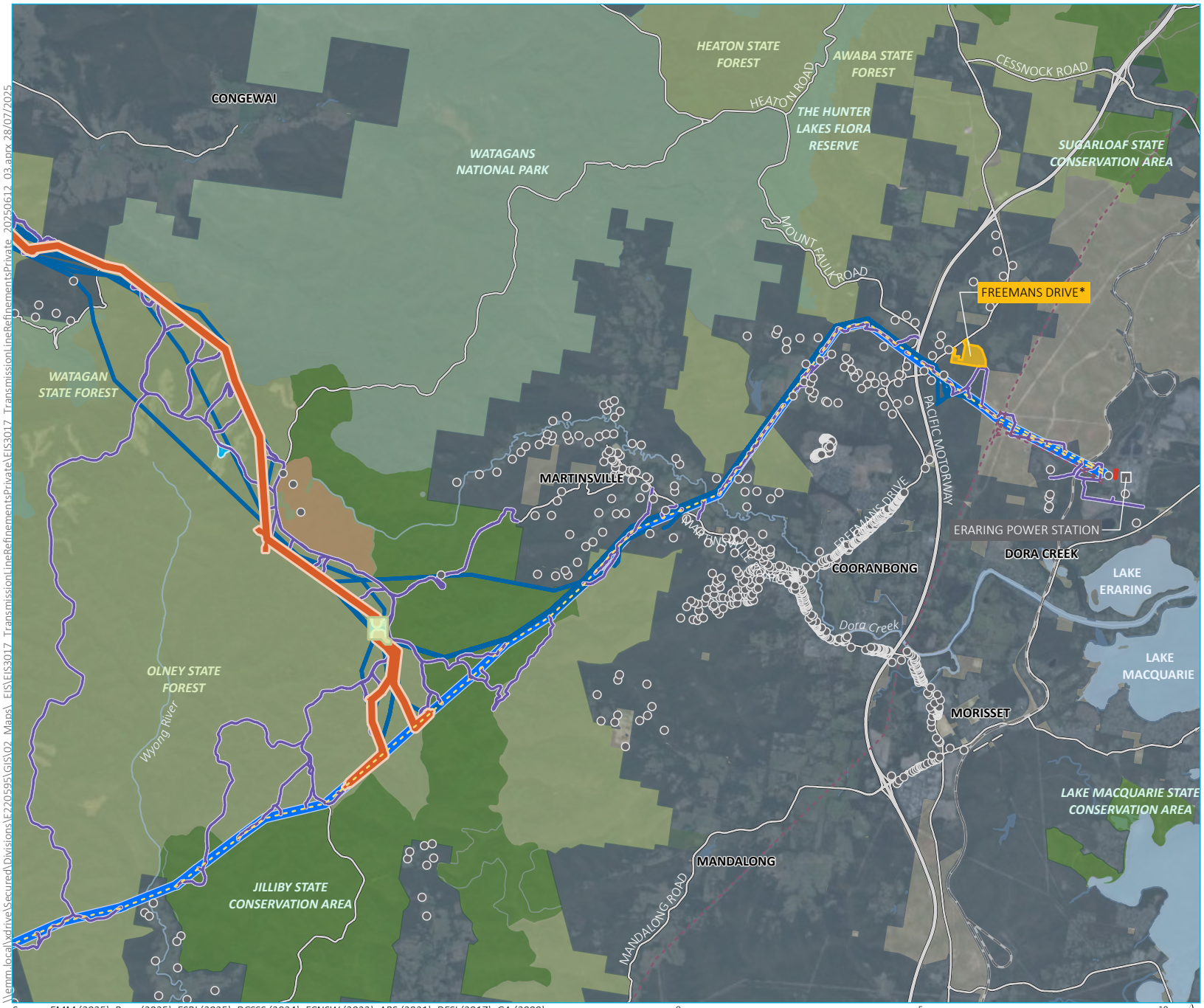
This change avoided the need to construct a new 500 kV transmission line from Olney State Forest to Eraring which had several benefits including:

- avoiding property acquisitions for 32 private landowners
- removing the potential for visual impacts to sensitive receivers in Martinsville and Cooranbong residential areas; the switching station is located in the forest without visibility to sensitive receivers
- reducing biodiversity impacts from avoided disturbance in Jilliby State Conservation Area and Koala habitat near Eraring
- reducing traffic through Corranbong to tower locations
- avoiding potential impacts to Aboriginal heritage items likely to occur around Dora Creek in Martinsville.

For the private land crossing at Laguna between sections of Watagan State Forest, it is proposed to span a large section (around one kilometre) meaning that towers would only be placed on one private property which would be accessed via existing access tracks from Watagan State Forest. This would mean no access, or construction traffic generation, would be required through Laguna.

Other refinements included avoiding private dwellings near Putty Road and utilising road verges and existing transmission infrastructure to co-locate the HTP transmission line, thereby minimising impacts on private land. At locations such as the HVO area near the confluence of Wollombi Brook and the Hunter River, the transmission line alignment avoids private land by using these co-location opportunities.

To reduce impacts on agricultural properties, alternative routes were developed to avoid traversing the centres of these lands, particularly along the Hunter River. These refinements would minimise disruption to farming operations, infrastructure and improvements, preserving the productivity and integrity of agricultural properties to the maximum extent possible.



KEY

- Discontinued alignment option
- Sensitive receiver
- Private property

Project impact area

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

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

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

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Transmission line refinements - private residences

Hunter Transmission Project
Environmental Impact Statement
Figure 3.10

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State forests

Within the State forests, the transmission line alignment has undergone refinements to avoid and minimise potential impacts on biodiversity, Aboriginal cultural heritage, historic heritage and surface water as well as potential impacts to active and future forestry operations. Impacts to forestry operations were identified through consultation with FCNSW.

Below is a summary of key refinements made within the State forests. These refinements are shown in Figure 3.11.

Biodiversity considerations

Refinements were made to the transmission line alignment to protect threatened species, high-value vegetation, and ecological communities, particularly within sensitive and high-conservation areas.

Impacts to the following biodiversity constraints were avoided or minimised through refinements:

- high-conservation areas - the termination of the transmission line alignment into the Olney switching station minimised clearing in Jilliby State Conservation Area. The alignment through the Olney-Watagan State Forest was adjusted to follow the southern boundary of Watagans National Park, avoiding the Warrawolong Nature Reserve, a NSW National Parks and Wildlife Service reserve
- extant vegetation - where possible, the alignment was located in areas previously disturbed by logging, particularly along Watagan Forest Road, for tower placement, stringing and laydown areas
- Brush-Tailed Rock Wallaby habitat - refinements were made to avoid clusters of identified Brush-Tailed Rock Wallaby habitat in the Pokolbin State Forest and Watagan State Forest. This species is listed as a serious and irreversible impact (SAII) species under the BC Act, requiring careful design adjustments to protect its habitat
- Sooty Owl habitat - refinements were made to avoid Sooty Owl habitat. Pushing the alignment further west in the Pokolbin and Corrabare State forests avoided clusters of habitat. This species is listed as an SAII species under the BC Act, requiring careful design adjustments to protect its habitat
- other threatened species - the alignment was adjusted to reduce impacts on significant clusters of threatened species, including those found exclusively within Pokolbin State Forest. Species considered in this avoidance and minimisation included the Singleton Mint Bush, a listed threatened flora species under the BC Act and EPBC Act, and Broken Back Ironbark, listed as an SAII species under the BC Act. The alignment chosen for the EIS substantially decreased the potential impact on these species throughout this area
- frog breeding habitat -high-risk artificial breeding ponds for the Littlejohn's Tree Frog have been avoided through alternative routes in the Olney State Forest, adjacent to the Jilliby State Conservation Area. Research in the area identified at least 4 artificial breeding ponds within the preliminary HTP corridor. These have been avoided through refinements. The Littlejohn's Tree Frog is listed as an endangered species under both the BC Act and EPBC Act

- old-growth trees - refinements were made in Watagan, Olney and Corrabare State forests to avoid old-growth trees as much as practically possible. Old-growth occurs in the deeper gullies of the State forests and so, where possible, these gullies were avoided or spanned where adequate clearance could be achieved to avoid clearing the vegetation below.

Aboriginal heritage considerations

Since initial discussions with Traditional Owners in late 2023, refinements to the transmission line alignment have been made to avoid/minimise impacts to culturally significant Aboriginal sites and locations, both tangible and intangible, wherever feasible. This is most evident in the limited potential impacts outlined in *Chapter 9 (Aboriginal heritage)* compared with the thousands of Aboriginal sites and objects documented across the region. It is highlighted that some 108 Aboriginal sites and places (which incorporates several hundred discrete site listings) are within 200 metres, but outside the project impact area, in part through subtle changes to the project.

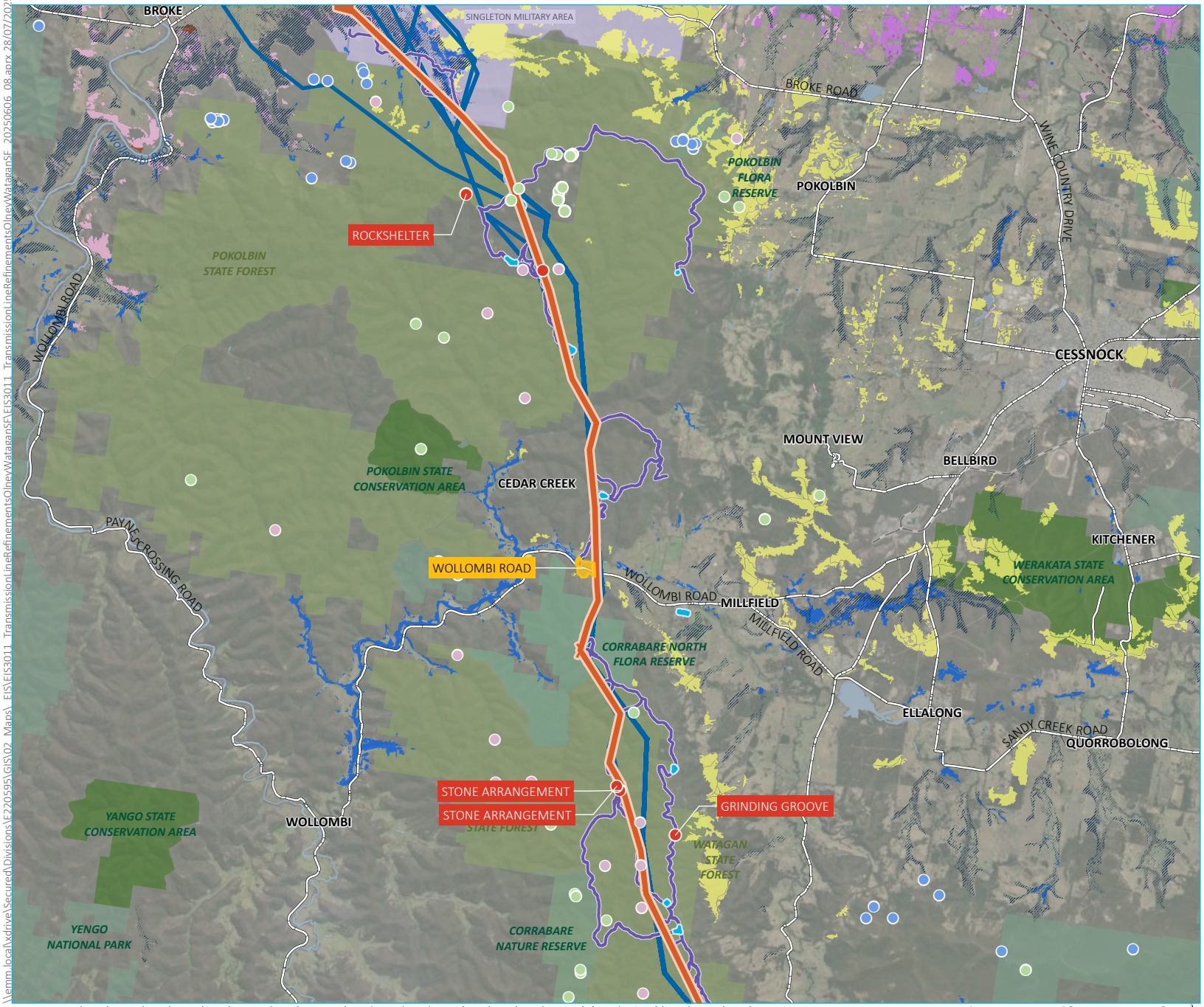
Design workshops were undertaken to explore refinements to reduce potential direct impacts to Aboriginal heritage. On-site validation consisted of a 30+ week field program, including pedestrian survey and test excavation by archaeologists and representatives of the Registered Aboriginal Parties. The field survey encompassed around 1000 kilometres of field survey and 6000+ discrete points of observation. Recordings of these field surveys and observation points were documented. This extensive process has been integral in refining the project, ensuring that the transmission line alignment and design have been carefully adjusted to minimise impacts while respecting cultural heritage.

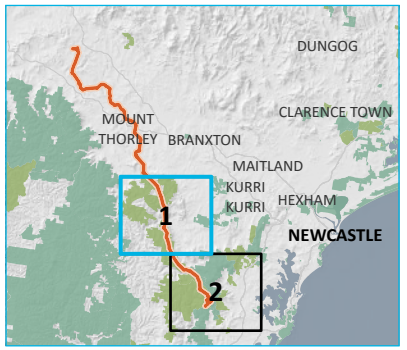
The transmission line alignment was adjusted to relocate transmission towers off prominent ridgelines and hilltops, moving them onto upper slopes to reduce visual prominence from culturally significant lookouts in the vicinity. This was particularly important across areas like Congewai Creek and between Mount Sugarloaf and Mount Yengo, where visibility and prominence are critical. Similarly, in Pokolbin and Corrabare State forests, the alignment was refined to minimise visual impacts on Lizard Rock, a site of cultural significance.

The transmission line alignment was adjusted to increase distances from key rock shelters off Broken Back Trail in Pokolbin State Forest. It was also realigned eastwards to avoid a number of identified rock shelters and stone arrangements in Corrabare State Forest.

In the Watagan State Forest, the alignment was diverted north (to the south of Harris Trail), to avoid indirect impacts to significant archaeological rock shelters. This refinement, which places the project impact area around 300 metres from the rock shelters, also reduces potential visual impacts from the Flat Rock Lookout. Furthermore, the northern refinement avoided intersecting an Aboriginal land claim.

The transmission line alignment was also adjusted to minimise indirect impacts to the Abbotts Fall cultural landscape and associated grinding groove site in Olney State Forest.





KEY

- Discontinued alignment option
- Key Aboriginal sites and places avoided
- Potential Warkworth sand system Archaeological deposits

Threatened species record

- Scrub Turpentine
- Brush-tailed Rock-wallaby
- Sooty Owl

Threatened ecological community

- Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions
- Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions
- Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
- Warkworth Sands Woodland in the Sydney Basin Bioregion

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

Transmission line refinements- state forests Map 1 of 2

Hunter Transmission Project
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Figure 3.11

Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); Umwelt (2023); Gippel (2023); WSP (2025)

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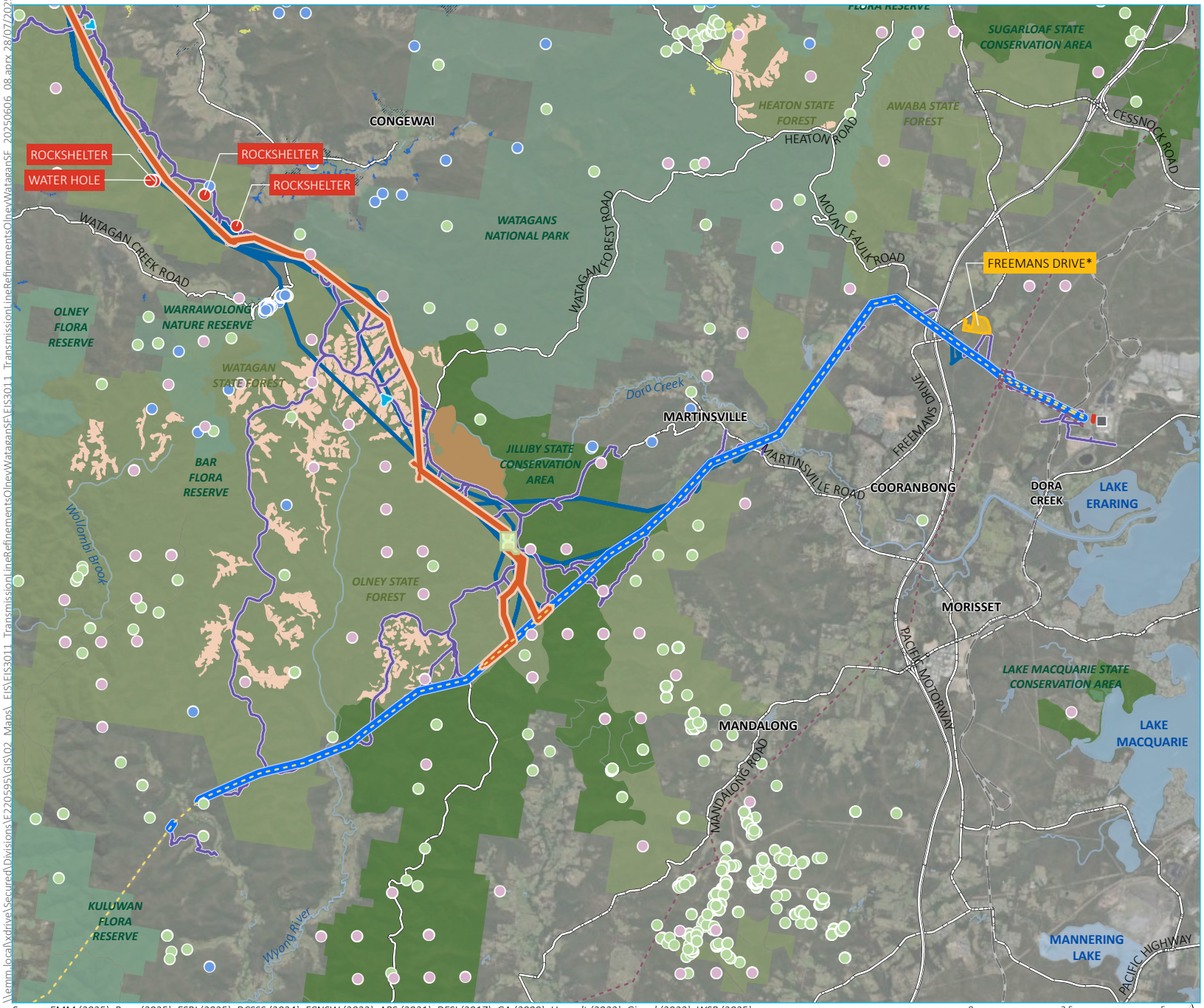

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Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); Umwelt (2023); Gippel (2023); WSP (2025)

Transmission line refinements- state forests
Map 2 of 2

Hunter Transmission Project
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Visual amenity

Whilst the transmission line alignment utilises State forest where possible between Pokolbin and the Olney switching station, some crossings of private land is required. For Corrabare State Forest, refinements prioritised minimising visual impacts on surrounding communities, including Congewai, Ellalong, and Quorrobolong. The transmission line alignment was adjusted to remain below the main ridgelines of the forest, preventing structures from being visible from the valley floors. Similarly, in the transition between Corrabare and Pokolbin State forests, the transmission line alignment was refined to follow State forest boundaries and avoid crossing into private properties where possible. As the transmission line alignment exits Pokolbin State Forest, it keeps east of the ridgeline to minimise visual impacts on the township of Broke.

Historic heritage considerations

Within the Olney State Forest, heritage items associated with the region's forestry history were carefully considered during the design and refinement of the project. The Original Forest House Site on the corner of Watagan Forest Road and Martinsville Hill Road contains remnants of forestry and timber production activities linked to early pine plantings. Nearby, the Original Forest House Dam, believed to be a natural spring, is located west of Watagan Forest Road near its intersection with McKenzies Road. Both sites are within FCNSW Forestry Management Zone 2. To protect these listed heritage sites, construction support sites and the transmission line alignment were refined to avoid direct impacts.

Surface water

To minimise environmental impacts such as sedimentation and erosion, the transmission line alignment was refined to avoid riparian zones, where possible. This was achieved through a detailed review of mapped watercourses, which helped identify areas of higher environmental sensitivity. Where possible, allowance was made for infrastructure to be placed along ridgelines rather than in gullies, significantly reducing the likelihood of intersecting hydrolines.

Recreation areas

State forests are used for a wide range of recreational activities. Within the Olney State Forest, at the junction of Watagan Forest Road and Wollombi Forest Road, there are a number of camping and picnic areas. In the Watagan and Olney State forests the transmission line alignment keeps as far south of this recreational area as possible to minimise potential disruption to these facilities during construction as well as permanent visual impacts. There was a need, however, to balance this separation with biodiversity constraints as moving further south of Watagan Forest Road leads to more potential to impact old-growth trees and endangered frog habitat. The area of Watagan State Forest north of Wollombi Forest Road has also recently been cleared for forestry operations and so it was preferable to use this disturbed area and avoid biodiversity impacts. Therefore, the transmission line alignment was refined to keep north of Wollombi Forest Road within Watagan State Forest, until around 200 metres from its intersection with Watagan Forest Road where it moves southwards. The transmission line alignment connects to the Olney switching station south of Watagan Forest Road. The transmission line alignment is setback around 200 metres from Watagan Forest Road, the main access to Olney and Watagan State forests, to minimise disruption and visual impacts to recreational users, as far as practicable.

Forestry operations

Extensive consultation has been undertaken with the Forestry Corporation of NSW (FCNSW) to incorporate constraints and preferences into the project. Within the Watagan and Olney State forests, adjustments were made to minimise potential impacts on active forestry operations and forest management zones. In Olney State Forest, the connections to Transgrid's existing 500 kV transmission line were deviated to reduce impacts on commercial Blackbutt forestry plantations. In the Watagan State Forest, the preferred transmission line alignment was further refined, diverting northward to align south of Harris Trail, minimising potential commercial impacts on hardwood plantation areas and associated forestry operations.

Refinements were also made to the transmission line alignment and the design of the Olney switching station to minimise disruption to the bushfire fighting capabilities of the FCNSW.

Protected natural areas

The preferred transmission line alignment was selected to avoid impacts to National parks and to other protected land to the maximum extent possible. Key considerations in refinement of the transmission line alignment were to further avoid and minimise impacts to protected land. Refinements to avoid and minimise impacts included:

- avoidance of the Warrawolong Flora Reserve by staying north of Wollombi Forest Road
- minimisation of impacts as much as possible to Jilliby State Conservation Area
- minimisation of impacts as much as possible to Corrabare North Flora Reserve.

Consultation has been undertaken with NSW National Parks and Wildlife Service as the land manager of these reserves and conservation area to discuss potential impacts where protected land could not be avoided, including where the project intersects the Jilliby State Conservation Area.

Project description

4

4 Project description

This chapter describes the key project information for both the construction and operation of the Hunter Transmission Project (HTP, 'the project'). The design, construction, operation and decommissioning and rehabilitation of the project as described in this chapter forms the basis of the environmental impact assessment (EIS). The project description is based on a concept design.

Considerable refinements have been made to the early design in response to environmental investigations and stakeholder engagement outcomes. The detailed design process would inform construction of the project and ongoing design refinements would further reduce the potential environmental impacts described in this EIS.

The project impact area has been developed to achieve a level of flexibility for future design refinement while allowing for a conservative and thorough level of impact assessment. Ongoing refinements of the project design and construction method would be carried out to:

- further avoid and minimise impacts identified in this EIS and during ongoing stakeholder and community engagement, including in response to submissions received following the exhibition of this EIS
- consider design innovation and/or alternative construction techniques
- respond to improved technologies or materials
- improve value for money.

4.1 Project summary

The project includes the construction and operation of around 110 kilometres of new overhead 500 kilovolt (kV) double circuit transmission line, 2 new switching stations (Bayswater South and Olney), upgrades to the existing Bayswater and Eraring substations, adjustments and upgrades to existing transmission lines, utility adjustments, and ancillary works, including constructing and upgrading permanent and temporary access tracks, road upgrades, construction support sites and laydown areas.

The key components of the project would be located within a defined project impact area, which for the purpose of this EIS is the area that has been assessed to be directly affected by the construction and operation of the project (see Figure 4.1). It is conservatively assumed that any part of the project impact area may be impacted (directly or indirectly) by the HTP, which allows flexibility for future design refinements while ensuring a robust impact assessment. For example, the HTP corridor is 140 metres wide to account for the final easement (70 metres wide) plus construction works and ancillary sites (such as laydown areas and stringing sites). The entire 140 metre corridor would not be impacted across the full 110 kilometres of the transmission line during

construction. *Chapter 7 (Approach to assessment)* provides further detail about the project impact area used for the environmental assessment in this EIS.

The HTP corridor can be characterised into 3 distinct sections, based on topographical, environmental and land development features. The route has been developed to use disturbed land and public land wherever possible to minimise impacts on communities and sensitive environmental areas.

Most of the northern section of the HTP corridor runs through flat and undulating land containing developments such as the Bayswater Power Station operated by AGL, mining land (including Hunter Valley Operations (HVO), Bulga Coal and Mount Thorley Warkworth mines) and the Singleton Military Area owned by the Australian Government Department of Defence. Most of the central section of the HTP corridor runs through elevated sandstone escarpments containing Pokolbin State Forest, Corrabare State Forest and Watagan State Forest. The southern section of the HTP corridor is also located on an elevated sandstone escarpment that runs through Olney State Forest, avoiding the Watagans National Park and Warrawolong Flora Reserve.

The HTP is proposed within 5 local government areas (LGAs) – Muswellbrook Shire Council, Singleton Council, Cessnock City Council, Lake Macquarie City Council and Central Coast Council (see Figure 4.2). Coal mining, manufacturing, electricity generation, agriculture, forestry tourism and viticulture form the economic foundations of the LGAs surrounding the project impact area.

A summary of key project elements is provided in *Chapter 1 (Introduction)*, with further details on the construction and operational features of the project provided in Table 4.1. The components of the project are shown in Figure 4.1 and Figure 4.2.

Table 4.1 Components of the project

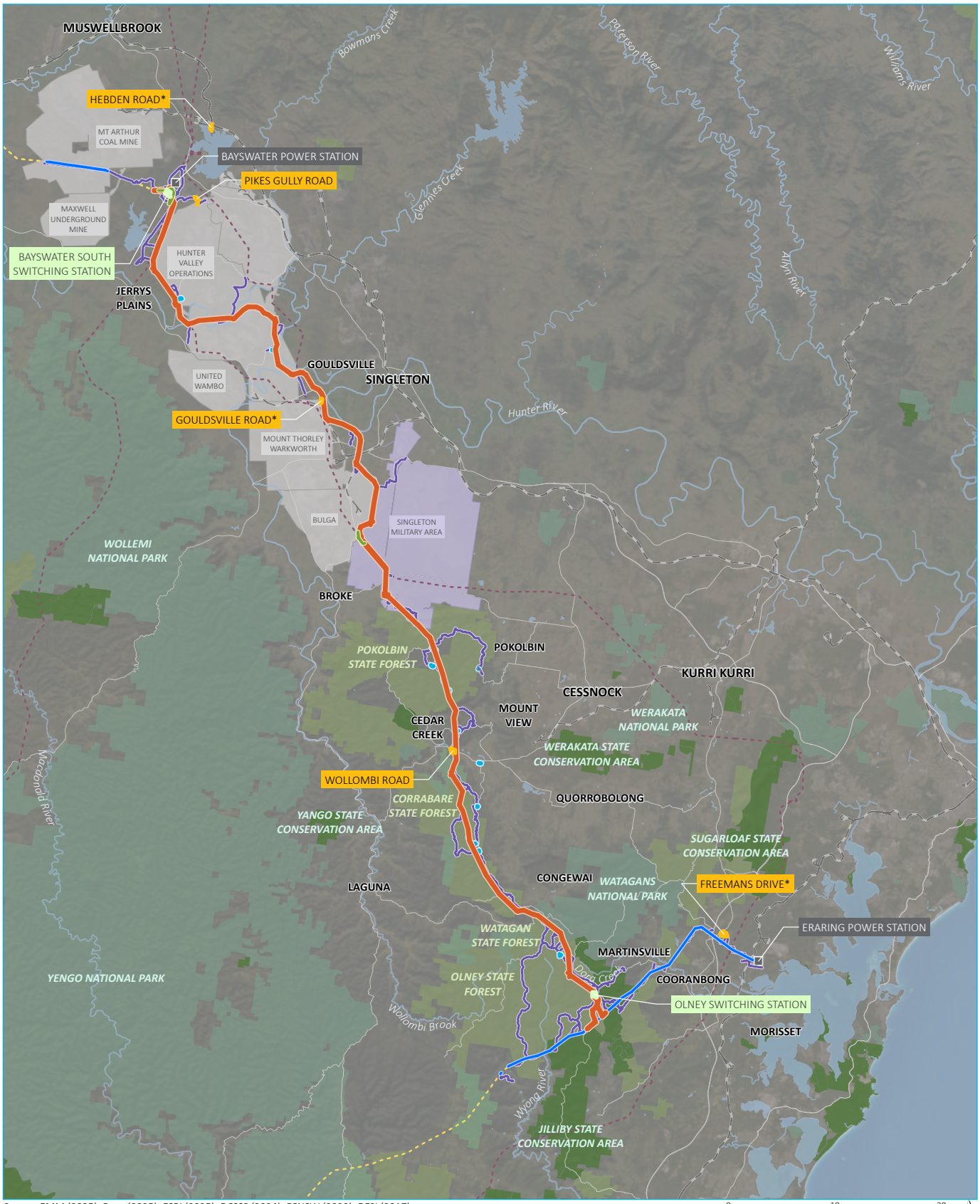
Project element	Summary of the project
Overview	
New transmission line and transmission towers	• Overhead 500 kV double circuit transmission line of around 110 km between the Bayswater South 500 kV switching station and the Olney 500 kV switching station • Steel lattice towers up to 85 m high and that are spaced anywhere between 75 m to around 1.5 km apart depending on topography (typically between 300 and 600 m) • 500 kV transmission lines with a minimum vertical clearance of 13.5 m • Construction corridor 140 m wide
Adjustments and crossings – existing transmission lines	• Adjustments to existing 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 330 kV transmission lines:

Project element	Summary of the project
	– Line 31: Bayswater – Regentville 330 kV – Line 32: Bayswater – Sydney West 330 kV – Line 81: Newcastle – Liddell 330 kV • Crossing of existing 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 330 kV at Warkworth and again at the Singleton Military Area.
Upgrades – existing transmission lines and towers	• Upgrades to overhead earth wire on existing 500 kV transmission lines including: – around 10 km of upgrades at Bayswater (Line 5A3 and Line 5A4) – around 17 km of upgrades at Martinsville, Ravensdale and Cedar Brush Creek (Line 5A1 and 5A2). • New communications infrastructure including: – new underground fibre cable connection between the existing Bayswater 500 kV/330 kV substation and the new Bayswater South 500 kV switching station – new optical ground wire for the new HTP 500 kV transmission line between Bayswater South 500 kV switching station and Olney 500 kV switching station – new optical ground wire on the existing and upgraded 500 kV transmission line between Olney 500 kV switching station and Eraring 500 kV/330 kV substation (Line 5A1 and 5A2). • Tower strengthening on various existing towers on Line 5A1, Line 5A2, Line 5A3 and Line 5A4
Switching stations/ substation upgrades	• 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 Eraring 500 kV/ 330 kV substation, including installation of 2 new 1500 MVA transformers • Remote work at existing substations, consisting of replacing or upgrading existing control and communication equipment
Access roads and tracks	• Access roads and tracks, including oversize/overmass routes, for the construction of the project is described in *section 4.3.5*

Project element	Summary of the project
Construction	
Construction impact area	• Construction impact area around 2351 ha • This is the area that would be affected 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 • As the larger of the construction and operation impact areas, the construction impact area was used to determine the extent of the overall project impact area
HTP corridor	• 140 m wide to allow for the construction of the new transmission line • This includes areas required for stringing activities and material laydown
Vegetation clearing	• Around 762 ha of native vegetation cleared within a disturbance area of 1266 ha
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
Temporary worker accommodation	• Three temporary worker accommodation facilities catering for around 780 of the main construction workforce are located at the Hebden Road, Gouldsville Road and Freemans Drive construction support sites
Ancillary sites	• Laydown areas, which would be established to allow for various construction activities and to minimise the need for vehicle movements to and from the construction support sites
Access roads and tracks	• Upgrades to the existing public road network and existing access tracks and the construction of new access tracks would be required in some locations to provide access to the construction impact area and would be undertaken prior to and during construction. Permanent access requirements during operation of the project is described below
Land requirements	• Total permanent areas (including transmission line easement and access road easements): 926 ha • Total temporary areas (including construction leases within the HTP corridor and other temporary locations such as construction support sites and laydown areas): 1886 ha • Total freehold acquisition areas (including whole of property and substation acquisition areas): 305 ha
Utility adjustments	• Third party utility works including fibre optics, electricity, gas, telecommunication, water, sewer and stormwater

Project element	Summary of the project
Construction program	• Construction to start in 2027 • Operation by the end of 2029
Construction resource requirements	• Around 830 full-time equivalent workers during peak construction periods • Plant and equipment including dozers, excavators, graders, compactors, rollers, cranes, dump trucks, water carts, delivery trucks, stringing blocks and winches, concrete trucks, asphalt truck and sprayers, helicopters/stringing drones, mobile concrete batching plants, mulchers, spider excavators and dewatering equipment (among others) • Materials such as concrete and steel reinforcement for tower foundations, steel for the transmission towers and substation gantry, densely graded base and crushed rocks, conductors, insulators and cabling for the transmission line, electrical components for the substations, PVC conduits, metal fencing and gates, stormwater drainage materials, diesel and petrol, pre-fabricated buildings, general building materials and fire system materials • Around 1580 ML of water (170 ML of potable water and 1410 ML of non-potable water)
Operation	
Operation impact area	• Operation impact area around 1261 ha • This is the area that would be occupied by permanent components of the project and/or maintained during operations, 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
Operational transmission line easement	• Operational easement generally 70 m wide within which the 500 kV transmission line would be located
Access roads and tracks	• Treatment works at existing public roads and intersections to support construction requirements would be permanent improvements to be maintained by the relevant road authority • New permanent access to the transmission line easement and switching stations
Land requirements	• Total permanent areas (including transmission line easement and access road easements): 926 ha • Total freehold acquisition areas (including whole of property and substation acquisition areas): 305 ha

Project element	Summary of the project
Vegetation management	• Vegetation within the easement would be maintained to achieve operational and safety requirements, including bushfire risk management (indicatively 13.5 m below the conductors under maximum operating line conditions) • Hazard trees that pose a risk to safe operation of the transmission line by falling onto tower structures, conductors and associated infrastructure, would be removed to manage any future risk to the transmission infrastructure • Vegetation in the easement and in asset protection zones (APZ) would be managed as needed on a cyclical basis over the life of the project
Resource requirements	• Operational workforce of up to 10 full-time equivalent workers • Resources used during operation would be associated with, but not limited to: – maintenance of electrical components at Eraring substation and the new switching stations such as transformers, reactors, control and protection systems, electric cabling and high voltage plant such as circuit breakers as required – maintenance of the transmission line and towers – maintenance of access tracks and roads – maintenance of fences and access gates – maintenance activities and use of machinery and vehicles (e.g. fuels, lubricants and metals) – maintenance of vegetation throughout the transmission line easement and along access tracks and roads – potable and non-potable water requirements – electricity for the operation of the switching stations and communications facilities. • During operation of the project, about 10,000 L of water per year would be required for maintenance activities, on-site staff facilities and testing of firefighting systems and services • Potable water would preferentially be sourced from council owned potable water supplies. Water would be purchased and transported to the switching stations as required, where it would be stored in water tanks



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

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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

Project overview

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Figure 4.1

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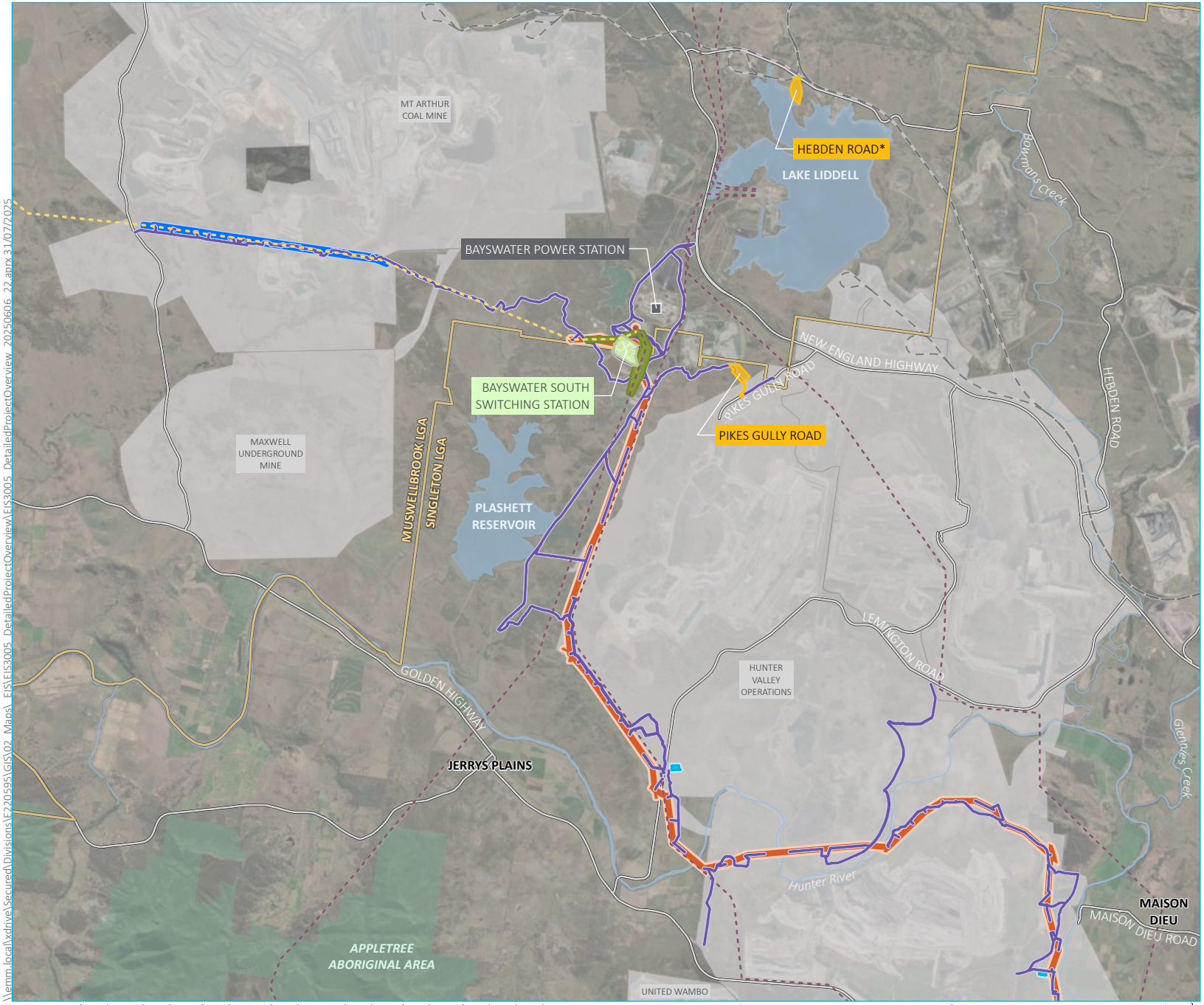

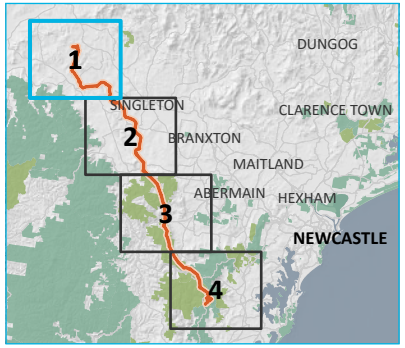

KEY

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)

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Detailed project overview
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 4.2

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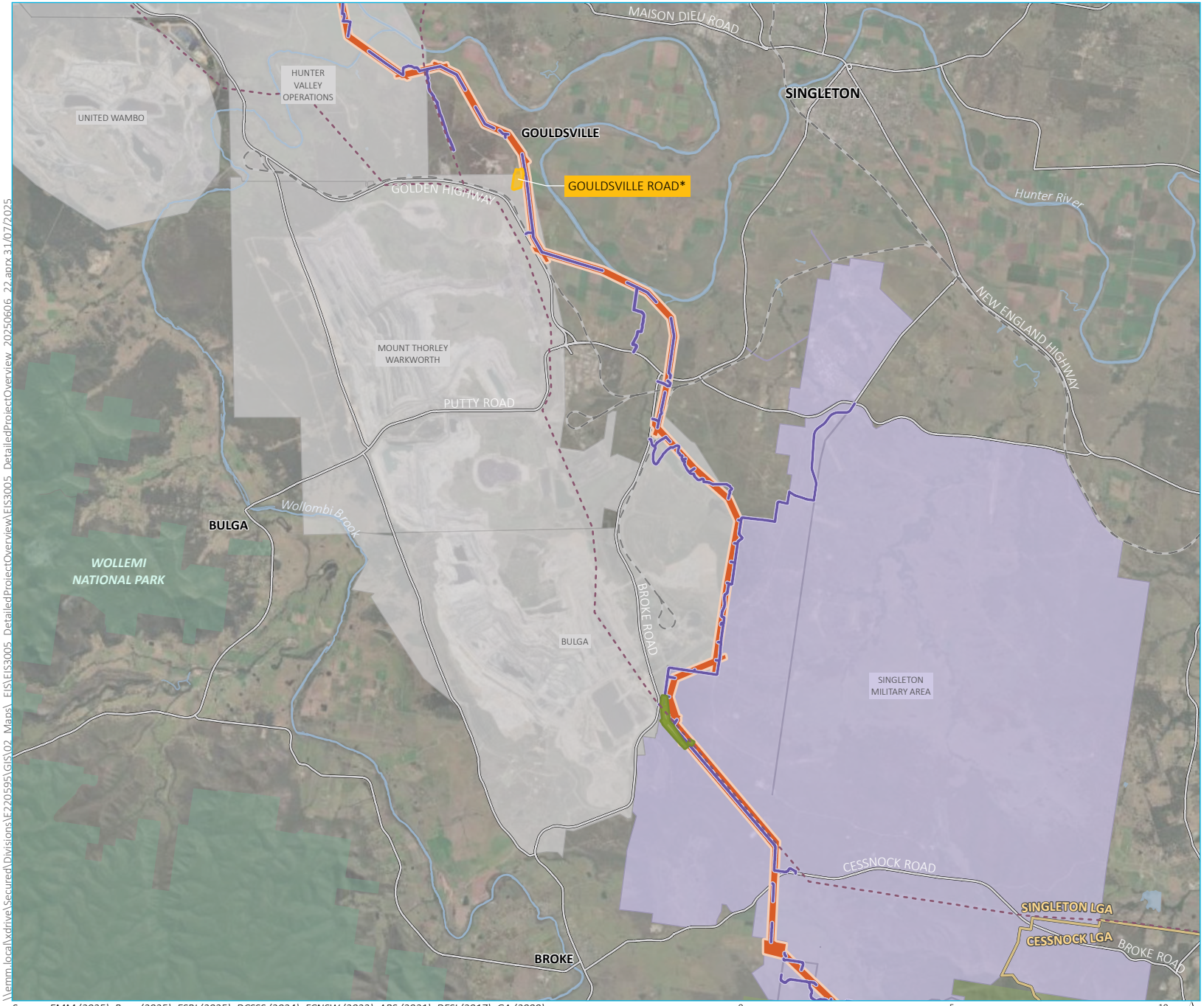

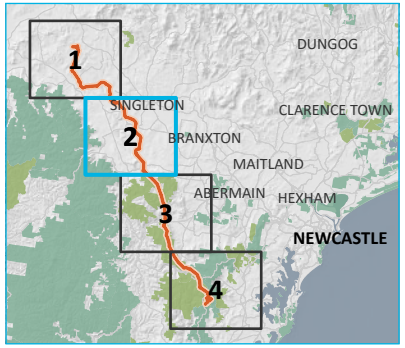

KEY

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)

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Detailed project overview
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 4.2

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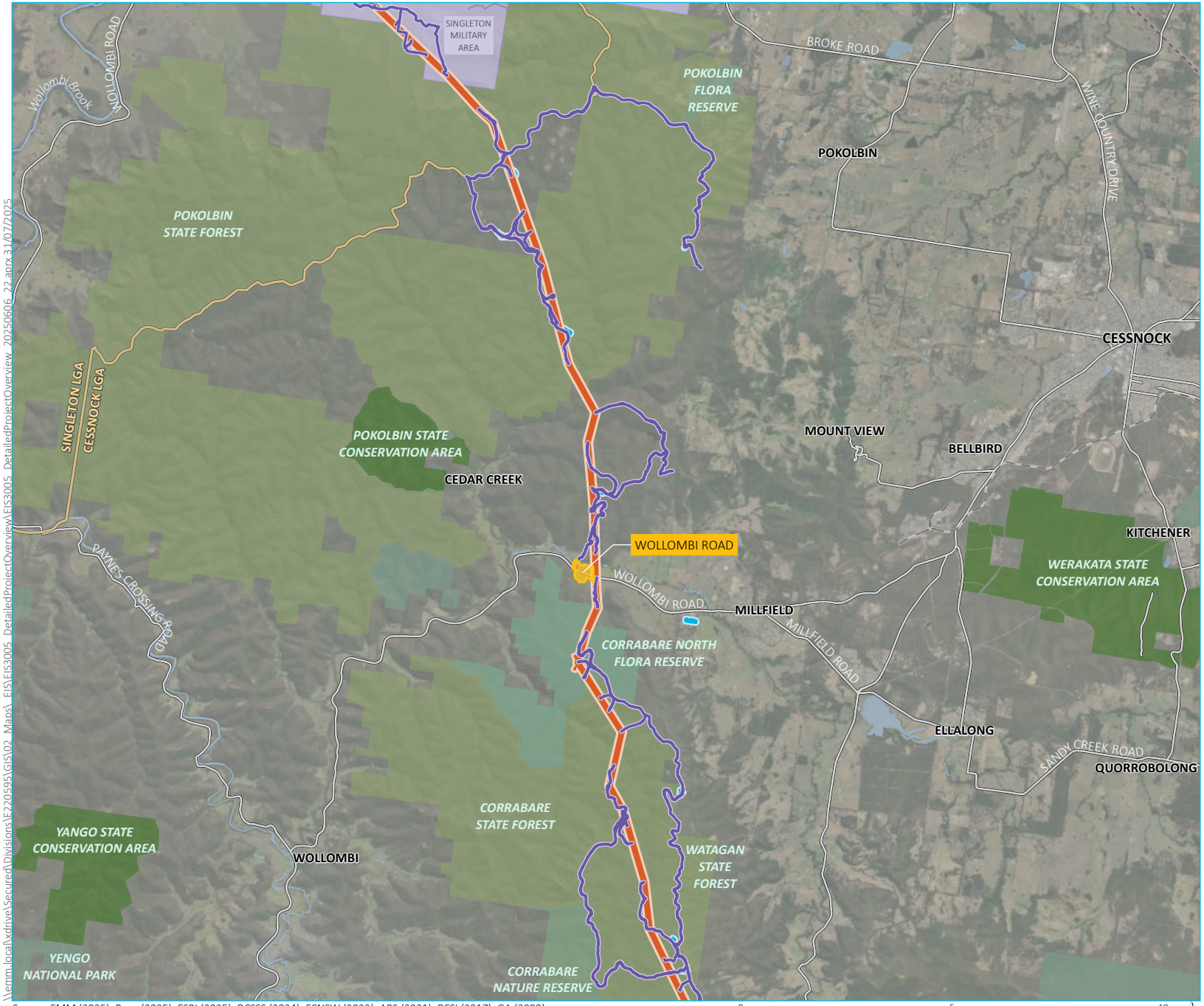

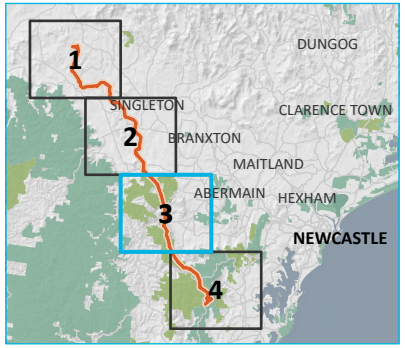

KEY

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)

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Detailed project overview
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 4.2

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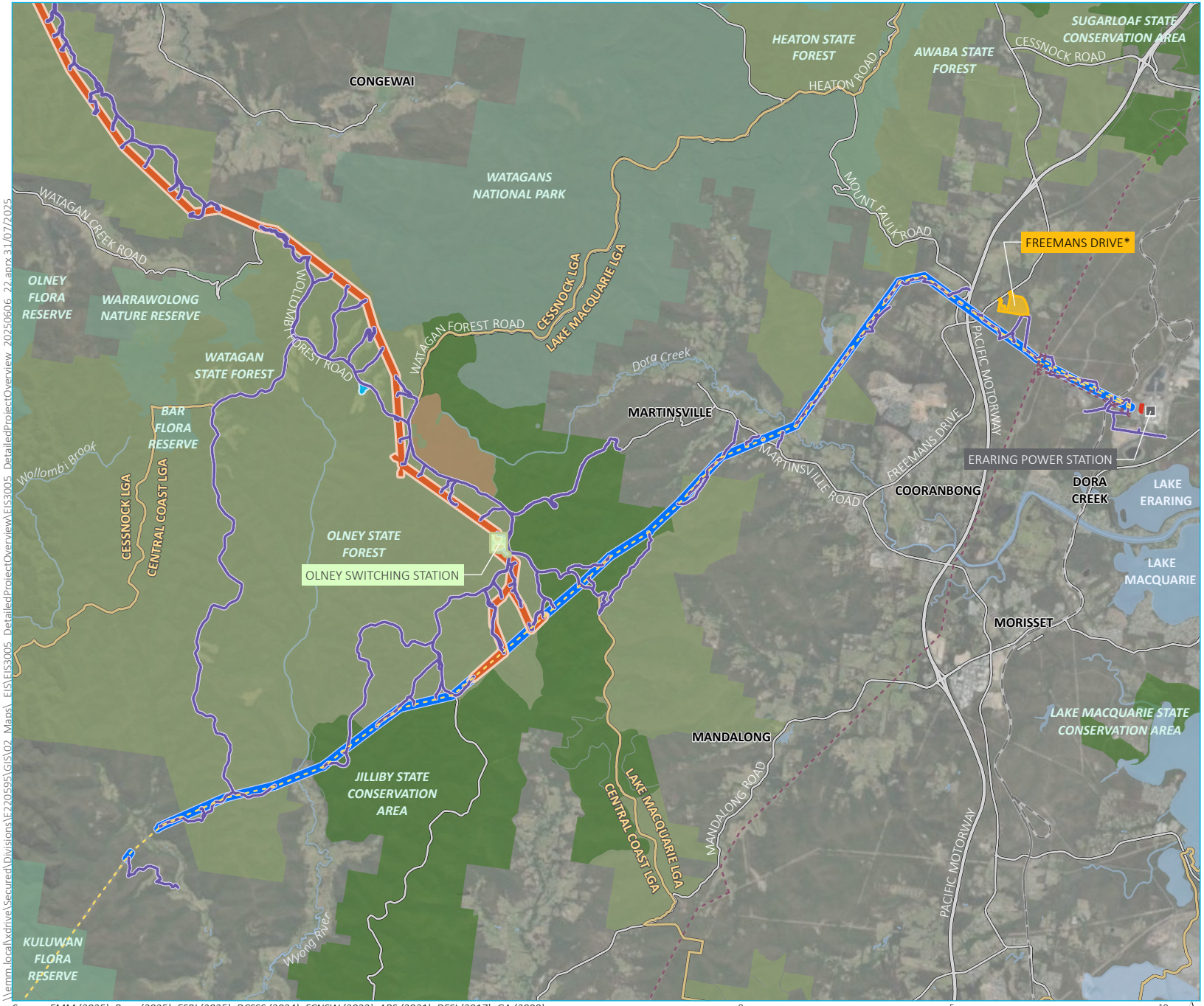

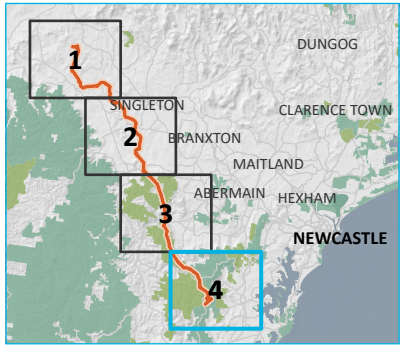

KEY

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

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

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Detailed project overview
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Figure 4.2

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4.2 Project components

4.2.1 New transmission line

The new transmission line would consist of a 500 kV double circuit line. It would have 24 phase conductors (also known as cables or wires) with 12 phase conductors per circuit (4 conductors per phase), 2 earth wires and a minimum vertical clearance of around 13.5 metres (see Image 4.1).

Image 4.1 Example 500 kV double circuit transmission line and towers (Eraring to Kemps Creek 500 kV)

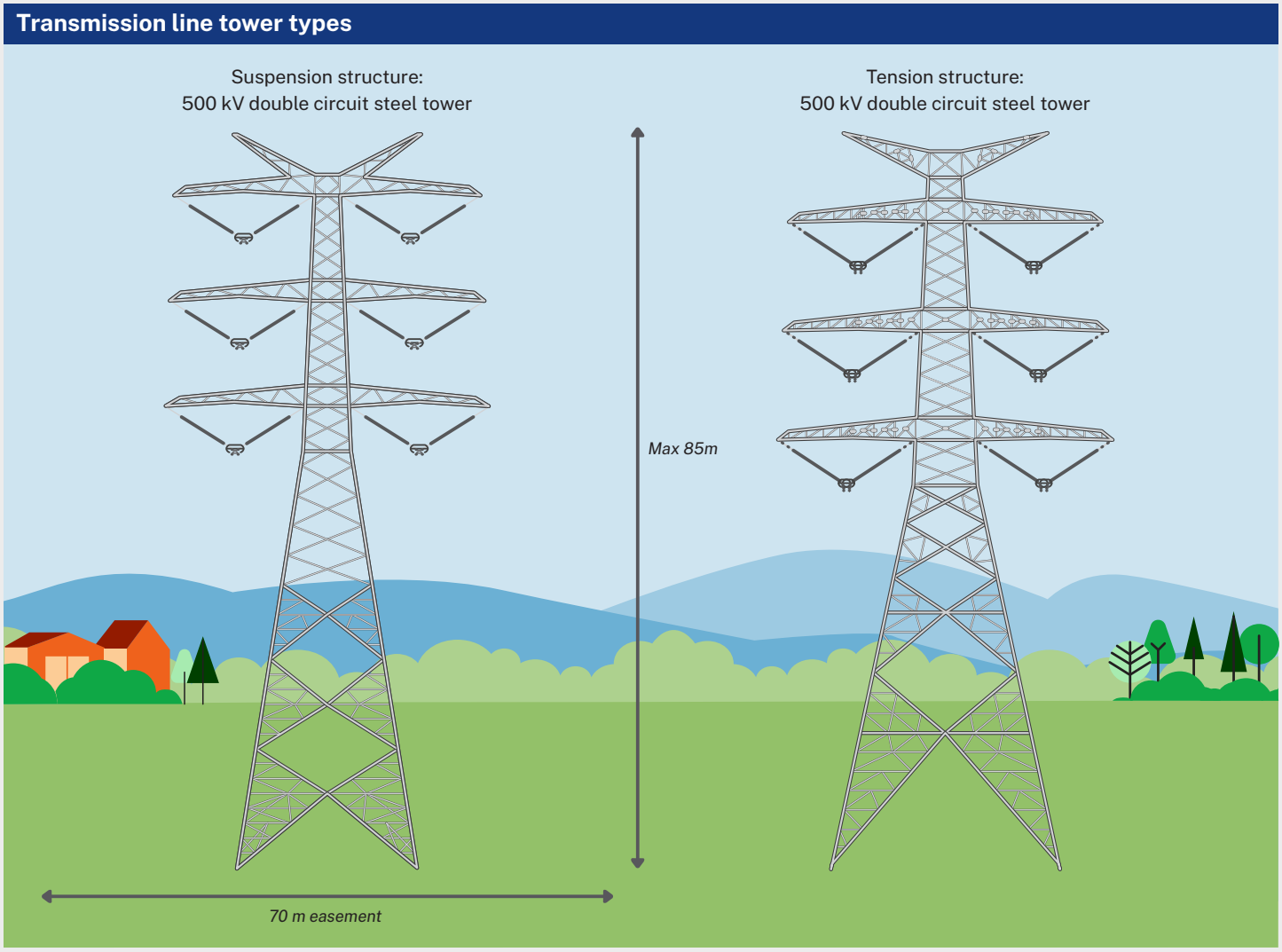
4.2.2 Transmission towers

The 500 kV transmission lines would be supported on a series of transmission towers. The final location and specification of each transmission tower would be dependent on a range of factors such as distance between each structure, structure loading, required vegetation clearances, transmission line voltage, changes in direction of the transmission line route, local geotechnical conditions, topography and local environmental constraints (such as the need to avoid specific areas of biodiversity value or to span watercourses). The type and arrangement of the transmission towers would continue to be refined as part of the finalisation of the project design, with a view to further minimising environmental impacts within the identified transmission line easement, wherever practicable.

The transmission tower type for the 500 kV network infrastructure would consist of free-standing steel lattice towers, and an area of around 60 metres by 70 metres around each transmission tower (around 4200 square metres) would be permanently cleared of vegetation. Depending on local circumstances, the height of the majority of the transmission towers would be up to 75 metres with some instances up to 85 metres to minimise impacts to environmentally sensitive areas. The number, location and type(s) of tower required would be confirmed as part of designed design. The indicative arrangement for the 500 kV transmission line and towers is provided in Figure 4.3 and a summary of transmission tower design for the project is provided in Table 4.2.

Table 4.2 500 kV transmission line tower design

Aspect	Description
Number of towers	Around 230
Type	Steel lattice towers, comprising: • Suspension towers: light or heavy – used to support the transmission conductors (wires/cables). Primary function is to keep the wires at a safe height above the ground and to support the weight of the cables across long spans. Typically used for straight sections of the transmission line. Towers would have a permanent base operational footprint of around 20 m by 20 m (400 m^2) (see Figure 4.3) • Tension towers: light, medium or heavy – used as the anchoring points to connect and apply tension to the conductors. Typically, the first and last towers of long sections of conductors. Used where there is a change in direction along the transmission line, though can also be used between long runs of suspension towers. Would have a permanent base operational footprint of around and 25 m by 25 m (625 m^2) (see Figure 4.3)
Height	Maximum height of up to 85 m and may vary depending on engineering requirements
Foundations	Would vary with geotechnical conditions with standard pile foundations in normal soils and special pile foundations (e.g. larger diameter and deeper foundations) in poor soils, floodplains, and areas with steep slopes and mine subsidence/fill (see Figure 4.3)
Communications	Transmission line towers would include communications infrastructure consisting of optical fibre ground wire
Spacing	Transmission line towers are typically spaced between 300 to 600 m apart but may be spaced at a minimum of 75 m with transmission line towers up to around 1.3 km in some cases (e.g. where there is terrain or crossing constraints - road, rail or watercourses)



NOTE: Figure not to scale. Typical widths only, may vary on a case by case basis.

Figure 4.3 Indicative concept design of the 500 kV transmission line tower types

4.2.3 New switching stations and upgrades to existing substations

The new transmission line would connect into the existing electricity system at 2 new 500 kV switching stations – the Bayswater South switching station in the north and the Olney switching station in the south (see Figure 4.1 and Figure 4.2 (Map 1 and Map 4)).

Upgrades at the existing substations at Bayswater and Eraring power stations would also be required to enable connection into the existing electricity system and to allow operation of the HTP (see Figure 4.2 (Map 1 and Map 4)).

Bayswater South switching station

Bayswater South switching station would be around 400 metres southwest of the existing substation at Bayswater Power Station on land owned by AGL. It would be accessed off the New England Highway via new and existing access roads and tracks at Bayswater Power Station (see Figure 4.2 (Map 1)).

Bayswater South switching station would be around 380 by 410 metres (15.6 hectares). This includes an asset protection zone of 32 metres adjacent to woodland and 25 metres adjacent to grassland for bushfire protection. Further information on potential bushfire impacts and asset protection zone requirements is provided in *Chapter 21 (Hazards and risk).*

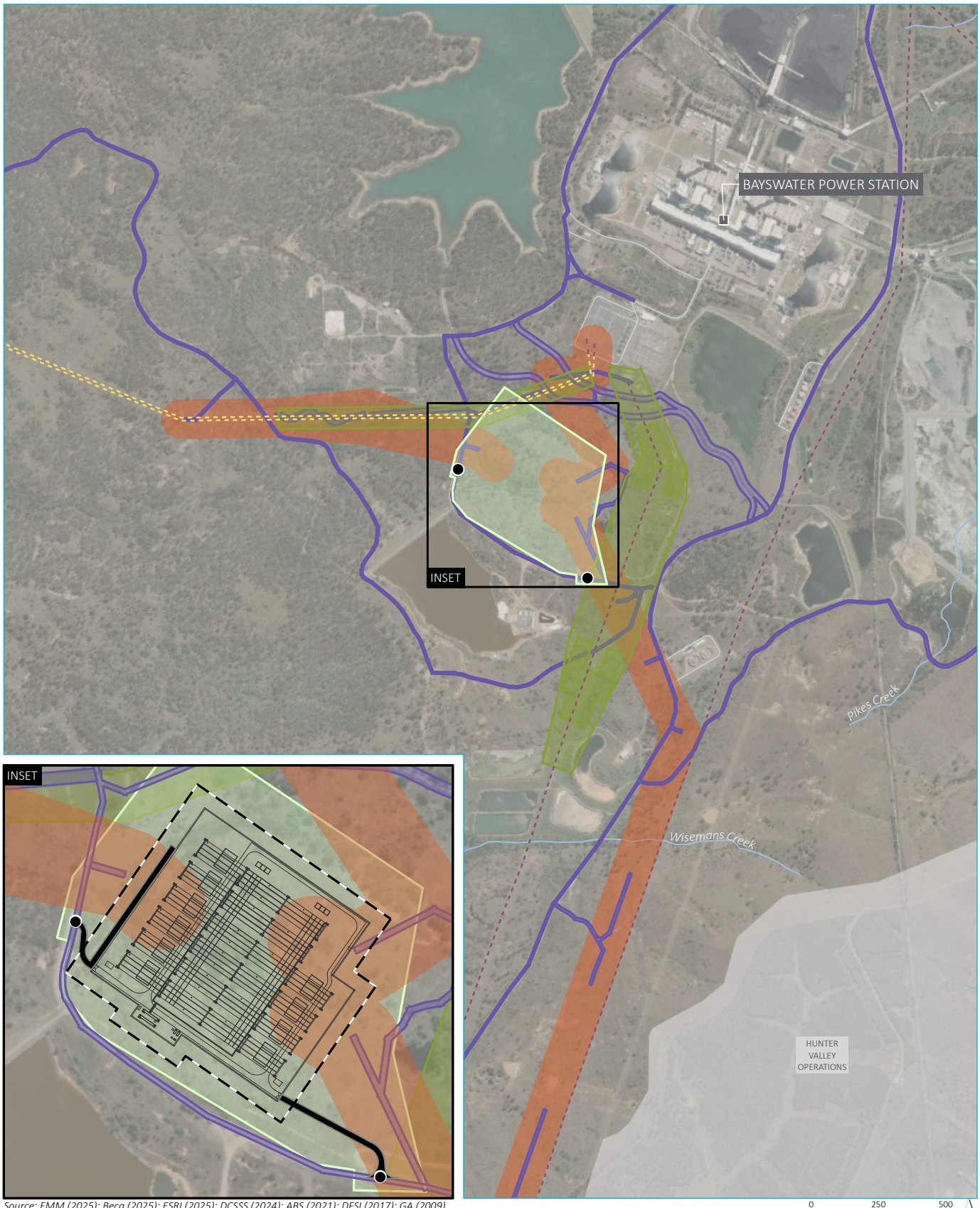
The following key infrastructure would be installed at the new Bayswater South switching station:

- 500 kV switchyard to connect to the NSW transmission network
- supporting electrical components including busbars, circuit breakers, isolators
- line shunt reactors
- gantries to connect with transmission lines
- communications equipment and control and protection systems
- supporting service building for communications, control and protection systems
- maintenance facility, including a water tank and storage sheds
- oil containment system (including bunding and containment tank) and oil water separation facility
- utilities (including communications, electricity, water supply, drainage and sewer infrastructure)
- amenities for operational and maintenance staff, including a parking area
- access roads and safety and security infrastructure (gates, fencing, lighting and cameras).

Space would be provided at Bayswater South switching station to allow for additional switching station infrastructure, such as additional line shunt reactors and switching station bays, and connections for additional transmission lines in the future. Bayswater South switching station would connect to:

- HTP 500 kV transmission line
- Line 5A3: Bayswater – Mt Piper 500 kV
- Line 5A4: Bayswater – Wollar 500 kV
- Bayswater Power Station 500 kV/330 kV substation
- a new 500 kV transmission line to support the future New England REZ.

An indicative concept design for Bayswater South switching station is provided in Figure 4.4.



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

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KEY

- Access road entry location
- Indicative switching station layout
- Asset protection zone
- Proposed access road

Project impact area

- HTP corridor
- Bayswater South switching station
- Adjustment to existing transmission line (lines 31 and 32)
- Access track

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Minor road
- Named watercourse
- Mining

Concept design – Bayswater South switching station

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Figure 4.4

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Olney switching station

Olney switching station would be located in Olney State Forest around 1.7 kilometres northwest of the existing Eraring to Kemps Creek 500 kV transmission line. It would be accessed via Watagan Forest Road in Olney State Forest (see Figure 4.2 (Map 4)).

Olney switching station would be around 350 by 400 metres (14 hectares). This includes an asset protection zone of 75 metres to the west and 55 metres to the north, east and south for bushfire protection (see *Chapter 21 (Hazards and risk)* for further information on potential bushfire impacts and asset protection zone requirements).

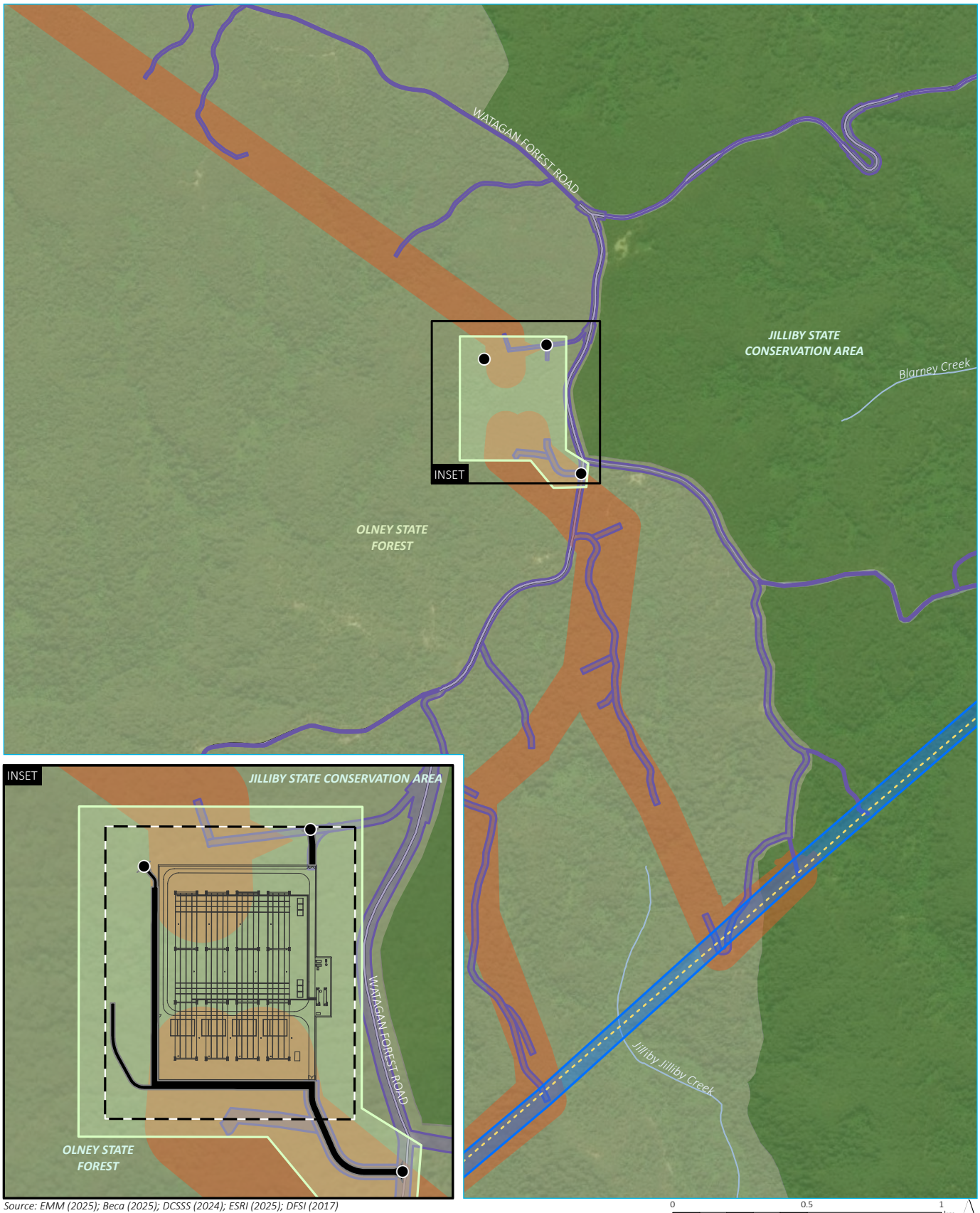
Key infrastructure that would be installed at the new Olney switching station would be the same as that installed at the Bayswater South switching station, however the Olney switching station would not feature the line shunt reactors.

Like Bayswater South switching station, room would be provided at Olney switching station to allow for additional switching station infrastructure, such as line shunt reactors, and connections for additional transmission lines in the future.

Olney switching station would connect to:

- HTP 500 kV transmission line
- Line 5A1 and 5A2: Eraring to Kemps Creek 500 kV transmission line
- Eraring Power Station substation.

A concept design of Olney switching station is provided in Figure 4.5.



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

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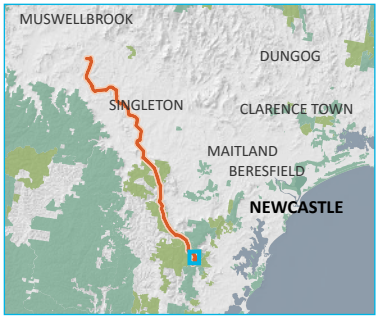

KEY

- Access road entry location
- Indicative switching station layout
- Asset protection zone
- Proposed access road

Project impact area

- HTP corridor
- Olney switching station
- Upgrades to existing transmission line (lines 5A1 and 5A2)
- Access track

Existing environment

- 500 kV transmission line
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State conservation area
- State forest

Concept design – Olney switching station

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Figure 4.5

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Upgrades to existing substations

Upgrades would be required at the existing 500 kV/330 kV substation at Bayswater Power Station and the 500 kV/330 kV substation at Eraring Power Station to accommodate the HTP.

The upgrades would include:

- Bayswater substation:
  - works within the substation to trench and connect communications infrastructure to Bayswater South switching station via underground fibre cable
  - modifications and upgrades to protection, control, automation and communication equipment.
- Eraring substation:
  - expansion of the substation to accommodate the installation of new transformers
  - relocating generator connections from Eraring Power Station and installation/replacement of associated switchgear as required
  - relocation of the existing transformer spare unit
  - installation of new 500 kV/330 kV transformer units, augmentation of 500 kV/330 kV bays and associated switchgear and connections
  - adjustments to existing utilities and drainage infrastructure to accommodate the proposed substation expansion.

4.2.4 Adjustments and upgrades – existing transmission lines

Adjustments to the location of several 330 kV and 500 kV lines currently operated and maintained by Transgrid, and other lower voltage lines such as those operated and maintained by Ausgrid and mining infrastructure asset holders would be required to enable the construction of the HTP (see Figure 4.2).

Upgraded overhead earth wire (to protect the line from lightning strike) and new communications systems (to enable monitoring of the network to identify faults) would be required at a number of existing 500 kV transmission lines operated by Transgrid to accommodate the operation of the HTP (see Figure 4.2).

The adjustments/upgrades and new earth wire/communications infrastructure required on existing transmission lines are outlined in Table 4.3.

Where possible, adjustments/upgrades to existing transmission lines would occur within existing easements.

Table 4.3 Adjustments/upgrades to existing transmission lines

Existing transmission line	Adjustment/ upgrade	Required adjustment/upgrade	Works to occur within existing easement	Figure reference
Line 5A3: Bayswater – Mt Piper 500 kV	Adjustment and upgrade	• Around 2 new towers to allow connection to the new transmission lines connecting to the proposed Bayswater South switching station • Earth wire upgrade	Within and outside of existing easement	Figure 4.2 (Map 1)
Line 5A4: Bayswater – Wollar 500 kV	Adjustment and upgrade	• Around 2 new towers to allow connection to the new transmission lines connecting to the proposed Bayswater South switching station • Earth wire upgrade	Within and outside of existing easement	Figure 4.2 (Map 1)
Line 31: Bayswater – Regentville 330 kV	Adjustment	• Around 6 new towers to shift line 31 around 50 m east to avoid a double circuit outage on Transgrid's existing transmission lines when stringing the new line over	Partially outside existing easement	Figure 4.2 (Map 1)
Line 32: Bayswater – Sydney West 330 kV	Adjustment	• Around 6 new towers to shift line 32 roughly 50 m west to avoid a double circuit outage on Transgrid's existing transmission lines when stringing the new line over	Partially outside existing easement	Figure 4.2 (Map 1)
Line 81: 330 kV: Newcastle – Liddell 330 kV	Adjustment	• Around 4 new towers to shift line 81 around 150 m southwest to avoid a double circuit outage on Transgrid's existing transmission lines when stringing the new line over	Partially outside existing easement	Figure 4.2 (Map 2)
Line 5A1 and 5A2: Eraring – Kemps Creek 500 kV	Adjustment and upgrade	• Around 17 new towers to allow connection to the new transmission lines connecting to the proposed Olney switching station • Earth wire and communications systems installation	Within and outside of existing easement	Figure 4.2 (Map 4)

The following adjustments would also be required to existing low voltage sub-transmission and distribution lines:

- Ausgrid 132 kV, 66 kV and 11 kV overhead lines
- HVO 66 kV and 11 kV overhead lines
- AGL 33 kV overhead line
- other private 11 kV overhead lines.

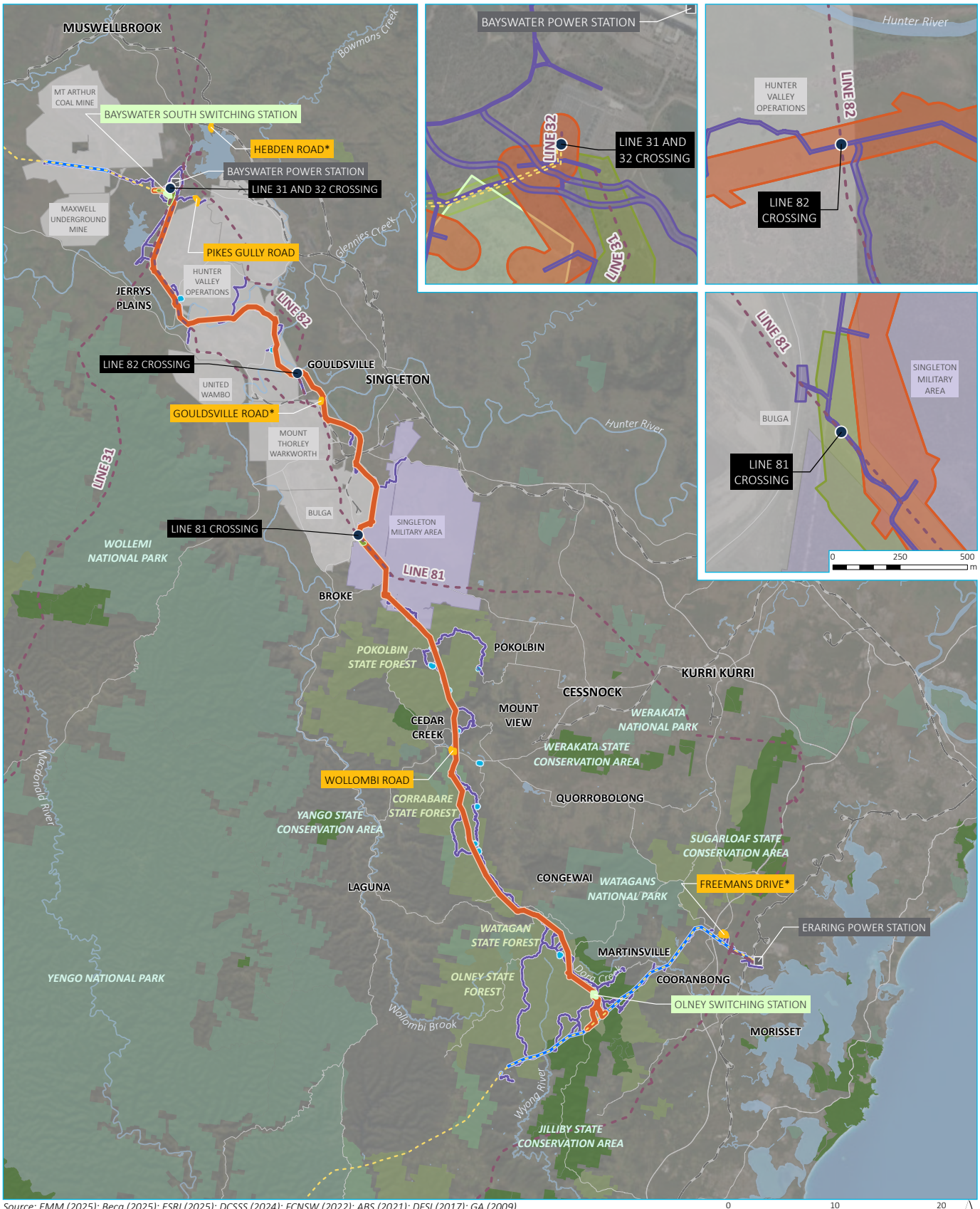
A schedule of potential utility adjustments is provided in *Appendix B (Schedule of utility adjustments and crossings)*.

4.2.5 Crossings of existing transmission lines

Crossings required of existing transmission, sub-transmission and distribution lines include:

- Transgrid – crossing of Line 31 and Line 32 330 kV transmission line
- Transgrid – 2 crossings of Line 81 330 kV transmission line
- Transgrid – 2 crossings of Line 82 330 kV transmission line
- Ausgrid – 2 crossings of 132 kV sub-transmission lines
- Ausgrid – around 6 crossings of 66 kV sub-transmission lines
- Ausgrid – around 10 crossings of 11 kV distribution lines
- HVO - around 3 crossings of 66 kV sub-transmission lines
- HVO – around 4 crossings of 11 kV distribution lines.

The locations for crossing the existing 330 kV transmission lines listed above is shown in Figure 4.6. A schedule of potential crossings is provided in *Appendix B (Schedule of utility adjustments and crossings)*.



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

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KEY

- Crossings of existing 330 kV transmission lines

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

HTP crossings of existing 330 kV transmission lines

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Figure 4.6

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4.3 Construction of the project

This section provides an overview of how the project would be constructed, including vegetation clearing requirements, work on the new and existing transmission lines, access requirements, construction support sites and temporary worker accommodation, and the construction program.

4.3.1 Vegetation clearing

Vegetation clearing or pruning would be required to:

- construct transmission towers
- establish the transmission line easement
- construct the switching stations
- adjust and upgrade existing transmission lines
- construct and upgrade access tracks and upgrade public roads and intersections
- establish construction support sites, including temporary worker accommodation, and other ancillary facilities
- manage hazard trees and potential bushfire risks.

The assessment of biodiversity impacts includes a disturbance area within the construction impact area to provide a more accurate estimation of the likely magnitude of vegetation clearance required, and any associated biodiversity impacts (see *section 7.3*). The construction of different project elements would involve different levels physical disturbance and vegetation clearing requirements. A summary of these requirements is provided in Table 4.4.

Based on the varying levels of vegetation impact associated with project elements, disturbance area categories have been identified to assess the potential biodiversity impacts of the project (see Figure 4.7). No clearing zones have also been identified within the transmission line easement where vegetation removal is not required (e.g. gullies that can be spanned) and where no access is required during both construction and operation (see Figure 4.8).

For further information on the application of the disturbance areas for the biodiversity assessment see *Chapter 8 (Biodiversity)* and *Technical Report 1 – Biodiversity development assessment report*.

Vegetation clearing would be undertaken with the use of machinery, or manually where it is unsafe to operate machinery, where access is limited or where ecological constraints have been identified (see *Technical Report 1 - Biodiversity development assessment report*). Root balls would be retained where possible due to identified environmental and heritage constraints. The clearing method would be determined by:

- vegetation type or structure
- slope and terrain
- environmental and ecological constraints.

Some vegetation clearing and pruning may be carried out as pre-construction minor work. Such clearing would exclude vegetation that is part of a threatened ecological community or habitat for threatened species that is subject to biodiversity offsets (see *Chapter 24 (Environmental management)*).

Table 4.4 Vegetation clearing requirements during construction

Project component	Requirements
Transmission towers	Construction of transmission towers would require vegetation removal for the following: • establishment of tower pads – which would require a cleared area of around 70 by 60 m (with the 70 m section placed along the length of the easement and the 60 m section across the width of the easement) for the construction of each structure in most instances, with larger construction benches of up to 100 by 70 m in steep terrain • stringing sites – which would require a cleared area of around 60 by 80 m where a direction change of the transmission line occurs • complete removal of vegetation would typically be required within these areas to facilitate safe access and use of construction vehicles, plant and equipment.
Transmission line easement	Vegetation clearing within the transmission line easement would require the removal vegetation that exceeds vegetation clearance requirements (indicatively 13.5 m below the conductors under maximum operating line conditions). Groundcover and understorey vegetation may not need to be cleared but may be impacted during clearing of the mid-storey and upper storey vegetation. There would be no clearing required in the no clearing zones.
Hazard tree protection	The hazard tree zone encompasses land located adjacent to the transmission line easement where selective tree removal, trimming or lopping would be undertaken to manage any risk of damage to transmission lines and structures in the event of tree fall. For the purpose of the EIS, hazard trees (trees outside the easement that are of a sufficient height which, if they were to fall, would exceed the clearance requirements for the transmission line, and are considered to be a hazard structurally), have been assessed as being removed in limited areas identified through LiDAR analysis of existing tree heights and topography.
Switching stations/ substations	Areas required for the construction of the proposed Bayswater South switching station and Olney switching station including associated access roads and asset protection zones (APZs) would require full vegetation clearing. No vegetation clearing is proposed as part of the upgrade works at Bayswater substation or Eraring substation.
Access tracks	Construction of new access tracks would generally require full vegetation clearing. Upgraded tracks may require vegetation clearing, to achieve the same total width as new access tracks, for widening/formation work or where vegetation may be considered a safety hazard. Existing tracks/roads of a suitable width would not require vegetation clearing.

Project component	Requirements
Construction support sites (including worker accommodation)	The areas required for the construction support sites, including the worker accommodation facilities, associated access roads and APZs, would require vegetation clearing. Construction support sites were selected based on a preference for previously disturbed/cleared areas.
Stringing sites and laydown areas	The areas required for stringing sites and laydown areas would require vegetation clearing for stringing and other ancillary activities to be carried out during construction. This includes stringing sites and laydown areas within the transmission line easement and laydown areas outside the transmission line easement.

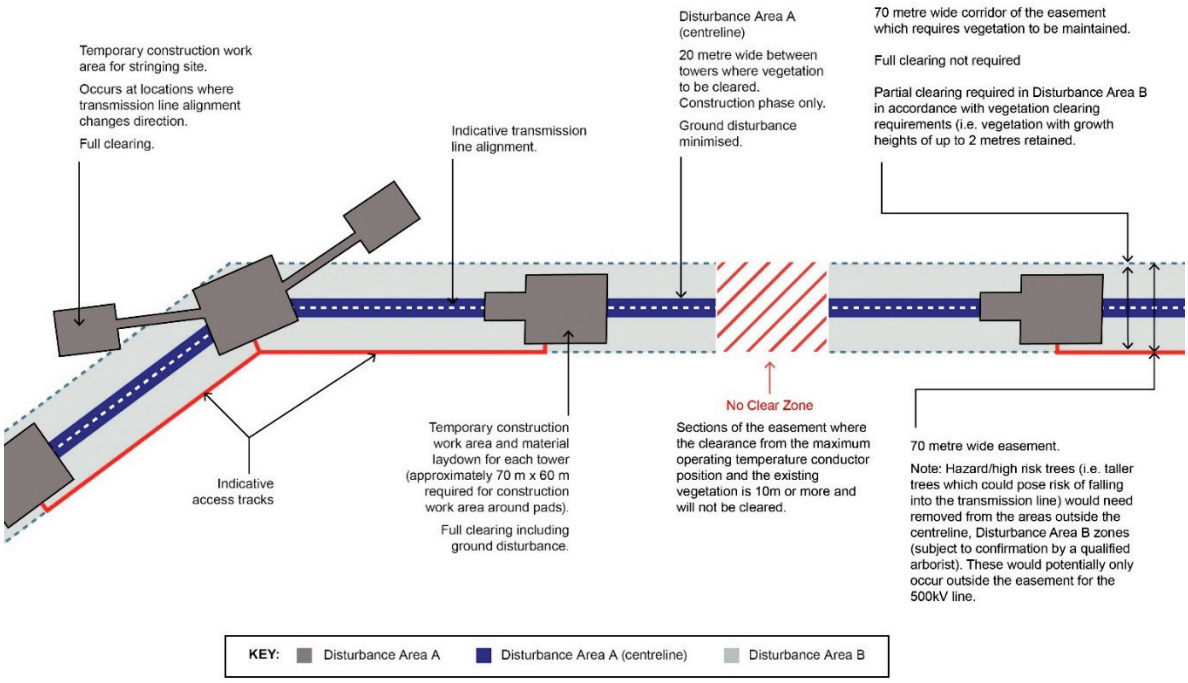


Figure 4-7 Indicative construction disturbance areas and vegetation clearing requirements

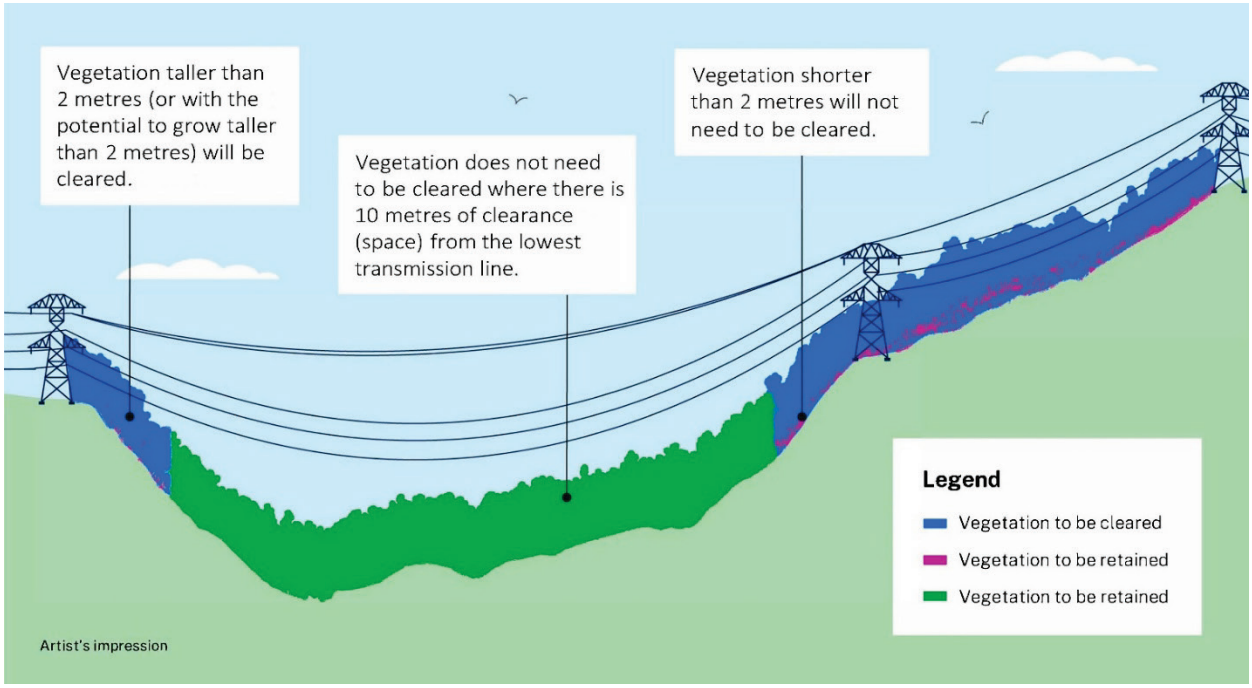


Figure 4-8 Conceptual diagram of no clearing zones on the forested plateau

4.3.2 Work within the transmission corridor

New transmission lines and towers

Construction of the transmission line, including the towers and stringing sites, would largely take place within the HTP corridor (which is about 140 metres wide).

Construction of the new transmission line would include the following activities:

- vegetation clearing in line with the vegetation clearing model developed for the project
- site establishment, including building access tracks to and within the HTP corridor, construction of temporary or permanent access gates, upgrades to existing intersections, setting up laydown areas and stringing sites, and delivering equipment and materials to site
- developing the foundations of the transmission towers. Most of the towers would have standard foundations. Special foundations would be required in some areas to address geotechnical risks (such as mine subsidence and fill, floodplain and steep slopes)
- assembling and installing the transmission towers. The tower sections would be pre-assembled at ground level using heavy lifting equipment, such as cranes (see Image 4.2)
- stringing the transmission line between towers using tractors and helicopters/drones
- connecting the transmission line to the switching stations
- testing the transmission line
- commissioning the transmission line
- demobilising the construction site and rehabilitating temporary disturbance.

Source: Transgrid

Image 4.2 Example 500 kV transmission line tower being assembled for Project EnergyConnect

Stringing sites

Stringing sites are used for the preparation, assembly and operation of stringing equipment to connect the transmission line to the towers.

To connect the transmission line, stringing sites would be positioned along the HTP corridor:

- where there are angles in the line over 30 degrees
- where there are large elevation changes
- where towers are either side of a major crossing such as a road, rail line or river
- at distances of no more than 10 kilometres.

The stringing sites are contained within the HTP corridor.

Crossings

As stated in *section 4.2.5*, the new transmission line would cross existing transmission, sub-transmission and distribution lines throughout the HTP corridor. Various construction methods would be used in the stringing of the new transmission line in locations where it would cross existing lines. Methodologies would include the use of cranes to support existing conductors for crossings of 330 kV transmission lines and the use of hurdles (including rope and net) to protect existing 132 kV and 66 kV sub-transmission lines.

The new transmission line would also cross several roads, rail lines, watercourses including the Hunter River. A drone or helicopter would typically be used to take a lead wire over the road/rail/watercourse to allow cables to then be pulled and strung to each tower within the stringing section (see Figure 4.9). Hurdles (including net and rope) and cranes would also be used as required in stringing activities for road and rail crossings.

The new transmission line would cross the road network in various locations throughout the project impact area, including the State road network at Putty Road near Broke Road, and regional roads such as Cessnock Road east of Broke and Wollombi Road west of Millfield. Further details on road network crossings are outlined in *Technical Report 4 – Traffic and transport impact assessment*. During stringing work over roads, traffic management and out of hours arrangements are typically required. EnergyCo has consulted with relevant road authorities regarding these works and will continue to engage during detailed design to confirm specific arrangements and local requirements. These works are also subject to the requirements of a road occupancy licence.

Stringing of the new transmission line over rail lines would occur at 2 locations near the Putty Road / Broke Road intersection. This rail line is known as the Whittingham to Mount Thorley line and is operated by the Australian Rail Track Corporation (ARTC). This line provides coal transport to Mount Thorley Warkworth, Wambo and Bulga Coal Mines. Stringing activities across rail lines would be undertaken in consultation with the ARTC and would likely be carried out during rail maintenance periods or scheduled rail shut downs and therefore would not impact rail services.

The new transmission line would cross watercourses and riparian corridors in numerous locations throughout the HTP corridor, including 3 crossings of the Hunter River and one crossing of the Wollombi Brook (near its confluence with the Hunter River). Further details on watercourse crossings are outlined in *Chapter 17 (Surface water)* and *Technical Report 10 – Surface water impact assessment*.

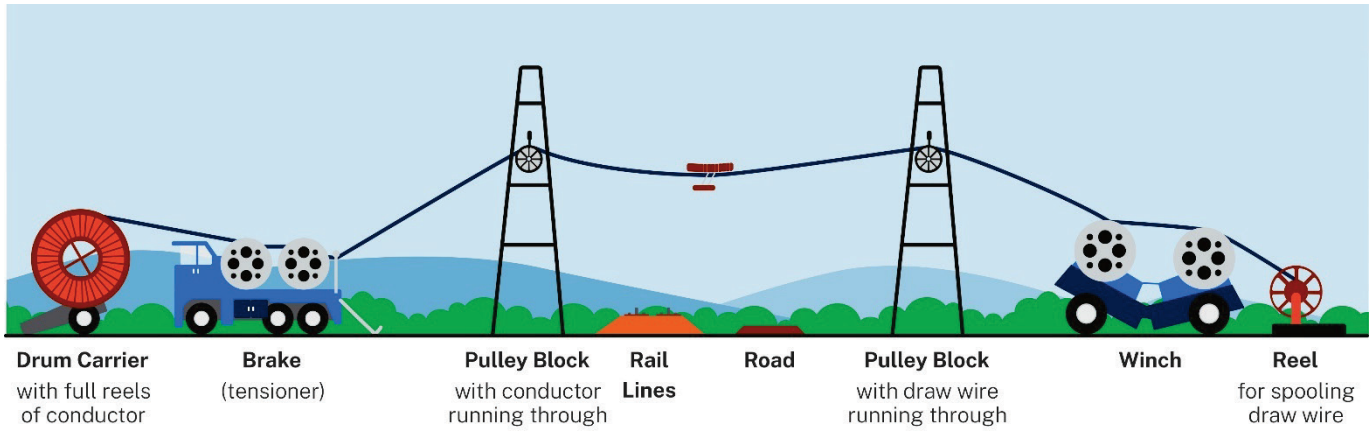


Figure 4-9 Example of transmission line construction at road and railway crossings

4.3.3 Work on existing transmission lines

Adjustment to existing transmission lines

In general, existing easements would remain unchanged where work on existing transmission lines is proposed. In some instances, such as tie-in works at the Bayswater South and Olney switching stations, minor localised widening of existing easements would be required. Following construction, new permanent easements would be established as needed for transmission infrastructure that is located outside of the existing easement.

Adjustments to existing transmission lines include:

- adjustments to the existing 500 kV transmission line at Bayswater to connect to the new Bayswater South 500 kV switching station and then tie-in with the existing Bayswater 500 kV/330 kV substation
- adjustments to an existing 330 kV transmission line at Bayswater near the Bayswater South 500 kV switching station to accommodate the new HTP 500 kV double circuit transmission line
- adjustments to an existing 330 kV transmission line within the Singleton Military Area
- adjustment to the existing 500 kV transmission line at Ravensdale to connect to the new Olney 500 kV switching station.

Adjusting the existing transmission lines would include the following key steps:

- pre-construction minor works
- vegetation clearing in line with the vegetation clearing model developed for the project, including for any minor localised widening of existing easements
- site establishment, including building access tracks, upgrades to existing intersections, setting up laydown areas, construction pads and stringing sites, and delivering equipment and materials to site
- third party utility and property adjustments
- developing the foundations of the adjusted transmission towers
- assembling and installing the adjusted transmission towers
- turning the existing transmission line off and disconnecting the transmission line from the old towers (an outage of the transmission line would be required)
- stringing the transmission line between the adjusted towers using tractors and helicopters/drones
- removing redundant towers and other infrastructure
- testing the adjusted transmission line
- commissioning the adjusted transmission line
- demobilising the construction site and rehabilitating temporary disturbance.

Construction of the adjusted transmission lines would typically occur within the associated existing easements or the HTP corridor.

Upgrades to existing transmission lines and towers

Upgraded earth wire would be required on Line 5A3 and Line 5A4 in the north and upgraded earth wire and communications systems would be required on Line 5A1 and Line 5A2 in the south. This infrastructure would be strung on existing transmission line towers.

Tower strengthening would also be required on various existing structures identified above, which would involve adding more braces to these existing towers. Temporary supports for the existing towers would not be required during tower strengthening activities as the existing braces would remain in place. Details of tower strengthening, including the number of towers requiring strengthening, would be confirmed during detailed design.

All works would be restricted to the existing transmission line easement maintained by Transgrid. Existing access roads and tracks would be used to undertake these works.

Road and rail crossings

Upgrades on Line 5A1 and Line 5A2 would occur in existing easements which cross over the M1 Pacific Motorway and the Sydney to Newcastle rail line in Cooranbong. Stringing methodologies over these assets would be confirmed during detailed design. It is likely that traffic management would be required during stringing activities over the M1 Pacific Motorway and a rail possession would likely be required to carry out stringing over the Sydney to Newcastle rail line. Further information on the proposed works is provided in *Chapter 11 (Traffic and transport).*

4.3.4 New switching stations and upgrades to existing substations

New switching stations

Construction of the new switching stations at Bayswater South and Olney would include the following key steps:

- pre-construction minor works, including traffic control (if required)
- vegetation clearing with erosion and sediment control measures as required
- site establishment, including building access tracks, setting up laydown areas, and delivering equipment and materials to site
- third party utility and property adjustments
- undertaking civil works to establish the pads for the new switching stations and associated infrastructure and services
- constructing the new switching stations
- installation of perimeter fencing and other works
- connecting the new transmission line to the new switching stations, and the new switching stations to the existing transmission network
- testing the new switching stations
- commissioning the switching stations
- demobilising the construction site and rehabilitating temporary disturbance.

Upgrades to existing substations

Works at the existing Bayswater substation would be limited to those required for connection to the new transmission line and commissioning. The construction methodology for the upgrade to the existing Eraring substation would include:

- demolition and removal of redundant electrical equipment
- earthworks to form or extend the substation bench
- modifying drainage structures
- installation of foundations, electrical equipment and security
- connection to the new transmission line

- commissioning.

Remote work at existing substations, consisting of replacing or upgrading existing control and communication equipment, would be completed in preparation for operation. There would be no noise or traffic impacts associated with this work.

4.3.5 Access

Vehicle movements

Construction vehicles would transport equipment, waste, materials and spoil, as well as workers.

Larger volumes of heavy vehicles would be required during main construction work associated with the transmission line and switching stations and would mainly be associated with the delivery of materials to the HTP corridor, laydown areas and construction support sites.

Light vehicle movements would generally be associated with workers travelling from nearby towns (local workforce and early works activities) and to and from individual work sites.

Non-standard or oversize and/or overmass loads would be required for the main construction work at the switching stations and substations (e.g. for transformer and reactor transport).

Construction trips would generally start from the construction support sites at Hebden Road, Pikes Gully Road, Gouldsville Road, Wollombi Road and Freemans Drive. The trip generation estimates for all the construction support sites are similar with the exception of Freemans Drive which is expected to have higher trips generated from the site, being the largest construction support site. Indicative maximum daily vehicle movements for Freemans Drive and the other construction support sites are provided in Table 4.5.

Further information on the expected construction vehicle movements for construction of the project is provided in *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport impact assessment*.

Table 4.5 Indicative vehicle movements during construction

Construction support sites	Maximum daily movements (peak construction)	
	Light vehicles	Heavy vehicles
Hebden Road	434	406
Pikes Gully Road	378	335
Gouldsville Road	434	406
Wollombi Road	378	335
Freemans Drive	562	480

The indicative total oversize and/or overmass vehicle movements for the duration of the project include those listed in Table 4.6.

The scheduling of oversize and/or overmass vehicle movements would be subject to the requirements of the local road authorities and further traffic studies during detailed design of the HTP.

Table 4.6 Oversize/overmass vehicle movements during construction

Component	Origin	Destination	Movements (total during construction)
Line shunt reactors	Port of Newcastle	Bayswater South switching station	3 deliveries
Transformers	Port of Newcastle	Eraring substation	7 deliveries
Auxiliary services buildings	Interstate	Bayswater South switching station Olney switching station	2 deliveries

For further detail on traffic and transport, see *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport impact assessment*.

Access requirements

Based on the concept design and early construction planning potential access routes proposed to be used during construction of the HTP were identified and are listed in Table 4.7 and shown in Figure 4.10.

Table 4.7 Summary of proposed access routes for construction

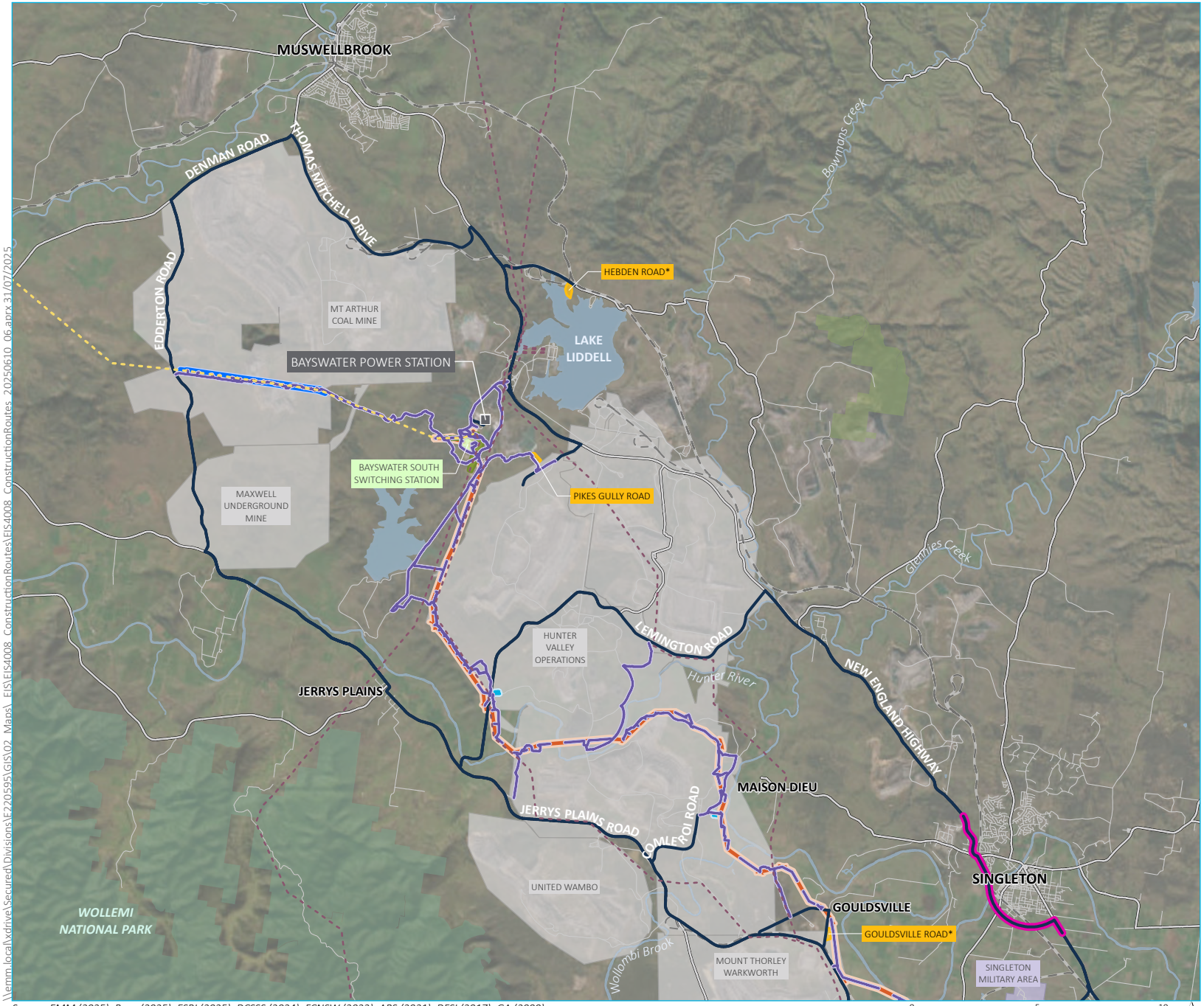
Local government area	Location (suburb)	Road name	Road classification
Muswellbrook	Muswellbrook	Denman Road	State road
	Muswellbrook	New England Highway	State road
	Edderton	Edderton Road	Local road
	Muswellbrook	Hebden Road	Local road
	Muswellbrook	Pikes Gully Road	Local road
	Muswellbrook	Thomas Mitchell Drive	Local road
	Muswellbrook	Unnamed Road to Bayswater Power Station	Local road
Singleton	Mount Thorley	Golden Highway	State road
	Warkworth	Jerrys Plains Road	State road
	Mount Thorley	Mitchell Line of Road	State road
	Mount Thorley	Broke Road (north of Broke)	Regional road
	Broke	Singleton Street	Regional road
	Broke	Wollombi Street	Regional road

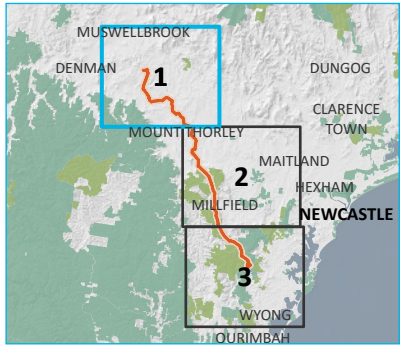
Local government area	Location (suburb)	Road name	Road classification
	Warkworth	Archerfield Road	Local road
	Broke	Cessnock Road	Local road
	Warkworth	Comleroi Road	Local road
	Gouldsville	Gouldsville Road	Local road
	Lemington	Lemington Road	Local road
	Warkworth	Long Point Road West	Local road
	Broke	Oakley Lane	Local road
	Singleton Military Area	Range Road	Local road
Cessnock	Cessnock	Allandale Road	State road
	Black Hill	John Renshaw Drive	State road
	Nulkaba	Wine Country Drive	State road
	Pokolbin	Broke Road (east of Broke)	Regional road
	Kurri Kurri	Cessnock Road	Regional road
	Millfield	Wollombi Road	Regional road
	Olney	Barwicks Road	Local road
	Olney	Bowmans Road	Local road
	Pokolbin	Broken Back Road	Local road
	Cedar Creek	Broken Back Trail	Local road
	Cedar Creek	Brush Creek Road	Local road
	Corrabare	Cabans Road	Local road
	Cedar Creek	Campbell Springs Trail	Local road
	Cedar Creek	Cedar Creek Road	Local road
	Corrabare	Cedar Ridge Road	Local road
	Kurri Kurri	Cessnock Road	Local road
	Corrabare	Crumps Road	Local road
	Olney	Farrells No 1 Road	Local road
	Olney	Farrells No 2 Road	Local road
	Olney	Farrells Road	Local road

Local government area	Location (suburb)	Road name	Road classification
	Corrabare	Fig Road	Local road
	Corrabare	Flick Road	Local road
	Olney	Halls Road	Local road
	Millfield	Hayes Road	Local road
	Corrabare	Hearns Road	Local road
	Olney	Heaton Road	Local road
	Corrabare	Langans Road	Local road
	Corrabare	Mahogany Road	Local road
	Cessnock	Maitland Road	Local road
	Pokolbin	McDonalds Road	Local road
	Olney	McGowans Road	Local road
	Millfield	MF1 Road	Local road
	Millfield	Mount Baker Road	Local road
	Millfield	Mount View Road	Local road
	Olney	New Mill Road	Local road
	Millfield	North Road	Local road
	Pokolbin	Oakey Creek Road	Local road
	Olney	Old Mill Road	Local road
	Pokolbin	Pokolbin Mountains Road	Local road
	Cedar Creek	Sawpit Road	Local road
	Corrabare	Trig Road	Local road
	Corrabare	Turpentine Point Road	Local road
	Corrabare	Unnamed roads off Langans Road	Local road
	Olney	Watagan Creek Road	Local road
Lake Macquarie	Cooranbong	M1 Pacific Motorway	National and State road
	Cooranbong	Freemans Drive	State road

Local government area	Location (suburb)	Road name	Road classification
	Morisset	Mandalong Road	State road
	Dora Creek	Wangi Road	State road
	Cooranbong	Alton Road	Local road
	Eraring	Construction Road	Local road
	Cooranbong	Freemans Drive (south of Cooranbong)	Local road
	Dora Creek	Gradwells Road	Local road
	Dora Creek	Hawke Mount Road	Local road
	Martinsville	Martinsville Hill Road	Local road
	Martinsville	Martinsville Road	Local road
	Cooranbong	Mount Faulk Road	Local road
	Cooranbong	Mount Nelinda Road	Local road
	Dora Creek	Newport Road	Local road
	Freemans Waterhole	Palmers Road	State road
	Dora Creek	Rocky Point Road	Local road
	Cooranbong	Valley Crest Road	Local road
	Martinsville	Watagan Road	Local road
Central Coast	Jilliby	Hue Hue Road	Local road
	Mardi	Old Maitland Road	Local road
	Warnervale	Sparks Road	Local road
	Ravensdale	Walkers Ridge Road	Local road
	Ravensdale	Watagan Forest Road	Local road
	Ravensdale	Wollombi Forest Road	Local road
	Wyong Creek	Yarramalong Road	Local road

Further information on key construction traffic routes from State roads, such as New England Highway, Golden Highway, Wollombi Road, Broke Road, Freemans Drive and the M1 Pacific Motorway is included in Figure 4.10 to Figure 4.13.





KEY

- Construction traffic route
- Oversize overmass vehicle route

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

*scheduled for completion 2026

Access routes
Map 1 of 3

Hunter Transmission Project
Environmental Impact Statement
Figure 4.10

EMM
creating opportunities

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

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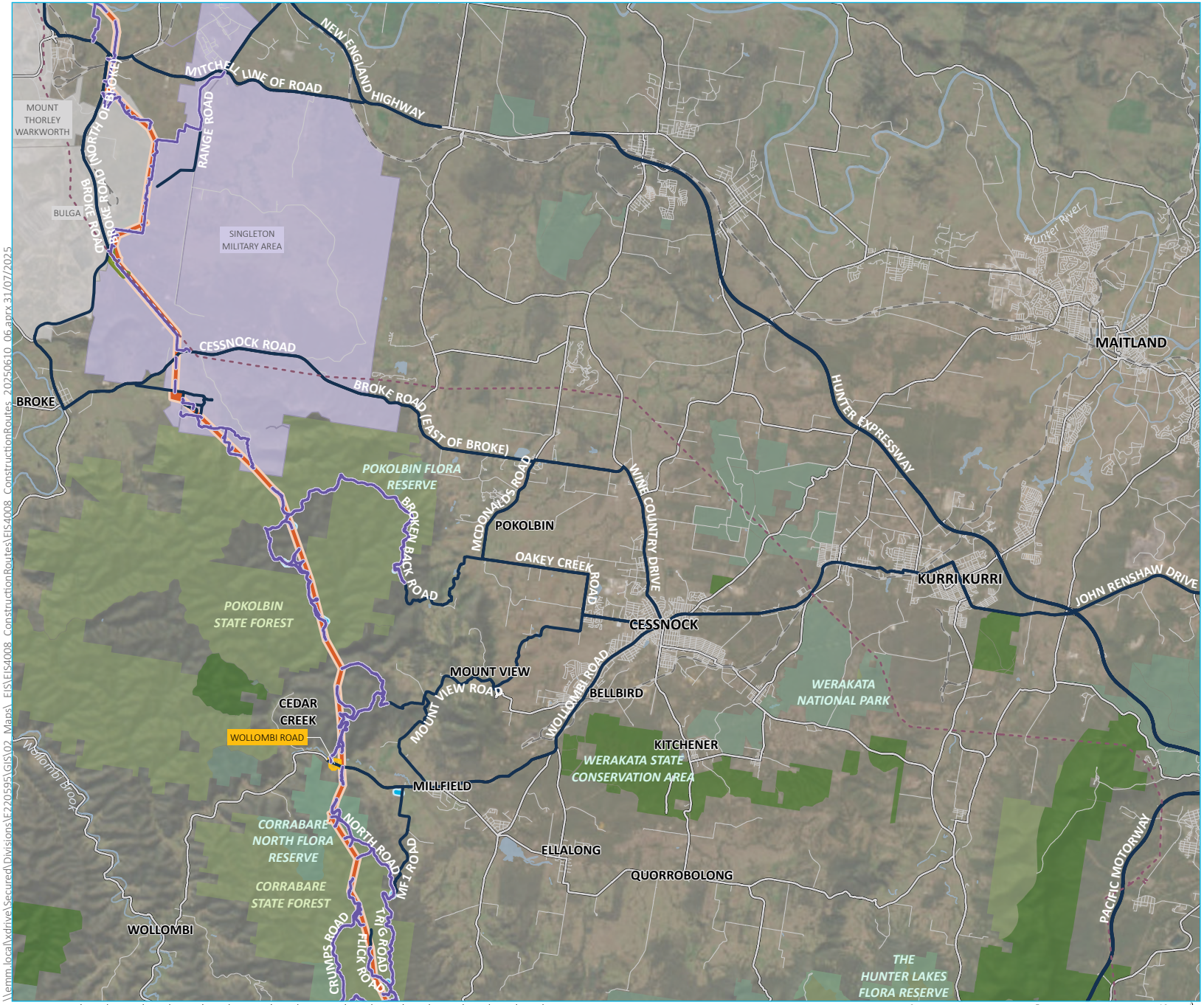

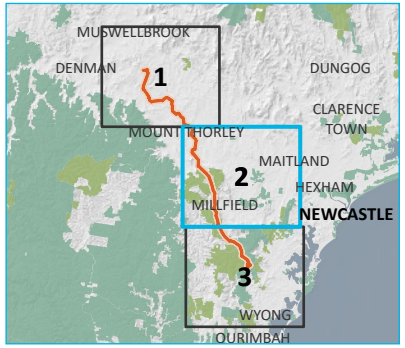

KEY

- Construction traffic route
- Oversize overmass vehicle route

Project impact area

- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Laydown area
- Adjustment to existing transmission line (line 81)
- Access track

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence
- Mining

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

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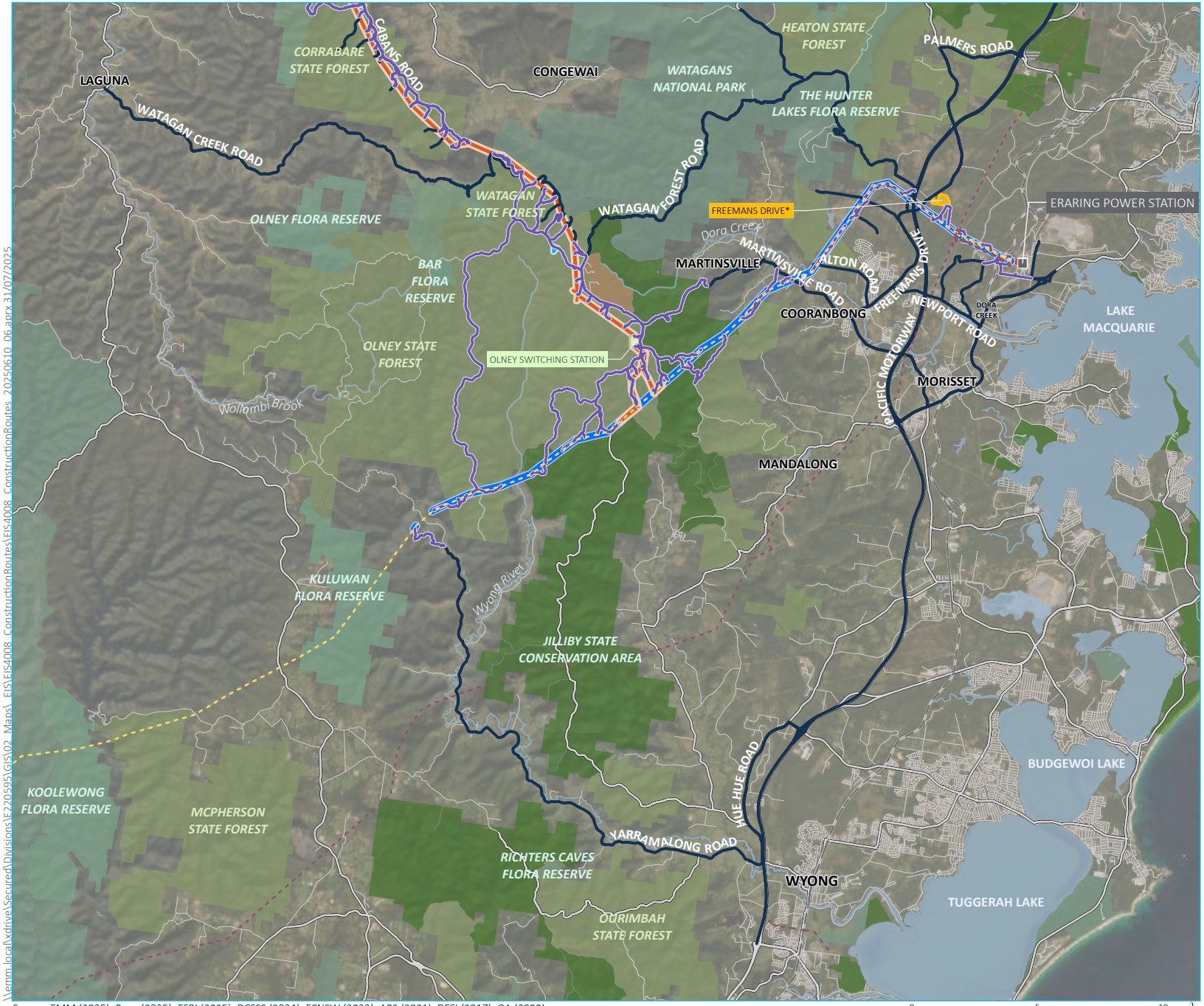
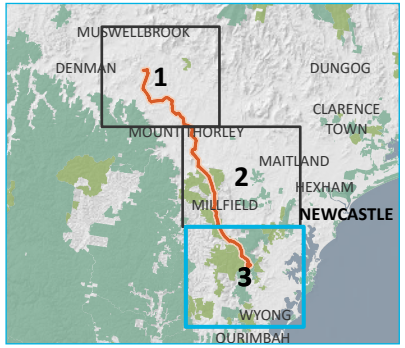
Access routes
Map 2 of 3

Hunter Transmission Project
Environmental Impact Statement
Figure 4.10

EMM
creating opportunities





KEY

- Construction traffic route
- Oversize overmass vehicle route

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Recreation area

Access routes
Map 3 of 3

Hunter Transmission Project
Environmental Impact Statement
Figure 4.10

EMM
creating opportunities

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

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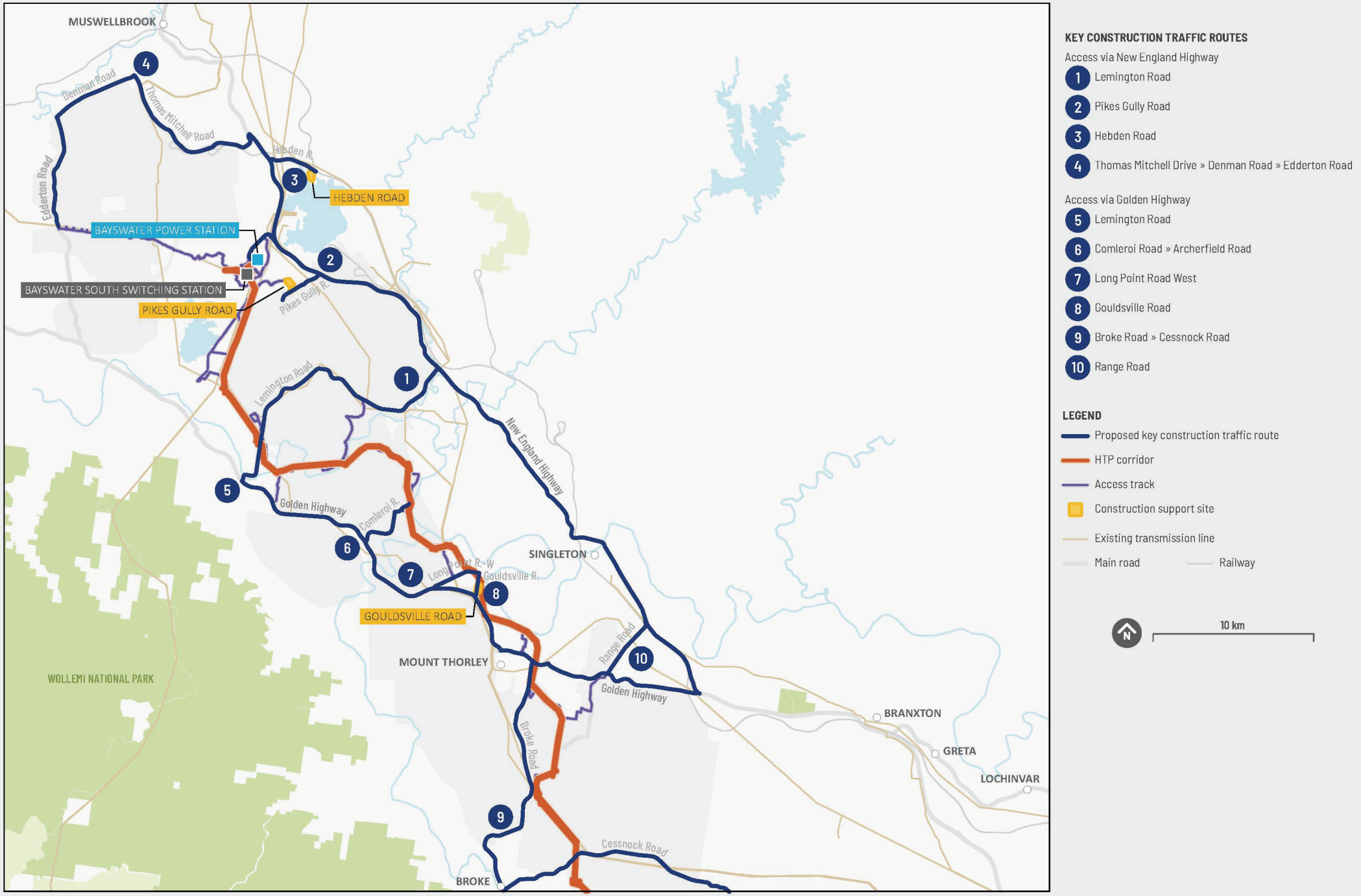


Figure 4.11 Key construction traffic routes – Muswellbrook and Singleton LGAs

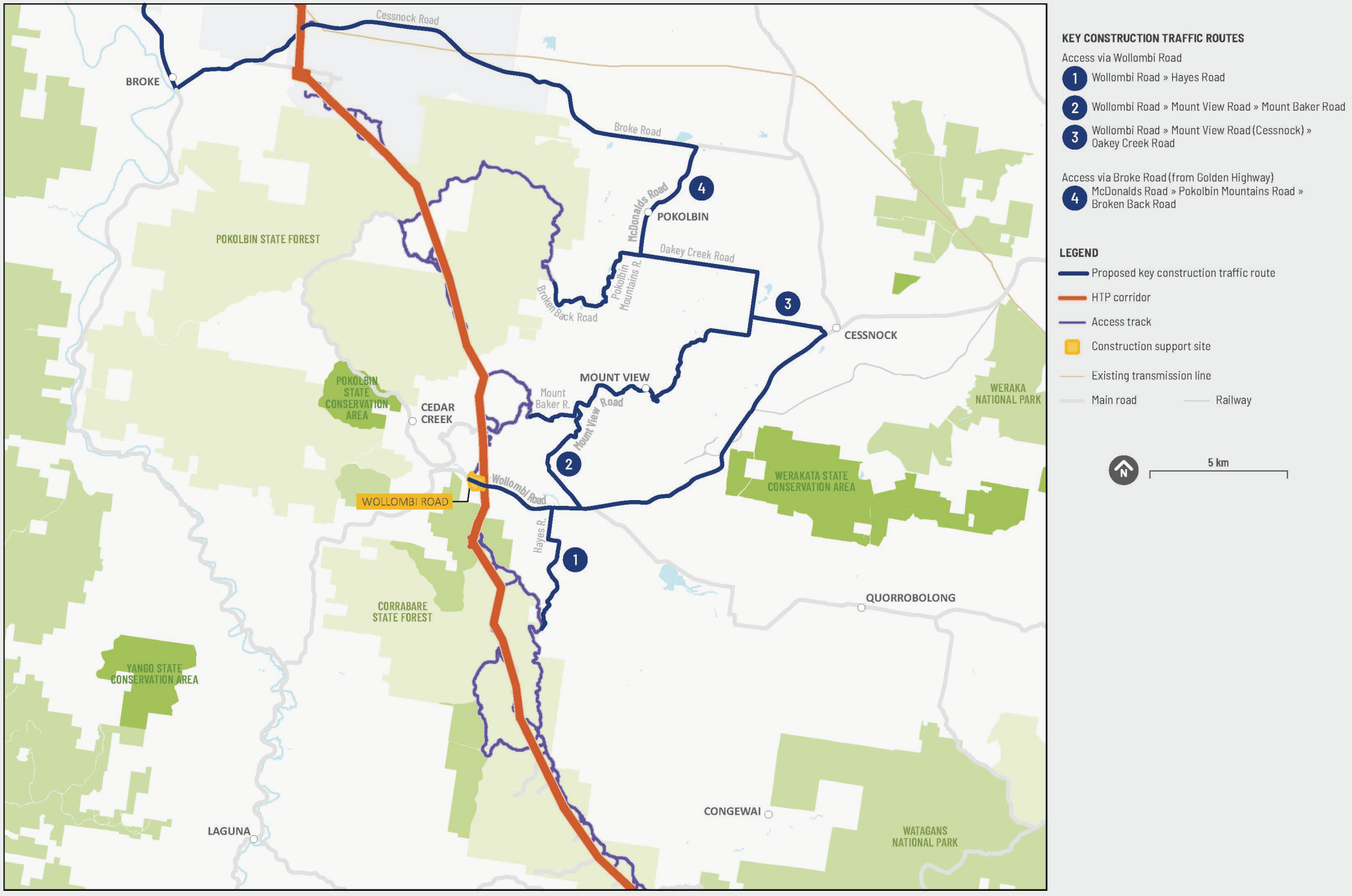


Figure 4.12 Key construction traffic routes – Cessnock LGA

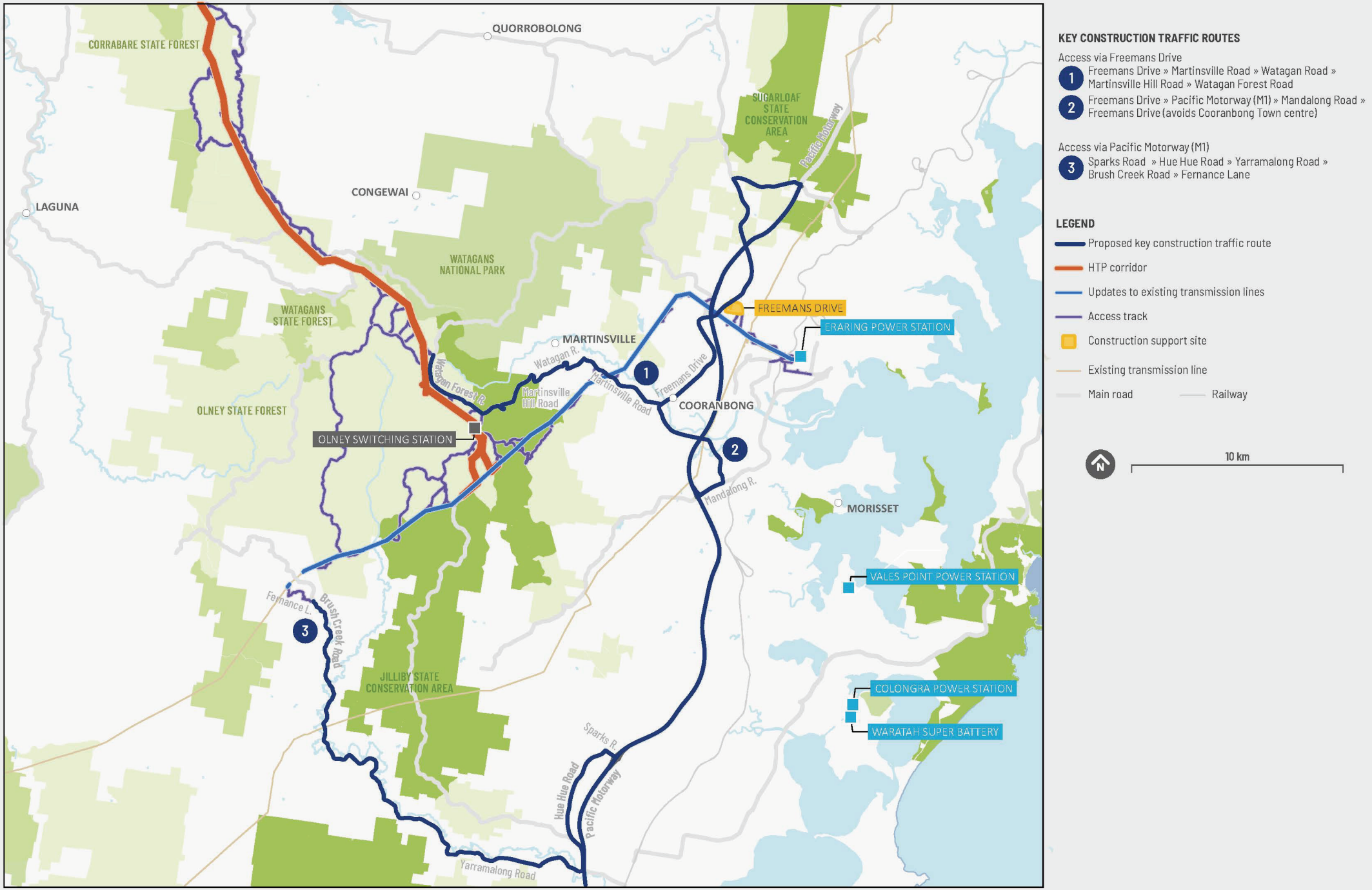


Figure 4.13 Key construction traffic routes – Lake Macquarie and Central Coast LGAs

The project would require the use of a combination of new and existing access tracks on private properties and upgrades to the existing public road network. Some improvements to existing roads, intersections and access tracks would be required to provide appropriate and safe access during construction and operation. New and upgraded access tracks would be designed to accommodate the expected vehicle movements during both construction and operation. Existing public access roads and access tracks would generally be wide enough to accommodate a traffic lane in each direction, with lanes typically between 2.5 and 3.5 metres in width. Wider sections may be required during construction to accommodate passing or turning lanes for large vehicles.

Access tracks

Some of the existing access tracks proposed would require upgrades to accommodate construction vehicles and machinery. The upgrades required to existing access tracks would vary depending on the condition of individual tracks. They would generally need to be up to 6 metres wide and able to accommodate a 19 metre semi-trailer (or similar vehicle). Where there are no existing access tracks that provide appropriate access to the new transmission line corridor, and where existing conditions (such as terrain) prevent access along the transmission line corridor, new access tracks would be constructed. These new tracks would be within existing disturbed areas, wherever possible. New access tracks would be constructed to meet the same requirements as the upgrades to existing access tracks described above.

Access tracks have been chosen in consultation with landowners. Individual land use needs have been considered to enable the landowner's continued use of the land, as well as to minimise the overall environmental impacts. The requirements to retain or reinstate access tracks would be determined in consultation with landowners during property access negotiations and ahead of the commencement of project operation.

Upgrades to existing access tracks and the construction of new access tracks would generally include the following key steps:

- pre-construction dilapidation surveys
- vegetation clearing with erosion and sediment control measures as required
- site establishment, setting up laydown areas, and the delivery of equipment and materials to site
- establishing traffic control (if required)
- levelling using a grader and roller
- laying road material (crushed rock), compaction rolling and construction of drainage infrastructure as required
- demobilising the construction site and rehabilitating temporary disturbance.

As most roads in the State forests are only suitable for one-lane movement of heavy vehicles, traffic control would be required during the construction period. To reduce disturbance to recreational users of the forest, passing bays are proposed to improve road capacity and safety.

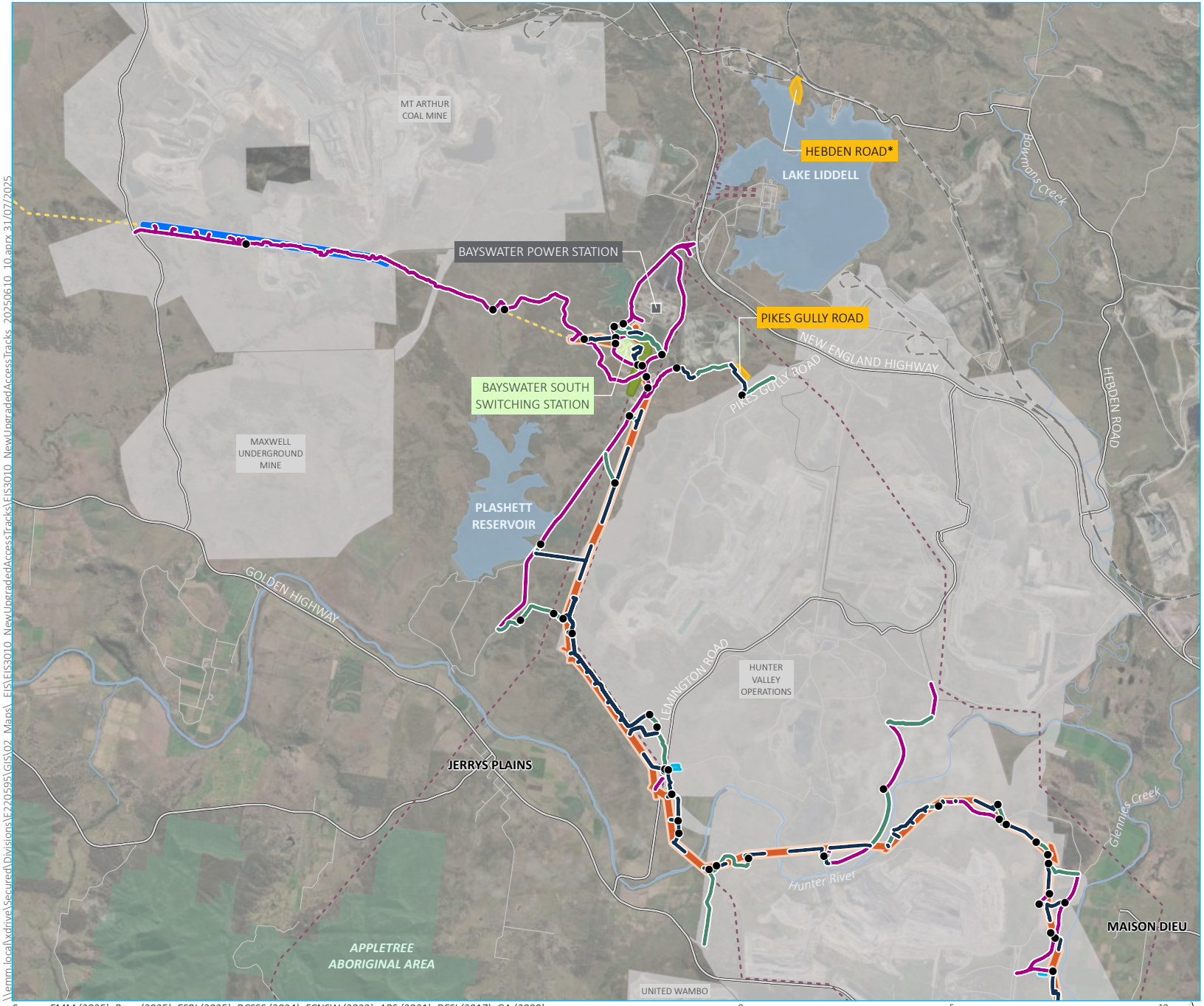
Table 4.8 further describes the access track requirements for the construction of the project. The full extent of works for the upgrade of existing access tracks and the construction of new access tracks would be confirmed following further review and survey of the nominated access tracks.

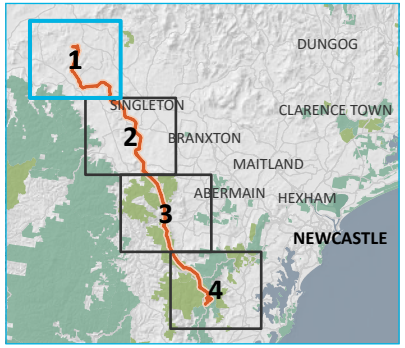
Further discussion on traffic and transport is provided in *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport impact assessment*.

Table 4.8 Access track requirements

Access track/road	Description
Existing tracks	Existing tracks include well-established unsealed local roads, forest roads and tracks maintained by Forestry Corporation of NSW or Transgrid, or unsealed property access tracks, generally suitable for heavy vehicles. Some existing access tracks may require maintenance activities or upgrades along the formation, such as resurfacing or grading, or drainage work. Vegetation removal and pruning/trimming may be required in some locations where vegetation may be considered a hazard. Where pruning/trimming is required, it would be undertaken to avoid impacts on the long-term viability of the vegetation where possible. Other existing access tracks may require upgrades for safety and suitability. These tracks typically consist of unsealed property access tracks of varying conditions, from well-established sections to rarely used, barely visible sections (i.e. requiring substantial upgrade). Upgraded access tracks are expected to require more substantial work to allow their use during construction compared with existing tracks/roads. Work may include earthworks to improve gradients, grading or resurfacing, formation widening or realignment, drainage work or upgrades to watercourse crossings. Vegetation clearing or pruning/trimming may be required for widening/formation work or where vegetation may be considered a roadside hazard. The total clearing width would generally be up to 10 m, with some limited areas (e.g. steep terrain, passing bays) requiring a clearing width of up to 20 m for batters and in limited areas up to 30 m.
New tracks	The locations of new access tracks have generally been selected to minimise environmental and property impacts. New tracks have been designed to include running the track along fence lines, using movement paths preferred by landowners, and going through existing property gates. Establishing the new tracks would typically include earthworks, grading, drainage work and construction of watercourse crossings. Fill material may be imported to provide a suitable capping material. To establish the new tracks, vegetation clearing or pruning/trimming may be required. The total clearing width would generally be up to 10 m, with some areas (e.g. steep terrain, passing bays) requiring a clearing width of up to 20 m and in limited areas up to 30 m.

The locations of existing access tracks, new access tracks and proposed upgrades to existing access tracks are shown in Figure 4.14.





KEY

- Entry point
- New tracks
- Existing tracks (upgrades)
- Existing tracks (no upgrades)

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)

Existing environment

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

Access tracks
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 4.14

EMM
creating opportunities

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

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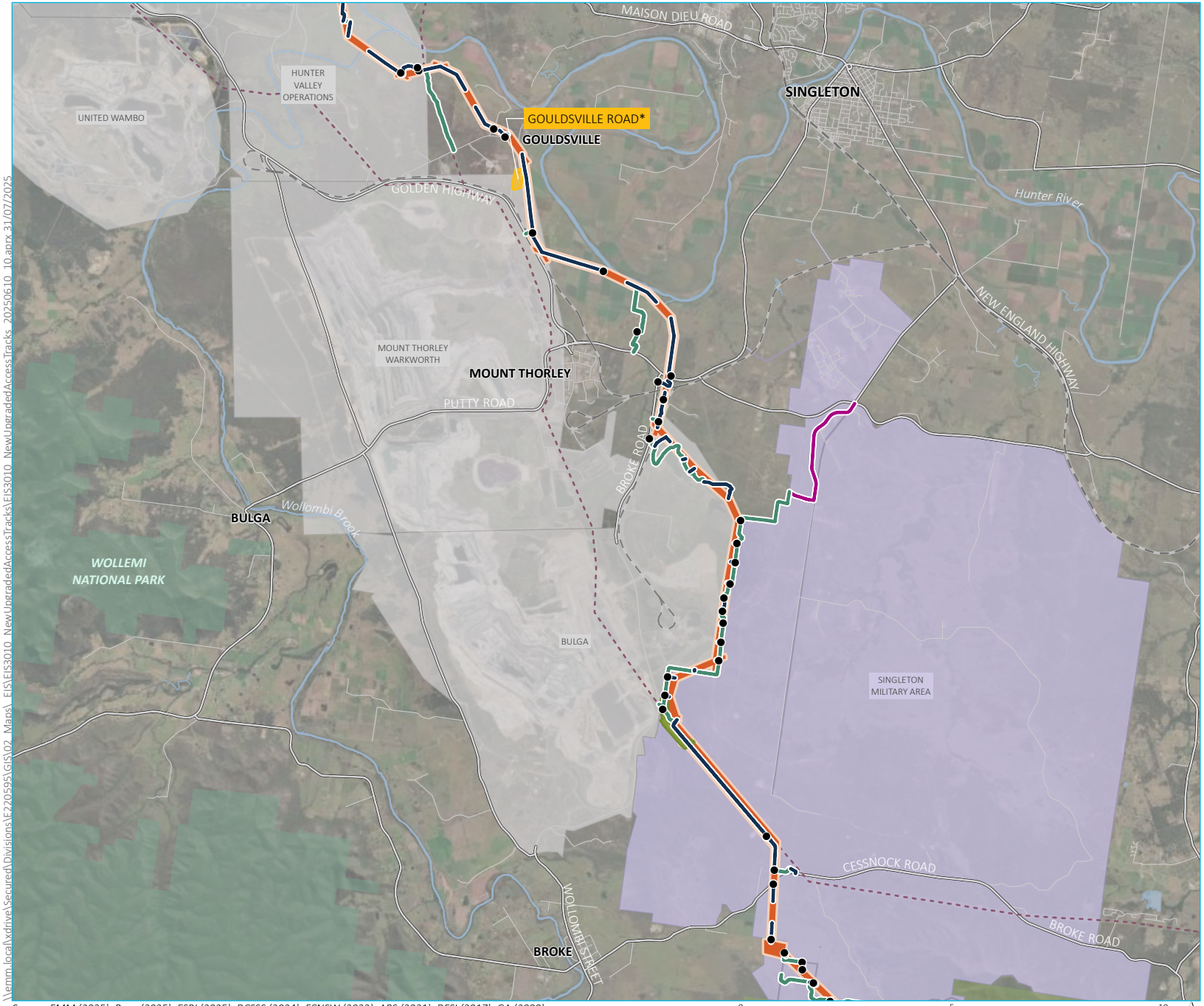

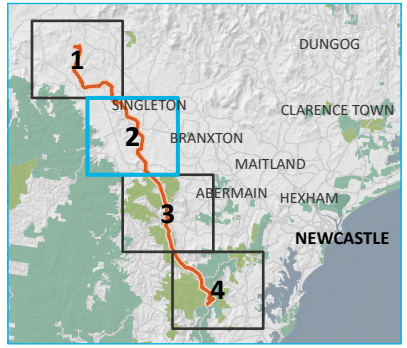

KEY

- Entry point
- New tracks
- Existing tracks (upgrades)
- Existing tracks (no upgrades)

Project impact area

- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Adjustment to existing transmission line (line 81)

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

Access tracks
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 4.14

EMM
creating opportunities

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

0 5 10 km
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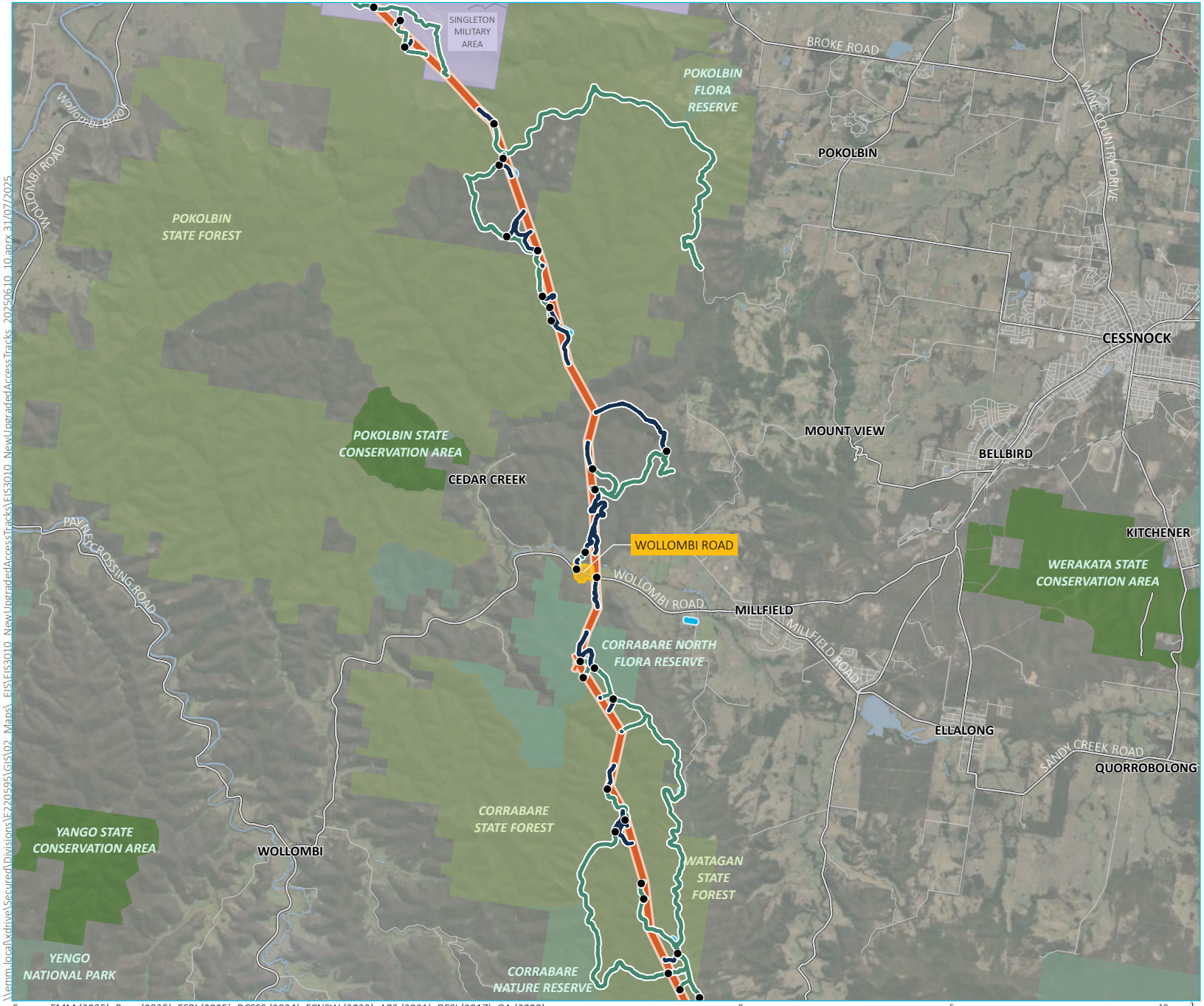

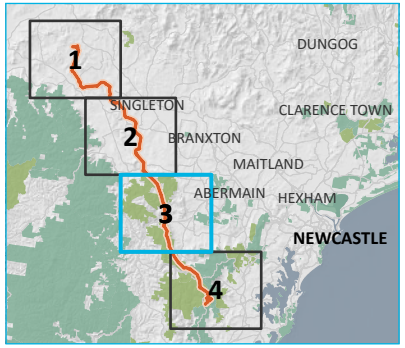

KEY

- Entry point
- New tracks
- Existing tracks (upgrades)

Project impact area

- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Laydown area

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence

Access tracks
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 4.14

EMM
creating opportunities

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

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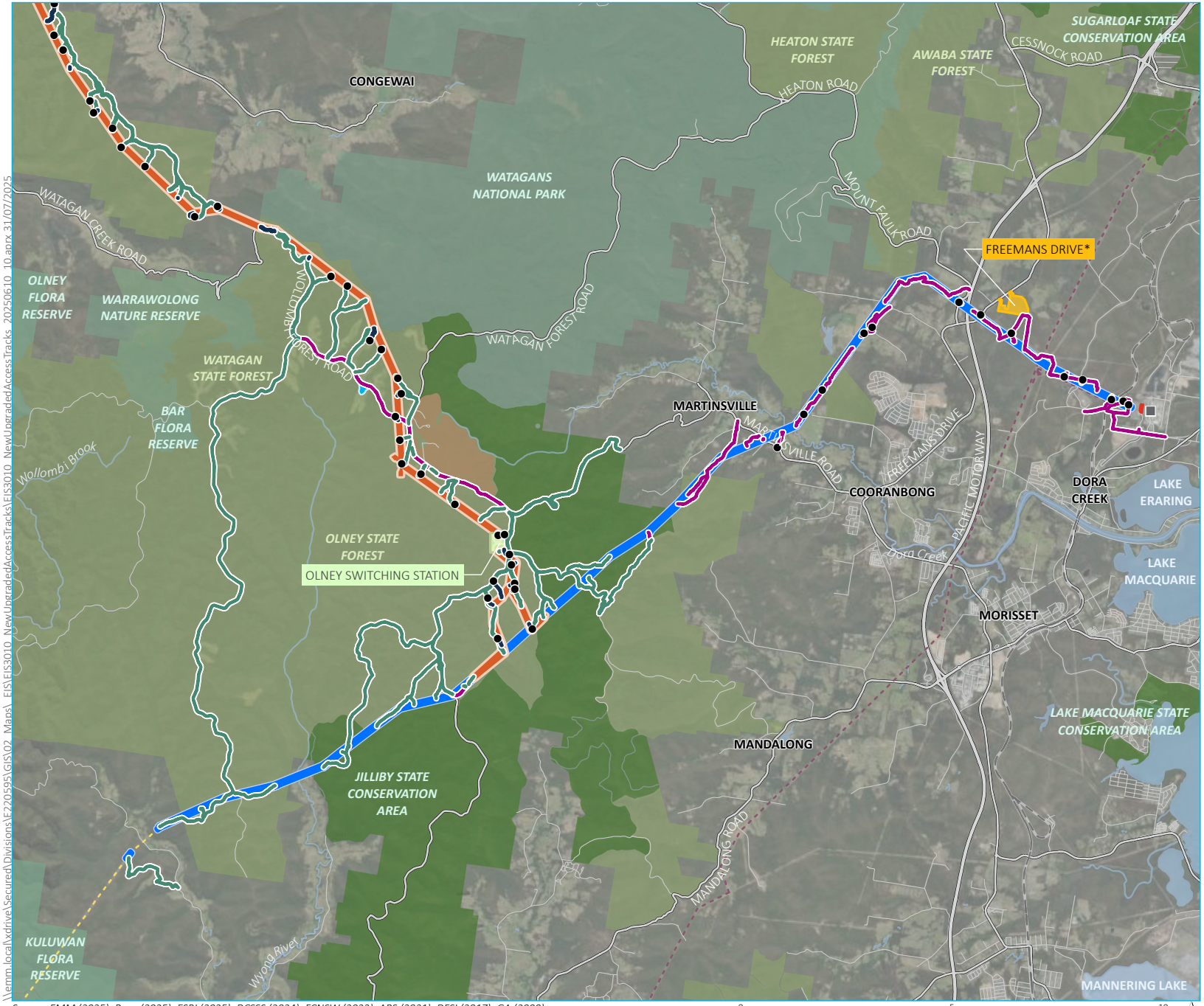

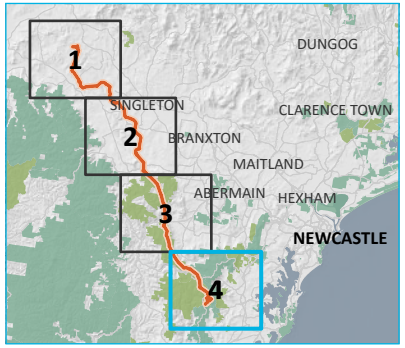

KEY

- Entry point
- New tracks
- Existing tracks (upgrades)
- Existing tracks (no upgrades)

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)

Existing environment

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

Access tracks
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 4.14

EMM
creating opportunities

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

0 5 10 km

GDA2020 MGA Zone 56

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Upgrades to the existing public road network

The project would rely on the use of existing public roads during construction and operation of the project. In several locations along the construction routes, upgrade works would be required, including at key intersections (see Table 4.10), to cater safely for the proposed construction traffic volumes and delivery of oversized equipment or construction material and ensure public road safety. Upgrades to the existing public road network would require relevant approvals under the NSW *Roads Act 1993* and would be confirmed in consultation with the relevant road authorities during the CSSI approval process.

The proposed upgrades for classified State, regional and local roads are listed in Table 4.9. Further details on the likely scope of the proposed upgrades are provided in *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport impact assessment.*

Table 4.9 Proposed upgrades at existing public roads

Local government area	Road	Road classification (road owner)	Location	Works required
Singleton	Oakley Lane	Local (Singleton Council)	Between Cessnock Road and 60 m south of Cessnock Road in Singleton	Widening for one lane movement for 19 m heavy vehicles with traffic control required
Cessnock	Hayes Road	Local (Cessnock Council)	Various sections between Wollombi Road and MF1 Road in Millfield	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	MF1 Road	Local (Cessnock Council)	Various sections between Trig Road and Hayes Road in Millfield	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Mount Baker Road	Local (Cessnock Council)	Various sections between Mount View Road and Existing Track (Mount View) in Millfield	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Pokolbin Mountains Road	Local (Cessnock Council)	Various sections between McDonalds Road and Broken Back Road in Pokolbin	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Broken Back Road	Forestry	Various sections between Pokolbin Mountains Road and Broken Back Trail in Cedar Creek	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Broken Back Trail	Forestry	Various sections between Broken Back Road and Campbell Springs Trail in Broke	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Cabans Road	Forestry	Various sections between Trig Road and Langans Road in Corrabare	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Campbell Springs Trail	Forestry	Various sections between Broken Back Trail and around 4 km south of Broken Back Trail in Broke	Widening for one lane movement for 19 m heavy vehicles with traffic control required

Local government area	Road	Road classification (road owner)	Location	Works required
	Existing Track (adjacent Mount Baker Road in Mount View)	Forestry	Various sections between Mount Baker Road and Wollombi Road in Mount View	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Langans Road	Forestry	Various sections between Cabans Road and Cedar Brush Walk in Corrabare	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	North Road	Forestry	Various sections between MF1 Road and Wollombi Road in Millfield	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Trig Road	Forestry	Various sections between MF1 Road and Cabans Road in Corrabare	Widening for one lane movement for 19 m heavy vehicles with traffic control required
	Watagan Creek Road	Forestry	Various sections between Wollombi Forest Road and around 2 km north of Wollombi Forest Road in Olney	Widening for one lane movement for 19 m heavy vehicles with traffic control required
Lake Macquarie	Martinsville Hill Road	Local (Lake Macquarie Council)	Various sections between Watagan Road and Watagan Forest Road in Lake Macquarie	Widening for one lane movement for OSOM with traffic control required
	Watagan Road	Local (Lake Macquarie Council)	Various sections between Martinsville Road and Martinsville Hill Road in Lake Macquarie	Widening for one lane movement for OSOM with traffic control required
Central Coast	Watagan Forest Road	Forestry	Various sections between Martinsville Road and Wollombi Forest Road in Ravensdale	Widening for one lane movement for 19 m heavy vehicles and OSOM with traffic control required

Local government area	Road	Road classification (road owner)	Location	Works required
	Wollombi Forest Road	Forestry	Various sections between Watagan Forest Road and Watagan Creek Road in Ravensdale	Widening for one lane movement for 19 m heavy vehicles with traffic control required

Road intersections that would be used by the project and would require upgrading, widening or modification for construction vehicle use and access are shown in Table 4.10. Upgrade works are determined based on intersection performance and operation, turning capacity, and safe intersection sight distances. Intersection upgrades would be confirmed in consultation with the relevant road authorities during the CSSI approval process.

Table 4.10 Potential intersections requiring upgrades

Local government area	Intersection	Road classification	Location	Treatments required
Muswellbrook	Hebden Road/access road to the Hebden Road construction support site	Local/local	Muswellbrook	• Localised intersection widening on the access road for turning vehicles • A basic left turn and basic right turn intersection
Singleton	Golden Highway/Lemington Road	State/local	Jerrys Plains	• Widening on Lemington Road for turning vehicle swept path purposes • Upgrade to a basic left turn and channelised right turn intersection
	Golden Highway/Comleroi Road	State/local	Warkworth	• Upgrade to a basic left turn and channelised right turn intersection required
	Golden Highway/Gouldsville Road	State/local	Gouldsville	• Upgrade to an auxiliary left turn and channelised right turn intersection required
	Putty Road/existing access track	State/local	Mount Thorley	• Widening on the existing access track for turning vehicles and a left turn lane and a merge lane on Putty Road
	Golden Highway/existing access track across rail track (Mount Thorley Warkworth mining complex)	State/local	Mount Thorley	• Widening on the existing access track for turning vehicles and relocation of Railway signage required
	Golden Highway/unknown road (east of Lemington Road)	State/local	Warkworth	• Widening on the unknown road for turning vehicles and passing vehicle movements • Upgrade to a channelised right turn intersection

Local government area	Intersection	Road classification	Location	Treatments required
	Putty Road/new access track	State/local	Mount Thorley	• An auxiliary left turn and basic right turn intersection • A reduced temporary speed limit would be required along Putty Road on approach to the intersection with the new access track
	Broke Road/existing access track	Regional/local	Mount Thorley	• Localised intersection widening required on the existing access road • Upgrade to an auxiliary left turn and basic right turn intersection • Reduced temporary speed limit required along Broke Road on approach to its intersection with the existing access track
	Cessnock Road/new access track	Regional/local	Singleton Military Area	• Road widening would be required on Cessnock Road including deceleration and acceleration lanes • In addition, this intersection does not comply with safe intersection sight distance (SISD) requirements. A reduced temporary speed limit would be required along Cessnock Road on approach to its intersection with the new access track
	Cessnock Road/new access track	Regional/local	Singleton Military Area	• Localised intersection widening on the access track for turning vehicles • A basic left turn and basic right turn intersection
	Cessnock Road/Oakley Road	Local/local	Broke	• Widening on Oakley Lane for turning vehicles required
	Long Point Road West/existing easement	Local/local	Warkworth	• Localised intersection widening on the existing easement for turning vehicles • Dedicated through, left and right turn lanes

Local government area	Intersection	Road classification	Location	Treatments required
	Long Point Road West/existing easement	Local/local	Warkworth	• This is a new access road to the existing easement • Localised intersection widening on the access road for turning vehicles • Basic left turn and basic right turn intersection
	Archerfield Road/existing access track	Local/local	Warkworth	• Localised intersection widening on Archerfield Road for passing vehicles and on the existing access track for turning vehicles
	Lemington Road/existing access track	Local/local	Ravensworth	• Localised intersection widening on the existing access track for 2-way vehicle movement
	Long Point Road East/existing access track	Local/local	Gouldsville	• A reduced temporary speed limit along Long Point Road East on approach to the intersection with the existing access track
	Pikes Gully Road/access road to the Pikes Gully Road construction support site	Local/local	Howick	• Localised intersection widening on the access road for turning vehicles • Road widening on Pikes Gully Road • A basic left turn and basic right turn intersection
	Lemington Road/new access track (opposite Old Lemington Road)	Local/local	Lemington	• Localised intersection widening on the access road for turning vehicles
	Lemington Road/Old Lemington Road	Local/local	Lemington	• Widening on Old Lemington Road for turning vehicles
	Gouldsville Road/access road to the Gouldsville Road construction support site	Local/local	Gouldsville	• Widening on the access road for turning vehicles • A basic left turn and basic right turn intersection • A reduced temporary speed limit would be required along Gouldsville Road on approach to the access road intersection

Local government area	Intersection	Road classification	Location	Treatments required
Cessnock	Wollombi Road/access roads to the Wollombi Road construction support site	State/local	Millfield	• Reconfigured lane layouts for new access tracks and intersections with Wollombi Road • Reduced temporary speed limit required along Wollombi Road on approach to the access roads intersection
	Wollombi Road/Mount View Road (Millfield)	Regional/local	Millfield	• Kerb adjustments at Mount View Road to widen for turning vehicles required
	Wollombi Road/Hayes Road	Regional/local	Millfield	• Widening, partial land acquisition and culvert extensions on Hayes Road is required
	Wollombi Road/new access track	Regional/local	Millfield	• Localised intersection widening and culvert extensions on the access track for turning vehicles • A basic left turn and basic right turn intersection • A reduced temporary speed limit would be required along Wollombi Road on approach to the intersection with the new access track
	McDonalds Road/Oakey Creek Road/Pokolbin Mountains Road	Local/local/local	Pokolbin	• Intersection requires widening for 2-way/2-lane heavy vehicle movements
Lake Macquarie	Freemans Drive/Martinsville Road	Local/local	Cooranbong	• Localised widening for turning vehicles • Auxiliary left turn and channelised right turn
	Martinsville Road/Watagan Road	Local/local	Martinsville	• Widening and land acquisition on Watagan Road for turning vehicles
	Watagan Forest Road/Martinsville Hill Road	Local/local	Martinsville	• A reduced temporary speed limit would be required along Martinsville Hill Road on approach to the Watagan Forest Road intersection

Local government area	Intersection	Road classification	Location	Treatments required
	Freemans Drive/Mount Faulk Road	Local/local	Cooranbong	• Upgrade to a basic left turn and channelised right turn intersection
	Freemans Drive/access road to the Freemans Drive construction support site	Local/local	Cooranbong	• Localised intersection widening on the access road for turning vehicles • A basic left turn and channelised right turn intersection • A reduced temporary speed limit would be required along Freemans Drive on approach to the access road intersection
	Freemans Drive/Mount Nellinda Road	Local/local	Cooranbong	• Upgrade to a basic left turn and channelised right turn intersection

Watercourse crossings

Several minor watercourse crossings may be required where an access track for vehicles, plant and equipment needs to cross a small creek or drainage line. Around 135 crossings of riparian corridors of minor and major watercourses would be required for the construction of new access tracks or upgrades to existing access tracks. This would include around 5 crossings of fourth order watercourses and higher. Access track crossings of watercourses would likely involve vegetation clearing, minor earthworks and installation of cross-drainage infrastructure such as culverts or pipes across flow paths where required.

Watercourse crossings would be designed, installed and maintained in accordance with relevant guidelines for watercourse crossings such as (but not limited to) *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI 2003) and *Managing Urban Stormwater: Soils and Construction - Volume 1*, 4th Edition (Landcom 2004).

Parking

Sufficient parking for light and heavy vehicles would be provided during construction of the HTP (see
Table 4.11).

Given the transient nature of the transmission line work, and potentially long distances required to travel, it is expected that workers would be transported by bus to and from work sites and the worker accommodation facilities at Hebden Road, Gouldsville Road and Freemans Drive.

Table 4.11 Indicative parking requirements during construction

Site	Light vehicle parking allowance (daily)	Heavy vehicle parking allowance (daily)
Hebden Road construction support site*	50	20
Bayswater South switching station laydown area	30	15
Pikes Gully Road construction support site	50	20
Gouldsville Road construction support site*	40	15
Wollombi Road construction support site	50	20
Freemans Drive construction support site*	60	30
Olney switching station laydown area	30	15

* Construction support site includes temporary worker accommodation.

4.3.6 Construction support sites

Five construction support sites (3 with temporary workers accommodation) would be established to support the construction of the HTP.

Hebden Road construction support site would be adjacent to Lake Liddell off Hebden Road and the New England Highway in the north of the project. It would be located on greenfield land currently zoned SP2 – Infrastructure associated with the Bayswater Power Station and would have a total area of around 11 hectares. Worker accommodation and helicopter/helipad facilities would be provided at this site (see Figure 4.2 (Map 1)).

Pikes Gully Road construction support site would be off Pikes Gully Road and the New England Highway southeast of Bayswater Power Station in the north of the project. It would be located on land currently zoned RU1 – Primary Production and would have a total area of around 10 hectares. Helicopter/helipad facilities would be provided at this site (see Figure 4.2 (Map 1)).

Gouldsville Road construction support site would be off Gouldsville Road and the Golden Highway to the east of the Mount Thorley Warkworth mining complex also in the north of the project. It would be located on land currently zoned RU1 – Primary Production and would have a total area of around 9 hectares. Worker accommodation and helicopter/helipad facilities would be provided at this site (see Figure 4.2 (Map 2)).

Wollombi Road (A and B) construction support site would be off Wollombi Road west of Millfield in the central part of the project. It would be located on land currently zoned RU1 – Primary Production and would have a total area of around 15 hectares (see Figure 4.2 (Map 3)). Wollombi Road A and B construction support sites would be separated by Wollombi Road, with Wollombi Road A construction support site to the north and Wollombi Road B construction support site to the south.

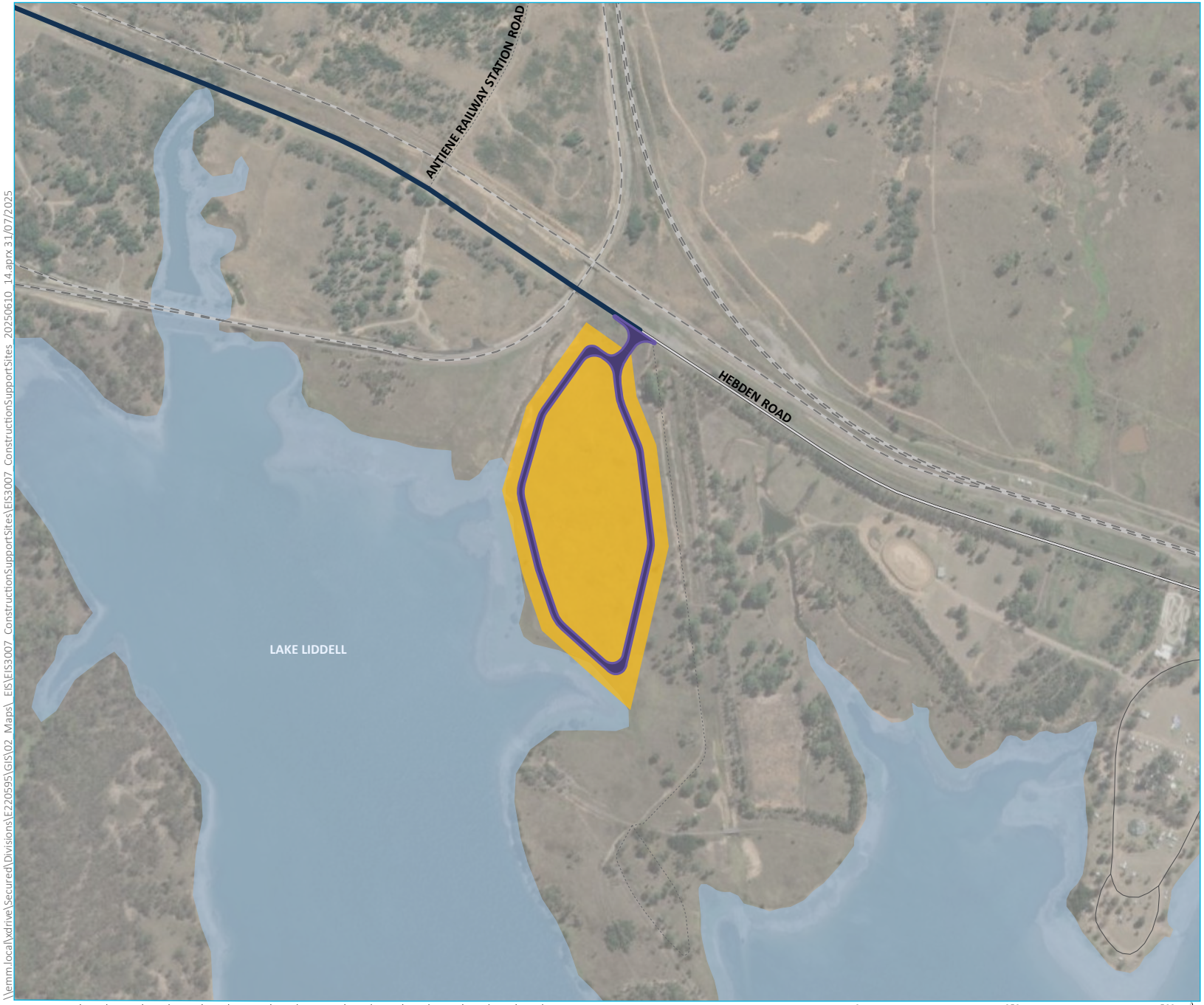
Freemans Drive construction support site would be off Freemans Drive northwest of Eraring Power Station in the south of the project. It would be located on land currently zoned RU2 – Rural Landscape and would have a total area of around 20 hectares. Worker accommodation and helicopter/helipad facilities would be provided at this site (see Figure 4.2 (Map 4)).

The construction support sites would indicatively include the following key components:

- material, plant/equipment, chemical/fuel and waste storage
- processing facilities (concrete batching, aggregate crushing, grinding and screening)
- maintenance facilities/workshops
- staff facilities (office, lunchroom and amenities)
- firefighting equipment
- helipad/helicopter facilities
- access and parking
- utilities
- potable water tanks
- wastewater treatment plant.

Asset protection zones (for bushfire protection) would be established around the construction support sites. The width of the asset protection zones would vary depending on bushfire risk at each site (see *Chapter 21 (Hazards and risk))* for further details on asset protection zone requirements for construction support sites).

The locations of the construction support sites are shown in Figure 4.1. Indicative layouts of the construction support sites are provided in Figure 4.15 through Figure 4.19.



KEY

- Construction traffic route
- Construction support site (includes APZ)
- Proposed access road

Existing environment

- Railway
- Major road
- Minor road
- Vehicular track
- Named waterbody

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

0 250 500 m

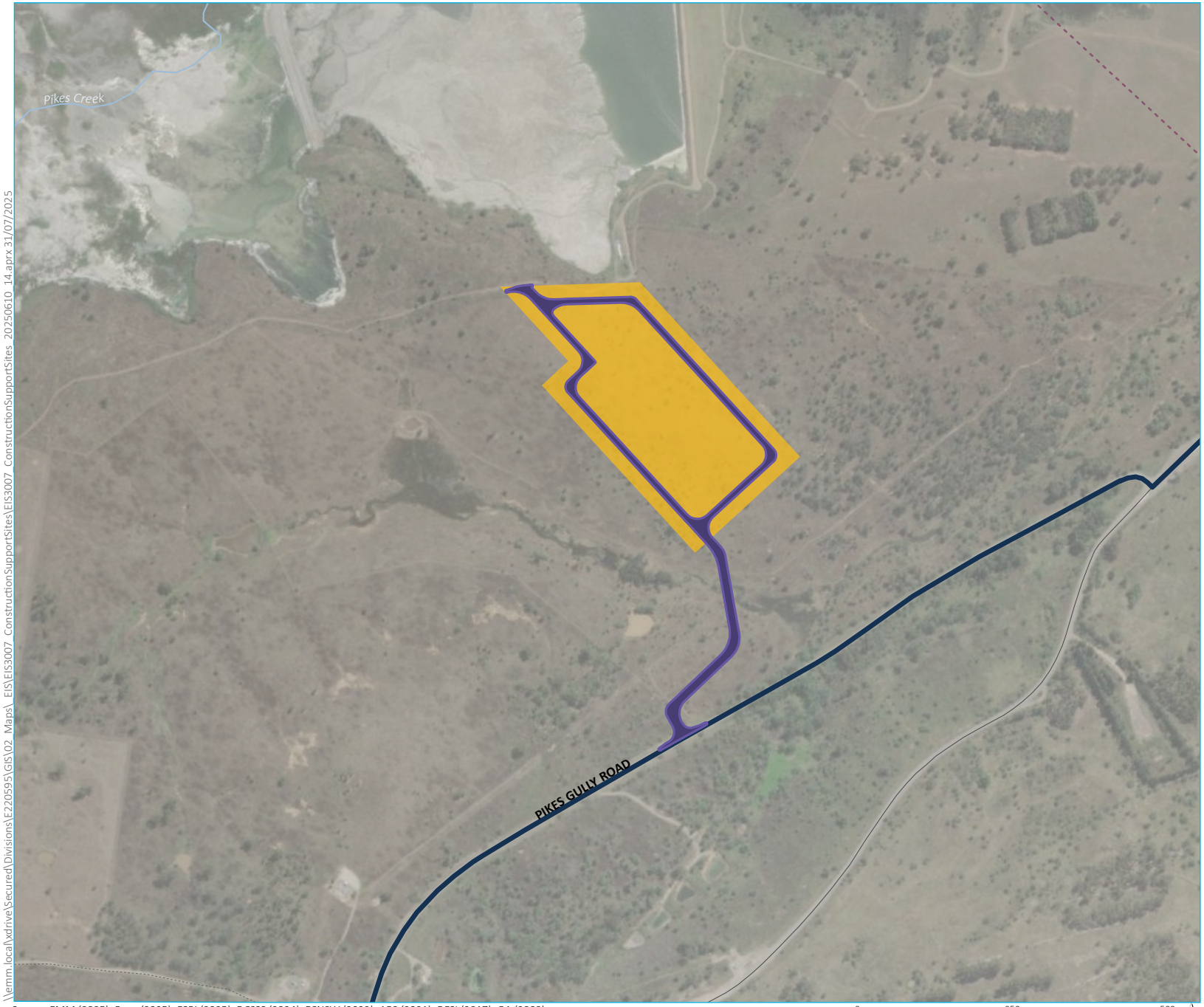
GDA2020 MGA Zone 56

N

Hebden Road
construction support site

Hunter Transmission Project
Environmental Impact Statement
Figure 4.15

EMM
creating opportunities



KEY

- Construction traffic route
- Construction support site (includes APZ)
- Proposed access road

Existing environment

- 330 kV transmission line
- Minor road
- Vehicular track
- Named watercourse

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

0 250 500 m

GDA2020 MGA Zone 56

N

Pikes Gully Road construction support site

Hunter Transmission Project
Environmental Impact Statement
Figure 4.16

EMM
creating opportunities

KEY

- Construction traffic route

Project impact area

- HTP corridor
- Construction support site (includes APZ)
- Proposed access road

Existing environment

- 330 kV transmission line
- Railway
- Named waterbody

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

0 250 500 m

GDA2020 MGA Zone 56

N

Gouldsville Road construction support site

Hunter Transmission Project
Environmental Impact Statement
Figure 4.17

EMM
creating opportunities

KEY

- Construction traffic route

Project impact area

- HTP corridor
- Construction support site (includes APZ)
- Proposed access road
- Named watercourse
- Named waterbody
- NPWS reserve

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

0 250 500 m

GDA2020 MGA Zone 56

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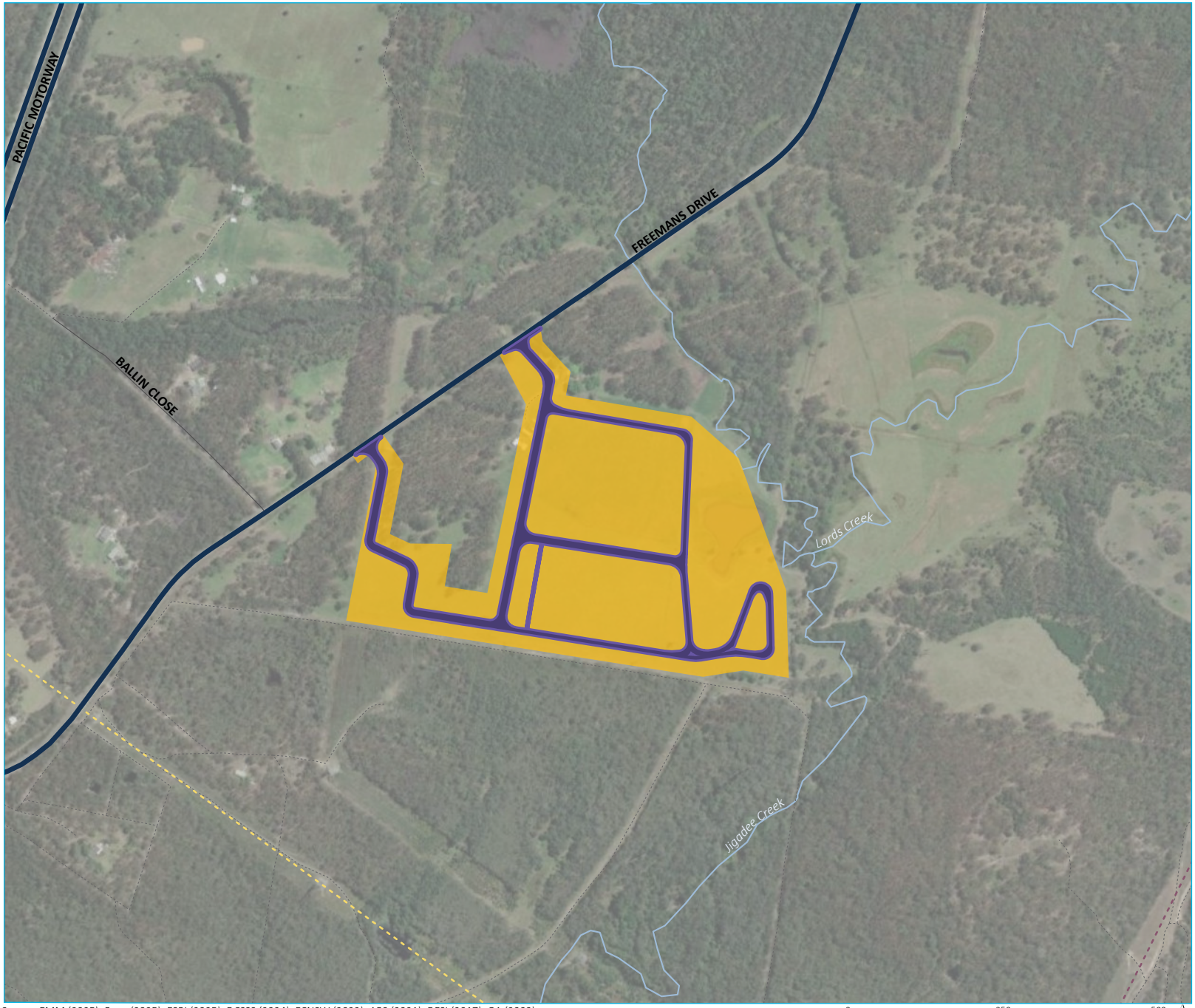
Wollombi Road construction support site

Hunter Transmission Project
Environmental Impact Statement
Figure 4.18

EMM
creating opportunities



KEY

- Construction traffic route
- Construction support site (includes APZ)
- Proposed access road

Existing environment

- 330 kV transmission line
- 500 kV transmission line
- Major road
- Minor road
- Vehicular track
- Named watercourse

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

0 250 500 m

GDA2020 MGA Zone 56

N

Freemans Drive construction support site

Hunter Transmission Project
Environmental Impact Statement
Figure 4.19

EMM
creating opportunities

4.3.7 Temporary worker accommodation

Temporary worker accommodation would be provided at the following construction support sites:

- Hebden Road – capacity for around 300 workers
- Gouldsville Road – capacity for around 180 workers
- Freemans Drive – capacity for around 300 workers.

The capacity allowance at each location is based on property lease areas, consultation with relevant landowners and management of other site constraints such as flooding and hazards/risks. Further feedback from relevant councils and construction specialists has been received and will be used to continue to refine the approach to temporary worker accommodation for the project.

The provision of temporary worker accommodation at these construction support sites would reduce the need for the main construction workforce to seek rental or short-term accommodation solutions in local areas with more constrained housing options, which has the potential to lead to higher rental prices in during the construction period. As such, temporary worker accommodation has been proposed to house the main construction workforce during peak construction periods. Some workers may be required to be housed in short-term accommodation locally prior to the establishment of temporary worker accommodation within construction support sites, however this is anticipated to be during pre-construction minor works and early works within the construction program and is not anticipated to lead to material impacts on local housing affordability or access. In addition, the project is committed to the inclusion of local construction workforce where possible so that a proportion of the total construction workforce would reside locally. Further details on temporary worker accommodation and potential impacts on the housing market are included in *Chapter 14 (Social)*.

The following additional facilities would be provided at construction support sites that have workers accommodation:

- utilities, including telecommunication services, electricity and water (including water treatment plant)
- demountable accommodation and office buildings
- workforce amenities, including food and catering, laundry, bathroom and first aid facilities
- generators.

The worker accommodation would be fully self-contained and would have sufficient capacity to cater for around 780 workers for the duration of the construction of the HTP.

4.3.8 Laydown areas

Laydown areas would be established to support construction activities and to minimise the need for vehicle movements to and from the larger construction support sites. They would generally be at the transition from more accessible to less accessible areas (for instance, at the tops of ridges and ends of long access routes in the State forests) and would be located both within and outside of the HTP corridor.

The laydown areas would act as temporary staging, storage, and complex plant/equipment setup areas. They would also act as traffic control nodes during construction.

The laydown areas would contain the following infrastructure (as needed):

- vehicle, equipment and materials storage
- chemical and fuel storage
- mobile concrete batching plants
- waste bins/storage
- maintenance sheds
- staff facilities (office and amenities)
- parking areas
- firefighting equipment
- generators and potable water tanks.

Most of the laydown areas would be within the HTP corridor. The location of laydown areas outside the HTP corridor are shown in Figure 4.2.

4.3.9 Property acquisition and easements

The HTP has been designed to avoid and minimise impacts on landowners and environmentally sensitive areas as far as possible and has prioritised the use of disturbed land like mining sites, and public land like State forests over private freehold lands. However, the acquisition of land, easements and licences from private landowners would be required for the following purposes:

- temporary construction support sites, temporary worker accommodation and laydown areas
- the operation of new switching stations and permanent access roads and tracks
- easements for transmission line infrastructure and associated access.

Property acquisition is currently underway across all sites between Bayswater and Eraring Power Stations. Personal managers have been appointed to offer landowners assistance and support throughout the acquisition process. All acquisitions of non-Commonwealth land would be conducted in consultation with the relevant landowners and in accordance with the NSW *Land Acquisition (Just Terms Compensation) Act 1991* (Land Acquisition Act), with a preference for acquisition through a negotiated agreement.

The HTP requires the temporary and permanent use of part of the Singleton Military Area which is Commonwealth-owned land. EnergyCo is negotiating an agreement with the Australian Government regarding the use of this land – including access during construction and the acquisition of permanent easements for transmission line infrastructure and associated access.

For transmission infrastructure located elsewhere in the HTP, EnergyCo would obtain a temporary construction lease, with permanent easements being acquired later subject to survey of the constructed works. The transmission line easement terms would set out how each party uses the land affected by the relevant easement. The terms would, among other things, allow ongoing access and maintenance of the transmission line to authorised entities. Landowners could continue to use the land within transmission line easements, subject to some restrictions for safety and operational reasons.

For the permanent access tracks within the transmission line easement, EnergyCo would obtain an access easement on the terms set out in Part 11 of schedule 4A of the NSW *Conveyancing Act 1919.* The new switching stations/substation upgrades would be situated on land where EnergyCo has carried out a partial freehold acquisition (due to the entire property not being required for permanent acquisition).

A summary of the property acquisition, easement and licence requirements for private landowners is included in Table 4.12. Additional detail about potential impacts of the project on property during construction and operation are included in *Chapter 12 (Land use and property)*.

Table 4.12 Private landowner property requirements

Property requirement	Number of affected private landowners/landholders
Full acquisition (freehold land), including for construction support sites	7
Permanent easement acquisitions for transmission lines, following temporary construction leases	12
Permanent easement acquisitions for access roads	2
Temporary construction leases for access road/track upgrades (greater than that required for operation)	14
Temporary construction leases for laydown areas	2
Lessee interests	3

4.3.10 Utility adjustments

Various other utilities would require adjustment to allow for the construction of the HTP. These include:

- gas lines owned by Ampol, Jemena and APA
- telecommunications lines owned by NBN/Telstra, Nextgen and TPG Telecom
- water lines owned by Hunter Water Corporation and Singleton Council
- sewer lines owned by Hunter Water Corporation
- stormwater lines owned by Centennial Coal, Cessnock City Council, Muswellbrook Shire Council and Singleton Council.

A schedule of utility adjustments is provided in *Appendix B (Schedule of utility adjustments and crossings)*.

Consultation with utility providers has been carried out throughout the development of the concept design for the project. This has included presentations to utility providers and councils on potential impacts to gas lines, telecommunications lines, water lines and sewage lines, including any proposed relocations of utilities to minimise potential impacts. Impacts to utilities would be further investigated during detailed design and consultation with utility providers and councils is ongoing.

Utilities would be relocated as required during construction of the project to avoid or minimise impacts from earthworks and other construction activities.

4.3.11 Emergency provisions

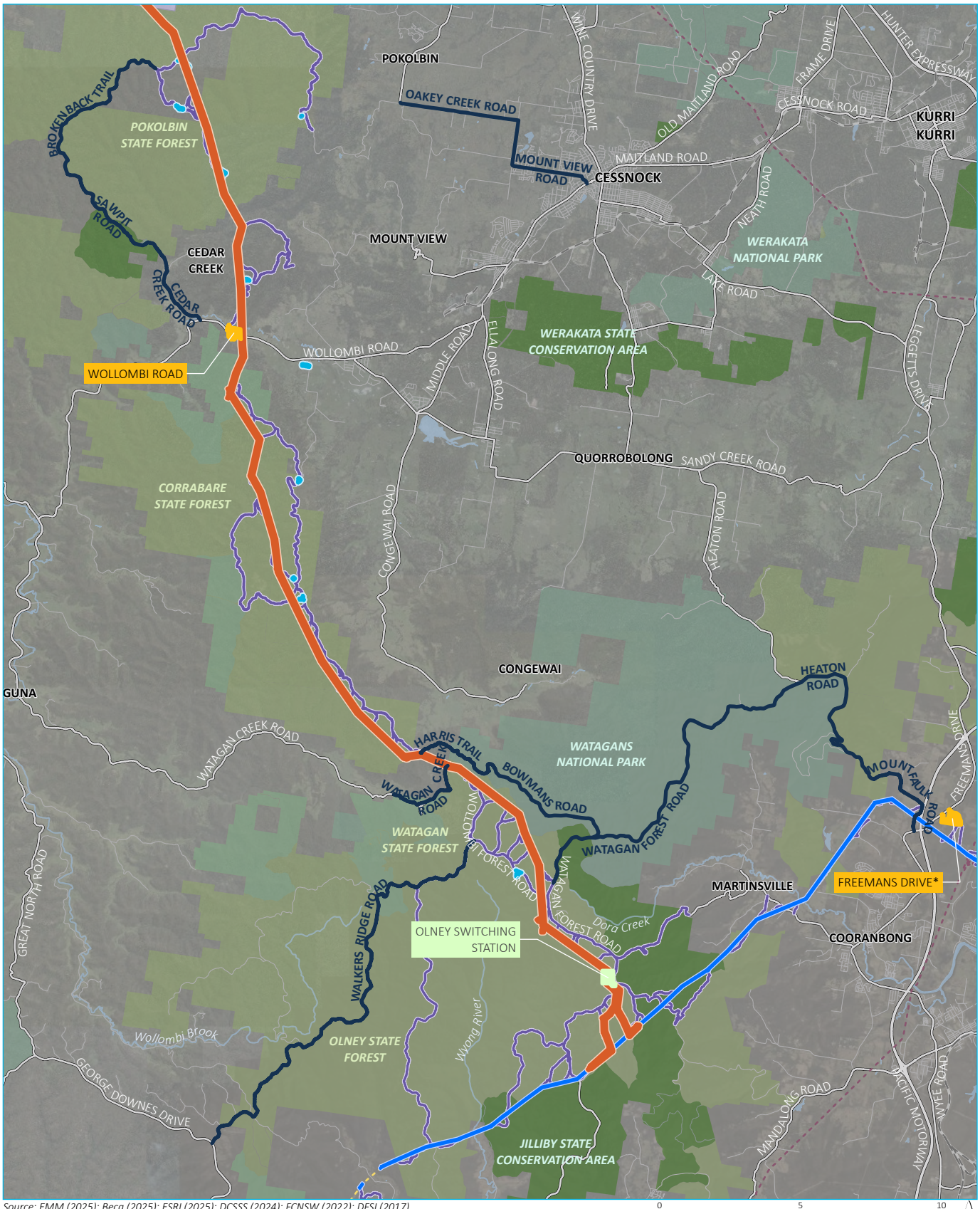
In the event of an emergency, construction workers would use emergency egress routes where evacuation is required and proposed construction access routes are unable to be used. Proposed emergency egress routes include but would not be limited to:

- Broken Back Trail, Sawpit Road, Cedar Creek Road
- Oakey Creek Road, Mount View Road
- Harris Trail, Bowmans Road, Watagan Forest Road, Heaton Road, Mount Faulk Road
- Watagan Creek Road
- Walkers Ridge Road
- Watagan Forest Road, Heaton Road, Mount Faulk Road.

Emergency egress routes are shown in Figure 4.20. These routes are concentrated in HTP Central and HTP South in State forest areas rather than in HTP North due to the presence of sufficient alternative routes to be used in the event of an emergency in the north of the project impact area.

In addition, emergency helipads would be provided at laydown areas on Wollombi Forest Road and Flick Road for helicopters to land in the event of an emergency.

These emergency egress routes and emergency helipad locations have been identified for the purposes of emergency scenario planning. As such, these do not form part of the project impact area or disturbance area and have not been assessed in the EIS (e.g. for traffic and transport, noise and vibration, etc.).



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

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KEY

- Emergency egress route

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
- Named watercourse
- Named waterbody
- State forest
- NPWS reserve
- State conservation area
- Defence
- Mining
- Major road
- Minor road

Emergency egress routes

Hunter Transmission Project
Environmental Impact Statement
Figure 4.20

EMM
creating opportunities

4.3.12 Construction and program

Construction

The potential phases of construction are described in Table 4.13 and Figure 4.21.

Table 4.13 Construction phases

Construction phase	Description
Pre-construction minor works (excludes activities otherwise permissible as Exempt Development)	Activities with a low potential to impact the environment may be permissible in advance of construction and without the requirement for an approved construction management plan. Pre-construction minor works may include: • clearing of vegetation in areas where biodiversity offsets would not be required • delivery of equipment to construction sites (excluding oversize equipment) • installation of certain mitigation measures (e.g. erosion and sediment controls, temporary exclusion fencing for sensitive areas, monitoring equipment) • preparation of existing access roads that require minimal work such as road grading and vegetation trimming • property surveys and the installation of property fencing and security gates as required.
Early works	Early works would include activities to be carried out following the approval of relevant management plans for the project. Construction of the transmission line would generally include early works such as vegetation clearing in the transmission corridor, at construction support sites and for access tracks and road upgrade works (once the biodiversity management plan is approved for the project – see *Chapter 8 (Biodiversity)*), site establishment works and erection of temporary facilities at construction support sites including worker accommodation facilities, and the delivery of oversize equipment to work sites. Construction of the new switching stations would generally include vegetation clearing at the switching station sites (once the biodiversity management plan is approved for the project – see *Chapter 8 (Biodiversity)*), and construction of new access to the sites.
Construction of Bayswater South and Olney switching stations and upgrades to Bayswater and Eraring substations	Switching station benches would be constructed first followed by equipment foundations, erection of equipment structures and equipment installation. Contractors may decide to commence work on both switching stations simultaneously or choose to stage this in line with the construction of the transmission line staging. Upgrades to Bayswater and Eraring substations would be co-ordinated with the power station operations and the transmission line construction staging. A construction staging plan for switching stations and substations construction would be prepared by the substation construction contractor which will detail how the construction activities will progress.

Construction phase	Description
Construction of the transmission line	Construction at each transmission line tower would be transient and intermittent. Construction activities would occur in a staged manner across the transmission corridor over the course of the construction program. For instance, following construction of the foundation, each transmission line tower would typically take one to 3 weeks to erect. However, the duration of construction activity at an individual transmission line tower, may vary for a number of reasons including (but not limited to): multiple work fronts, resource and engineering constraints, environmental constraints, landowner requirements, work sequencing, location, and inactive/respite periods. Within any given stage of transmission line construction, there would be multiple work fronts. For example, foundation works, or tower erection, would occur in several locations along the transmission line corridor at the same time. A construction staging plan for transmission line construction would be prepared by the transmission line construction contractor which will detail how the construction activities will progress.
Testing and commissioning	Testing the new infrastructure (transmission lines, adjusted transmission lines, switching stations and upgraded substations) would be undertaken to ensure system integrity. Testing would be undertaken after construction and prior to commissioning the project.

Construction program

Construction of the HTP is expected to start in late 2027 and commence operation by the end of 2029. It is anticipated that overall construction would take around 2.5 years, subject to weather conditions. An indicative program is shown in Figure 4.21. The construction program would continue to be refined throughout detailed design in consultation with the appointed construction contractors.

Construction program

Construction phases	Early 2027	Mid 2027	Late 2027	Early 2028	Mid 2028	Late 2028	Early 2029	Mid 2029	Late 2029
Pre-construction minor works	■	■							
Early works			■	■					
Transmission line construction				■	■	■	■	■	
Transmission line testing and commissioning									■
Substation/switching station construction				■	■	■	■	■	
Substation/switching station testing and commissioning									■

Figure 4.21 Indicative construction program

4.4 Resource requirements for construction

The resources and materials required for construction include workforce, plant and equipment, materials and water. Waste would also be produced during construction. These key inputs and outputs are outlined in Table 4.14.

Table 4.14 Key construction inputs and outputs

	Workforce Around 830 workers.
	Plant and equipment Such as dozers, excavators, graders, compactors, rollers, cranes, dump trucks, water carts, delivery trucks, stringing blocks and winches, concrete trucks, asphalt truck and sprayers, helicopters/stringing drones, mobile concrete batching plants, mulchers, spider excavators and dewatering equipment (among others).
	Materials Concrete and steel reinforcement for tower foundations, steel for the transmission towers and substation gantry, densely graded base and crushed rocks, conductors, insulators and cabling for the transmission line, electrical components for the substations, PVC conduits, metal fencing and gates, stormwater drainage materials, diesel and petrol, pre-fabricated buildings, general building materials and fire system materials.
	Water Around 1410 ML of non-potable and 170 ML of potable water for workers accommodation and construction activities such as concrete batching, dust suppression, vehicle washdown, earthworks and pavement compaction.
	Waste Such as green waste (mulch, timber, shrubs, grasses), spoil from excavations, concrete waste, steel and other metals, conductor, earthing and tower waste, pipe and conduit, electrical cabling, hazardous waste, transportation and packaging waste (plastic, paper, carboard, pallets, cable drums), general domestic waste (food waste, paper, plastic and glass), and wastewater.

4.4.1 Workforce

Workforce numbers would vary depending on the phase of construction and associated activities. During peak construction activities, it is expected that up to 830 full-time equivalent people would be employed to construct the HTP. An overview of the anticipated workforce for key construction activities is provided in Table 4.15.

Depending on skills and availability, the construction workforce may be sourced locally, regionally, interstate or from overseas, if required. It is envisaged that most workers, not local to the area would be housed in the temporary worker accommodation provided within the construction support sites.

Table 4.15 Anticipated construction workforce

Construction activity	Anticipated construction workforce (estimate)
Staff[1]	220
Civil (i.e. earthworks)*	210
Tower erection	200
Transmission line	120
Switching stations and substations	80

1: Includes workforce for transmission line and substations/switching stations

4.4.2 Plant and equipment

During construction the following plant and equipment would likely be required:

- dozers
- scrapers
- excavators (various sizes)
- spider excavators
- hydraulic hammers
- graders
- dump trucks
- elevated work platforms
- cranes (various sizes)
- compactors
- rollers
- water carts
- chainsaws
- tub grinder/mulchers
- drum mulchers
- pavement laying machines
- stringing blocks and winches
- asphalt truck and sprayers
- concrete trucks
- smooth drum rollers
- generators
- power tools
- delivery trucks
- mobile concrete batching plant
- helicopters/stringing drones
- dewatering equipment.

4.4.3 Materials

The estimated quantity and indicative sources of the materials required to construct the HTP is provided in Table 4.16.

Volumes of fuels that would be used during construction include:

- around 6.6 million litres of diesel and 357,000 litres of petrol in construction equipment
- around 8000 litres of diesel and 33,000 litres of petrol in construction vehicles.

Table 4.16 Estimated quantity and source of materials used for construction

Construction materials required	Estimated quantities	Potential source
Transmission line		
Reinforcement	9000 tonnes	Newcastle and Sydney
Concrete	97,000 cubic metres	Hunter Region
Steelwork	18,000 tonnes	Overseas via Port of Newcastle
Conductors	42,500 tonnes	Overseas via Port of Newcastle
Quarry products	1,250,000 cubic metres	Hunter Region
Timber	4000 tonnes	Hunter Region
Bayswater South switching station		
Quarry products	39,000 cubic metres	Hunter Region
Concrete	8500 cubic metres	Hunter Region
Steelwork	1103 tonnes	Overseas via Port of Newcastle
Spray seal - bituminous materials	2000 square metres	Newcastle
Olney switching station		
Quarry products	24,000 cubic metres	Hunter Region
Concrete	7200 cubic metres	Hunter Region
Steelwork	935 tonnes	Overseas via Port of Newcastle
Spray seal - bituminous materials	1600 square metres	Newcastle
Construction support sites		
Quarry products	445 000 cubic metres	Hunter Region
Concrete	850 cubic metres	Hunter Region
Spray seal - bituminous materials	13,300 square metres	Newcastle

4.4.4 Water

Water requirements

It is estimated that a total of around 1580 megalitres of water would be required for the construction of the HTP. This includes 170 megalitres of potable water that would be required for amenities at the construction support sites and temporary worker accommodation facilities, as well as for concrete batching activities. Non-potable water sources would be prioritised for the remaining 1410 megalitres of water demand for construction activities.

A summary of the required water volumes and estimated water demand for key construction activities is provided in Table 4.17.

Table 4.17 Construction water estimates

Construction activity	Annual water demand (ML/year)	Total water demand (ML)
Non-potable water		
Dust suppression of roads and exposed areas	600	1200
Road and access track construction	60	120
Landscaping of revegetated areas	5	10
Construction support sites	5	10
Earthworks (wetting of backfill to allow for effective compaction)	35	70
Total non-potable water	705	1410
Potable water		
Accommodation facilities (within construction support sites)	60	120
Concrete batching	10	20
Construction support sites	15	30
Total potable water	85	170
Total water requirements (construction)	790	1580

Water supply

As noted above, the use of non-potable water is preferred over potable water, however this is dependent on the location and nature of the activity using the water as well as the quantity and quality of available water at the time.

The sourcing of water would be according to the following hierarchy, where feasible and reasonable, and where water quality and volume requirements are met:

- rainwater harvesting (non-potable water)
- reuse of construction water, treated wastewater and/or groundwater inflows, where practicable (non-potable water)
- recycled water from existing wastewater treatment plants (non-potable water)
- extraction of water from surface water and/or groundwater, including:
  - surface water sources via existing licences. EnergyCo is currently in negotiations to acquire 2 properties which contain existing water access licences (WALs) for surface water extraction. The entitlements from these 2 WALs (19171 and 19175) combined allow

for 67 megalitres per year surface water (50 megalitres per year from WAL 19171 and 17 megalitres per year from WAL 19175) from Congewai Creek in the Upper Wollombi Brook Water Source, Mid Congewai Creek Management Zone

- regulated surface water sources (non-potable water) from the Hunter River (within the Hunter Regulated River Water Source) and unregulated sources (non-potable water) from Congewai Creek (Upper Wollombi Brook Water Source)
- groundwater via existing licensed groundwater bores. It is understood that there is about 5500 megalitres per year of entitlements that may be available from existing active, non-mining licensed groundwater bores within 5 kilometres of the project impact area. The use of groundwater via existing groundwater bores would be subject to negotiations between the construction contractor (once appointed) and the licensee holder(s)

- reuse of treated mine water, if practicable (non-potable water). The potential use of treated mine water would be investigated during detailed design
- existing regulated and unregulated surface water sources (potable water). Potable water would be sourced from Council owned potable water supplies and/or from Hunter Water.

A combination of these water sources would be required to meet the total potable and non-potable water demand for the project. The feasibility of each of these water sources would be confirmed as part of detailed design and construction planning for the HTP so that there is sufficient water supply for the duration of the project. Notwithstanding this, the water volume requirements for construction would be met by the abovementioned potential water sources. A summary of the potential water supply sources for construction of the project is provided in Table 4.18.

Collectively, the range of options identified demonstrates a potential water supply that is more than project water requirements. Further investigation into the feasibility of each of the water sources and preferred options would be undertaken during detailed design and construction planning, in consultation with local councils, water utility companies, licence holders and mine operators.

The preferred sources of construction water and the method of construction water storage would be confirmed prior to the start of construction. Water would be transported from water sources, water suppliers and/or groundwater extraction points via tanker truck and used immediately within the project impact area and/or stored in storage tanks within construction support sites. Traffic volumes associated with the transport of water have been considered and form part of the traffic impact assessment provided in *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport impact assessment*.

Further information regarding water supply is provided in *Chapter 17 (Surface water)* and *Technical Report 10 - Surface water impact assessment* as well as *Chapter 18 (Groundwater)* and *Technical Report 11 – Groundwater impact assessment*.

Table 4.18 Summary of potential water supply options

Water supply option	Water type	Indicative water use	Indicative supply volume (per year)	Connection type
Reuse of construction water, treated wastewater and/or groundwater inflows, where practicable	Non-potable	Dust suppression, road construction, landscaping, earthworks	Small volumes, opportunistic supply	New
Recycled water: • Cooranbong water centre (Altogether group) • Dora Creek Wastewater Treatment Works (Hunter Water) • Paxton Wastewater Treatment Works (Hunter Water) • Singleton Sewage Treatment Plant (Singleton Council)	Non-potable	Dust suppression, road construction, landscaping, earthworks	Between around 240 ML/yr and 12,000 ML/yr, limited by treatment capacity and existing uses	Existing
Groundwater supply from existing bores, in negotiation with the current license holders of these entitlements	Non-potable	Dust suppression, road construction, landscaping, earthworks	5500 ML[1]	Existing
Surface water extraction from Congewai Creek, via existing WALs owned by EnergyCo (WAL 19171 and WAL 19175)	Non-potable	Dust suppression, road construction, landscaping, earthworks	67 ML	Existing

Water supply option	Water type	Indicative water use	Indicative supply volume (per year)	Connection type
Surface water extraction from new connection locations: • Congewai Creek • Hunter River Surface water extraction from existing locations: • Plashett Reservoir (owned and operated by AGL Macquarie) • Lake Liddell (owned and operated by AGL Macquarie) • Hunter River via the Mount Thorley Joint Venture water supply scheme (operated by Singleton Council)	Non-potable	Dust suppression, road construction, landscaping, earthworks	>2000 ML/yr, depending on water availability and licensing arrangements	Existing and/or new dependent upon watercourse
Mine water reuse from nearby operating coal mines (Hunter Valley Operations, Bulga Coal, Mount Thorley Warkworth and Mandalong Mine)	Non-potable	Dust suppression, road construction, landscaping, earthworks	Unknown	Existing
Hunter Water and Singleton Council reticulated water systems	Potable	Workforce accommodation, concrete batching, amenities and site offices	As needed	New
Hunter Water and Singleton Council standpipes	Potable	Workforce accommodation, concrete batching, amenities and site offices	As needed	Existing

1: indicative volumes based on existing active, non-mining related groundwater bores within 5 kilometres of the project impact area

4.4.5 Waste

The estimated quantity of waste generated during construction of the HTP is provided in Table 4.19.

Waste generated during construction would be managed through standard waste management procedures documented in a waste management plan.

The waste management plan would identify, quantify and classify the waste streams likely to be generated during construction of the project. It would also describe the measures to be implemented to reduce waste generation and manage, reuse, recycle and safely dispose of waste during construction of the HTP.

Table 4.19 Estimated quantity of waste generated during construction

Waste stream	Estimated quantity
Green waste, including timber, shrubs, grasses, leaves and weeds	3600 cubic metres
Spoil from excavations that is unsuitable for reuse	450,000 cubic metres
Concrete waste	14,000 tonnes
Asphalt, road base, concrete and gravel	Less than 150 tonnes
Vehicle/plant maintenance materials, including empty oil and other containers/drums; lubricants, waste oils, fuels, coolant, radiator fluid, hydraulic fluid; drained oil filters; electrical waste, including batteries and cables; and tyres	18 tonnes
Steel and other metals	6,750 tonnes
Timber used in forming of foundations or piles	400 tonnes
Conductor, earthing and tower waste materials, pipe and conduit, and electrical cabling	2,125 tonnes
Hazardous waste and/or contaminated waste	50 tonnes
Transportation and packaging waste, including plastic, paper, cardboard, pallets, fumigated timber cable drums	Less than 300 tonnes
General domestic waste, including food waste, paper, cardboard, plastic and glass	60 tonnes
Wastewater, including concrete washouts and sewage	70 megalitres

4.4.6 Construction hours

Project standard hours of work

Construction of the project would generally be carried out during recommended standard hours as defined by the *Interim Construction Noise Guideline* (NSW Department of Environment and Climate Change (DECC) 2009)) (ICNG):

- Monday to Friday between 7:00 am and 6:00 pm
- Saturday between 8:00 am and 1:00 pm
- no work on Sundays or public holidays.

Worker accommodation facilities would be operational 24 hours per day, 7 days per week, however this will be for occupancy rather than associated with any construction related activities on site.

Out of hours work

If there are no sensitive receivers that would be impacted by the construction work in a given location, and in agreement with affected stakeholders, the construction hours could be extended beyond standard hours. Examples of this could be construction work in the vicinity of the existing Bayswater and Eraring power stations, the mining complexes and in the certain parts of the State forests. Extended work hours would increase construction productivity and therefore reduce the overall duration of the construction of the HTP. Areas where these extended construction hours could potentially be implemented based on the distance of construction works from sensitive receivers are outlined further in *Chapter 16 (Noise and vibration)* and *Technical Report 8 – Noise and vibration impact assessment*.

Where sensitive receivers are noise affected during extended construction hours (that is, where construction noise is above the noise management level (see *Chapter 16 (Noise and vibration)*), and the works cannot be undertaken during standard work hours, mitigation measures would be implemented through an out of hours work protocol.

Some activities may be required outside of the project standard hours of work for safety, technical or public infrastructure operational reasons (e.g. to minimise utility or traffic disruptions).

Work outside the project standard hours of work may include (but not be limited to):

- transmission line construction at crossings of a main road or railway
- work where a road occupancy licence (or similar) is required, depending on licence conditions
- transmission line cutover and commissioning
- the delivery of equipment or materials outside standard hours requested by police or other authorities for safety reasons due to their size such as the delivery of transformer and reactor units, utility relocations
- connection of the new assets to existing assets under outage conditions
- emergency work to avoid the loss of lives and/or property and/or to prevent environmental harm
- work timed to correlate with system planning outages
- situations where agreement is reached with affected sensitive receivers

- activities that do not generate noise that exceeds the applicable noise management level at any sensitive receiver.

During detailed design and further construction planning, a program would be determined to identify the required night work periods (including dates and durations).

Except for emergencies, construction work would be carried out in accordance with an out-of-hours work protocol and would not take place without prior notification to stakeholders in accordance with the protocol, which would be documented within a noise and vibration management plan and traffic management plan.

4.5 Operation and maintenance of the asset

This section provides an overview of the operation and maintenance activities required for the project, including maintenance of the new transmission line, adjusted and upgraded transmission lines, switching stations and substations, and access roads and tracks.

4.5.1 New transmission line maintenance

Regular maintenance activities would be required for the transmission line during operation. Maintenance activities would include:

- managing vegetation in and around the transmission line easement to protect the transmission line from hazard trees and bushfire (see Figure 4.22)
- regularly inspecting the transmission line and towers (via ground and air)
- undertaking fault and emergency response (unplanned maintenance) should an unplanned outage occur (for example through a weather event or other failure of infrastructure)
- fixing, replacing or upgrading components of the transmission line to extend its life.

Operation of the transmission line would occur in a permanent easement 70 metres wide.

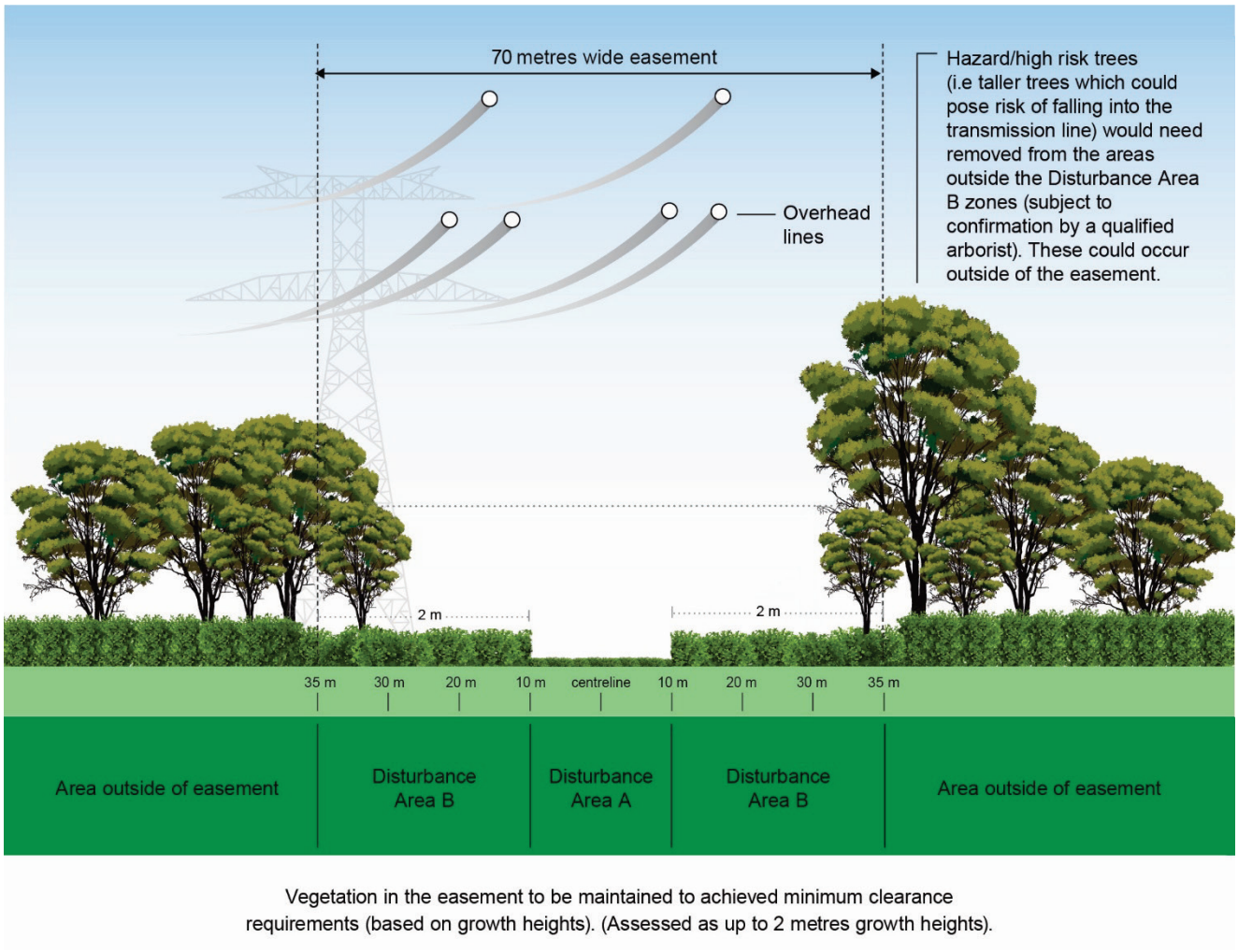


Figure 4-22 Indicative vegetation clearance and management within operational easement (WSP 2025)

Refinement during detailed design and construction planning may allow for some increase in vegetation height and vegetation retention to occur if vegetation clearances of 13.5 metres to the conductors are achievable.

4.5.2 New switching stations and upgraded existing substations maintenance

Regular maintenance activities would be required at the new switching stations during operation. Likely maintenance activities would include:

- maintaining vegetation around the perimeter of the switching station (the asset protection zone) to protect the switching station from bushfire
- regularly testing and servicing the electrical equipment and battery systems
- undertaking fault and emergency response (unplanned maintenance) should an unplanned outage occur
- fixing, replacing or upgrading components of the switching station to extend its life.

Maintenance activities would continue at the upgraded substations in line with the current maintenance program undertaken at the Bayswater substation and Eraring substation sites.

4.5.3 Adjusted and upgraded existing transmission lines maintenance

Regular maintenance activities would continue to be required for the adjusted/upgraded transmission lines during operation and in line with their existing maintenance activities undertaken by Transgrid, and existing distribution lines by Ausgrid and Hunter Valley Operations.

Operation of the adjusted/upgraded transmission lines would occur in an easement of up to 70 metres wide for the 330 kV adjusted/upgraded transmission lines and 70 metres wide for the 500 kV adjusted/upgraded transmission lines in accordance with existing maintenance regimes, with the exception of minor localised widening of the existing easement for tie-in works near the Bayswater South and Olney switching stations.

4.5.4 Access

Access to the transmission line easement and switching stations during operation would be via existing public and private roads and access tracks, and new access tracks established as part of the project during construction (see Figure 4.10 and Figure 4.14). Priority has been given to the use and upgrade of existing access tracks over the creation of new access tracks, where possible.

Ongoing use of the upgraded tracks and new tracks during operation would be required for asset maintenance activities. These general asset maintenance activities can predominantly be undertaken with light vehicle access within the easement. Repairs and upgrade works would require access for larger vehicles. The use of formed access tracks may not be required to all transmission towers. Some of the upgraded tracks and new tracks that are not required for operation would be restored with groundcover following construction. The final extent of reinstatement is uncertain given that some landowners may wish to retain access tracks which are not required for asset maintenance.

Routine vegetation maintenance would be required along permanent access tracks during operation. This would involve clearing of vegetation on the track, track sides (for mobile plant and the like), and/or trimming of trees that pose fall-in risk to the access track corridor that would prevent safe vehicle passage.

Access tracks would be left in a suitable condition in consultation with landowner. In some cases, access easements may be required to allow operational access to the transmission line easement from the nearest public road. These access easements would be negotiated with landowners as necessary.

Access track maintenance would be carried out as required during operation and based on ongoing use, track upgrades would be undertaken to allow for operation and maintenance activities within the transmission line easement and at switching stations and substations to be continued.

During operation, the public road network would be used where required for routine maintenance. The switching stations and transmission lines would be inspected by the network operator's operational staff and contractors on a regular basis, with other operational activities occurring in the event of an emergency.

Parking

Parking for a limited number of maintenance and operational light and heavy vehicles would be provided at the new Bayswater South and Olney switching stations. For transmission line maintenance, parking would be possible within the transmission line easement.

4.5.5 Land requirements for operation and maintenance

Property acquisition would be carried out prior to construction, with permanent acquisitions remaining in place throughout operation for the transmission line easement and switching stations.

Land permanently acquired for the transmission line easement would provide a right of access for network operator staff and contractors to maintain and operate the transmission line and other operational assets. The easement also generally identifies the zone of ongoing vegetation management to ensure safe electrical clearances during the operation of the transmission lines. Vegetation management beyond the easement may also occur where nearby hazard trees have the potential to fall and breach safety clearances, as is discussed in *section 4.5.1*.

As is outlined in *section 4.3.9*, permanent partial property acquisition would be required for the Bayswater South and Olney switching stations to allow for the operation and maintenance of the switching stations by network operator staff and contractors.

4.6 Decommissioning and rehabilitation

Prior to the completion of construction, temporary areas used to support the construction of the project, such as construction support sites (including temporary worker accommodation) and laydown areas, would be decommissioned and rehabilitated as required. As outlined in *Chapter 12 (Land use and property)*, pre-condition assessments of the construction impact area would be undertaken to determine the existing condition of assets, infrastructure, utilities and the general condition of the land. This would inform requirements for rehabilitation within property management plans established with landowners.

Following construction, the life of the project is anticipated to be around 50 years and potentially beyond this with regular maintenance and upgrades. If required, decommissioning and rehabilitation would occur over 2 years.

Upon closure, the transmission line, transmission towers and switching stations would be removed and disturbed areas would be rehabilitated to pre-existing land use or other condition, in consultation with relevant stakeholders. In addition, new access tracks would, in consultation with relevant stakeholders, either be retained for their continued use or be decommissioned and disturbed areas rehabilitated to the pre-existing land use or other condition.

A detailed decommissioning and rehabilitation plan would be prepared prior to decommissioning of the HTP if and when required.

Statutory context

5

5 Statutory context

This chapter outlines the statutory context for the Hunter Transmission Project (HTP, 'the project') and explains the relevant environmental impact statement (EIS) and planning approval process. This chapter also outlines the environmental planning instruments applicable to the project. Further detail regarding the statutory context and compliance of the project is provided in *Appendix C (Statutory compliance)*.

5.1 Overview

The HTP was declared to be critical State significant infrastructure (CSSI) under section 5.13 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act) in July 2022 by the NSW Minister for Planning and Public Spaces. The HTP is listed in schedule 5, section 30 of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP) and is subject to assessment and approval by the NSW Minister for Planning and Public Spaces in accordance with Division 5.2 of the EP&A Act.

The HTP is also a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and requires approval from the Australian Minister for the Environment and Water (EPBC 2024/09874). In determining that the project is a controlled action, the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) advised that the HTP will be assessed in accordance with the NSW Assessment Bilateral Agreement under Part 9 of the EPBC Act.

The NSW Department of Planning, Housing and Infrastructure (DPHI), in accordance with the NSW Assessment Bilateral Agreement between NSW and the Australian governments, will co-ordinate the detailed assessment of the impacts of the HTP under both the EP&A Act and EPBC Act in a single, integrated approvals process.

5.2 NSW approval

5.2.1 Permissibility

Permissibility of the HTP is established under section 2.44 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP). Per section 2.44, development for the purpose of an electricity transmission or distribution network to be carried out by, or on behalf of, an electricity supply authority or public authority may be carried out without consent on any land. However, development may not be carried out on land reserved under the NSW *National Parks and Wildlife Act 1974* (NPW Act) without consent unless the development is authorised under the Act or is carried out on land to which an easement has been granted.

Around 90 hectares of the project impact area is reserved under the NPW Act, including the Jilliby State Conservation Area and the Corrabare North Flora Reserve. The Energy Corporation of New South Wales (EnergyCo) has begun discussions with the NSW National Parks and Wildlife Service concerning the creation of an easement for the HTP within Jilliby State Conservation Area and the Corrabare North Flora Reserve.

EnergyCo is identified as a public authority per section 1.4(1) of the EP&A Act. As such, the HTP is permissible without consent pursuant to section 2.44 of the Transport and Infrastructure SEPP, as it is defined as an electricity transmission or distribution network and would be carried out by or on behalf of a public authority, subject to securing an easement in accordance with section 153 of the NPW Act prior to any determination by the NSW Minister for Planning and Public Spaces under the EP&A Act.

Permissibility is also established under section 2.15(c) of the Planning Systems SEPP which provides for the declaration of CSSI. As the HTP is listed in schedule 5, section 30 of the Planning Systems SEPP, the project is permissible without consent.

The applicable planning approvals process for the HTP is summarised in Figure 5.1.

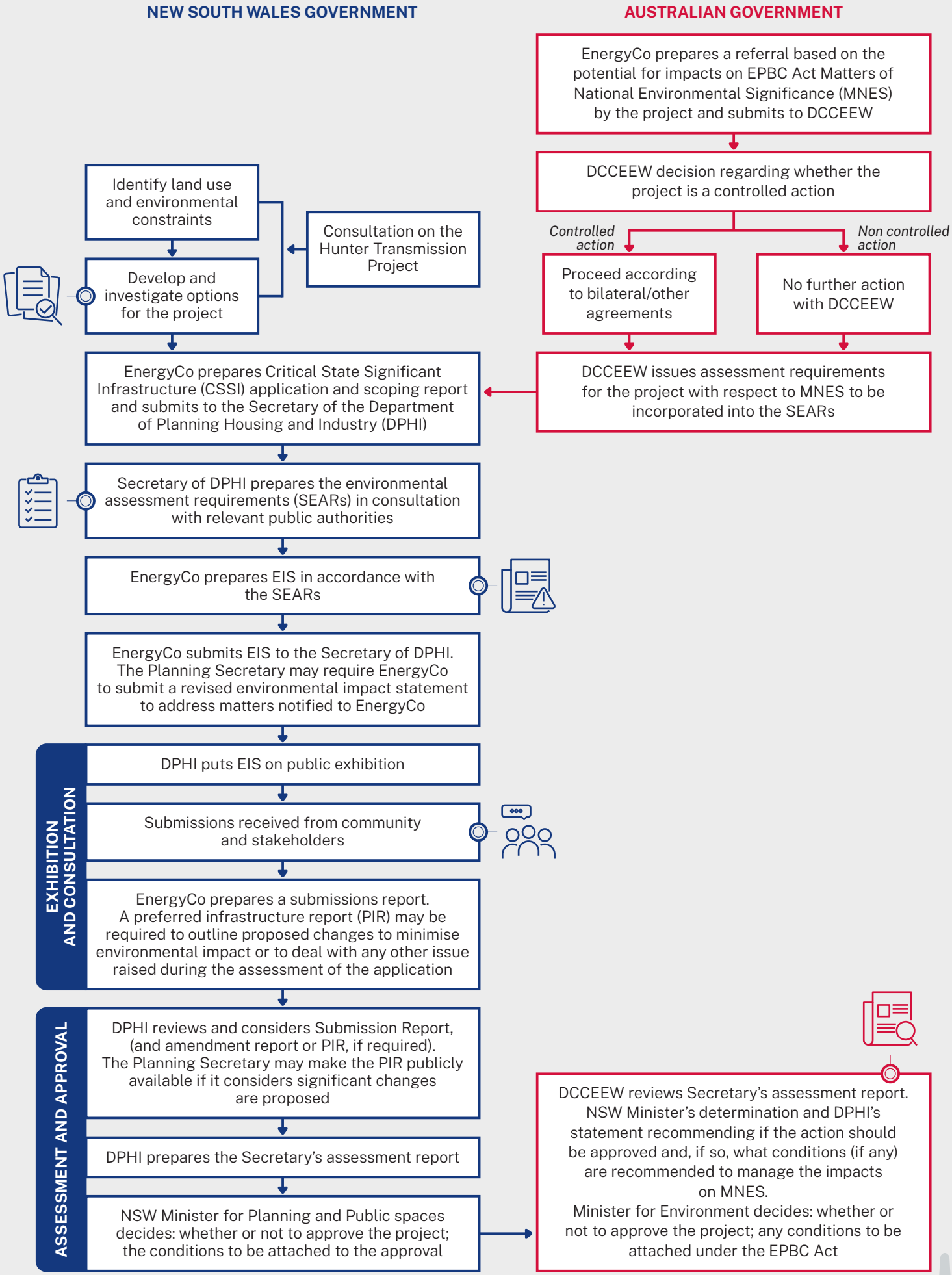


Figure 5.1 Assessment and approval process for the project

5.2.2 Other approvals

Approvals not required

Per section 5.23 of the EP&A Act, certain approvals are not required to be separately obtained for CSSI as they are integrated into the assessment and approval process. These approvals include the following:

- a permit under section 201, 205 or 219 of the NSW *Fisheries Management Act 1994*
- an approval under Part 4 or an excavation permit under section 139 of the NSW *Heritage Act 1977*
- an Aboriginal heritage impact permit under section 90 of the NPW Act
- a bushfire safety authority under section 100B of the NSW *Rural Fires Act 1997*
- a water use approval under section 89, a water management work approval under section 90, or an activity approval (other than an aquifer interference approval) under section 91 of the NSW *Water Management Act 2000*.

Consistent approvals

Under section 5.24 of the EP&A Act, certain approvals for the HTP cannot be refused if they are necessary for carrying out the project and are substantially consistent with the CSSI approval. These include:

- an aquaculture permit under section 144 of the NSW *Fisheries Management Act 1994*
- approval under section 22 of the NSW Coal Mine Subsidence Compensation Act 2017
- consent under section 138 of the NSW *Roads Act 1993*
- an environment protection licence (EPL) under Chapter 3 of the *Protection of the Environment Operations Act 1997* (POEO Act).

Of the above, the following approvals are relevant to the HTP:

- section 22 approval under the NSW *Coal Mine Subsidence Compensation Act 2017* for parts of the project located within the Patrick Plains Subsidence District and West Lakes Mine Subsidence District. Mine subsidence issues are addressed in *Chapter 12 (Land use and property)*
- section 138 consent under the NSW *Roads Act 1993* for works required to public roads
- possibly an EPL under Chapter 3 of the POEO Act for helicopter movements during construction.

Other relevant approvals

Other relevant approvals that may apply to the HTP which are not expressly integrated into the CSSI approval process are outlined in Table 5.1.

Table 5.1 Other relevant NSW legislation

Legislation	Applicability to the project	Where addressed in EIS
NSW *Aboriginal Land Rights Act 1983*	The purpose of the NSW *Aboriginal Land Rights Act 1983* includes providing land rights for Aboriginal persons and Aboriginal Land Councils in NSW. The project impact area includes land within 5 local Aboriginal land councils (LALCs), including: • Biraban LALC • Darkinjung LALC • Awabakal LALC • Mindaribba LALC • Wanaruah LALC. Under this Act, LALCs can claim Crown land. If the claim is determined in favour of the LALC, the relevant land is transferred as freehold title to the LALC. 'Claimable Crown lands' includes Crown lands that are not lawfully used or occupied and that are not needed, nor likely to be needed, for an essential public purpose.	Crown Land and Aboriginal land rights claims are further discussed in *Chapter 12 (Land use and property)*
NSW *Biodiversity Conservation Act 2016*	The NSW *Biodiversity Conservation Act 2016* (BC Act) aims to conserve threatened species, populations and ecological communities through ensuring appropriate assessment, management and regulation of actions that may damage critical or other habitat for a listed threatened species, or may otherwise significantly affect a threatened species, population or ecological community. Under the BC Act, CSSI projects are required to prepare a biodiversity development assessment report (BDAR) to identify and assess biodiversity impacts under the provisions of the BC Act and offset those impacts using the NSW Biodiversity Assessment Method (BAM).	Biodiversity impacts, including relevant EPBC Act provisions, associated with the project have been assessed in accordance with the BC Act and the BAM. The results of the BDAR for the project are summarised in *Chapter 8 (Biodiversity)*

Legislation	Applicability to the project	Where addressed in EIS
NSW *Biosecurity Act 2015*	The NSW *Biosecurity Act 2015* (Biosecurity Act) provides for the prevention, elimination, minimisation and management of biosecurity risks in NSW posed by a biosecurity matter, which is defined in section 10 of the Biosecurity Act. Under the Biosecurity Act, weeds are defined as a plant that is a pest, and a biosecurity risk exists where invasive weeds, now termed priority weeds under the Biosecurity Act, have the potential to negatively impact on the environment. Under section 22 of the Biosecurity Act, EnergyCo has a general duty to prevent, eliminate and minimise any risks posed by any biosecurity matter encountered during the carrying out of the project.	Consideration of biosecurity matters is included in *Chapter 8 (Biodiversity)*
NSW *Contaminated Land Management Act 1997*	The NSW *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 (EPA) to respond to and manage site contamination when it considers that contamination is significant enough to require regulation. 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. The EPA holds records of sites that have been notified under section 60 of the CLM Act or otherwise reported to the EPA.	EPA notified sites and an assessment of the potential contamination impacts of the project are included in *Chapter 20 (Soils and contamination)*
NSW *Crown Land Management Act 2016*	The NSW *Crown Land Management Act 2016* sets out the requirements for the management of Crown land in NSW and provides a decision-making framework for the use of Crown land in the State. The project impact area includes around 40 ha of Crown land mostly between the Pacific Motorway and the Eraring Power Station. The project impact area also includes Crown roads and Crown watercourses (including the Hunter River, Congewai Creek and Wollombi Brook).	Impacts to Crown Land and associated mitigation measures are included in *Chapter 12 (Land use and property)*

Legislation	Applicability to the project	Where addressed in EIS
NSW *Electricity Infrastructure Investment Act 2020*	The objectives of the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) include the need to co-ordinate investment in new generation, storage, network and related infrastructure. It establishes a process under which the NSW Minister for Energy can declare a geographical area of the State a renewable energy zone (REZ) and can specify the generation, storage or network infrastructure that will be implemented in that zone. It also provides for the declaration of a project as a priority transmission infrastructure project (PTIP). The HTP has been declared to be a PTIP. Under section 32 and 36 of the EII Act, the Minister for Energy may direct or authorise a network operator to carry out the project as a PTIP: • after consulting with various parties, including the Minister for Planning and Public Spaces • considering various matters under section 34 of the EII Act, including views of the local community, land use planning, and environmental and heritage matters • being satisfied that the project is an appropriate response to a target breach identified in an Energy Security Target Monitor and is in the public interest. Under section 38 of the EII Act, the Australian Energy Regulator will calculate the prudent, efficient, and reasonable costs of delivering the project and determine the amount payable to the network operator. This process runs in parallel with the environmental approvals process under the EP&A Act.	The EII Act is discussed further in *Chapter 2 (Strategic context)* Consultation activities carried out for the project are outlined in *Chapter 6 (Engagement)*

Legislation	Applicability to the project	Where addressed in EIS
Electricity Supply (Safety and Network Management) Regulation 2014	Under clause 5 of the Electricity Supply (Safety and Network Management) Regulation 2014, the network operator of the project must take all reasonable steps to ensure the design, construction, commissioning and decommissioning of the project is safe. This includes taking steps to support the: • safety of members of the public • safety of persons working on networks • protection of property (whether or not belonging to a network operator) • management of safety risks arising from the protection of the environment (e.g. preventing bushfires that may be ignited by network assets) • management of safety risks arising from loss of electricity supply. The network operator must have a detailed safety management system in place to deal with these matters that complies with Australian Standard AS 5577-2013 Electricity Network Safety Management Systems. The Independent Pricing and Regulatory Tribunal oversees the implementation of these statutory obligations.	Safety has been considered throughout the design development for the project and would be critical throughout the construction and operation of the project. Safety considerations would be incorporated into environmental management strategy outlined in *Chapter 24 (Environmental management)*
NSW *Fisheries Management Act 1994*	The NSW *Fisheries Management Act 1994* (FM Act) provides for the identification, conservation and recovery of threatened fish, aquatic invertebrates and marine vegetation. One of the key objectives of the FM Act is to conserve fish stocks and key fish habitats. Part 7 of the FM Act establishes that a permit is generally required to dredge, reclaim, obstruct fish passage, harm marine vegetation, or use explosives or electrical devices in a watercourse that is classified as key fish habitat. However, as CSSI, the project is exempt from the need to obtain permits under sections 201, 205 and 219 of the FM Act.	Potential impacts to aquatic biodiversity have been assessed in *Chapter 8 (Biodiversity)*

Legislation	Applicability to the project	Where addressed in EIS
NSW *Forestry Act 2012*	The NSW *Forestry Act 2012* (Forestry Act) provides for the management and use of State forests and other Crown-timber land for forestry and other uses. The Forestry Act establishes the Forestry Corporation of New South Wales (FCNSW) as a statutory State-owned corporation who is the land manager of State forests. The project impact area would cross 4 areas of land reserved under the Forestry Act being the Pokolbin State Forest, Corrabare State Forest, Watagan State Forest and Olney State Forest. Certain rights to occupy land that is State forest or a flora reserve may not be granted except as provided for in the Forestry Act. FCNSW is empowered to lease State forest land or issue a permit under section 59 facilitating the construction and operation of renewable energy infrastructure. Section 34(1) of the Forestry Act also provides that the Minister may, on such terms and conditions as the Minister thinks fit, grant an easement or right of way through or over land within a State forest or flora reserve. This section would empower the Minister administering the Forestry Act to exercise a discretion to grant an easement though these forests. Under the Forestry Regulation 2022, the FCNSW can also reserve a forestry area for separate or exclusive use for specific purposes and for specified periods. A licence under the Forestry Act may be required to authorise the taking or destruction of timber, forest materials or forest products within the State Forest land. Ongoing engagement with FCNSW will continue through detailed design of the HTP.	Impacts on State forest land are discussed in *Chapter 12 (Land use and property)*, and a discussion of the economic impacts of the project on State forest land is included in *Chapter 22 (Other matters)*
NSW *Heritage Act 1977*	The NSW *Heritage Act 1977* specifies that a person must not disturb or excavate land knowing, or suspecting, that the action may result in the discovery, exposure, movement, damage or destruction of a relic, unless the work is undertaken in accordance with an excavation permit. Additionally, the Act requires that the discovery or location of a relic must be notified to the Heritage Council unless the Heritage Council is aware of the relic's location. As is outlined above, under the CSSI provisions for the project, exemptions and permits that would otherwise be required under Part 4 and section 139 of the NSW *Heritage Act 1977* are not required for approved SSI projects per section 5.23 of the EP&A Act. Heritage impacts associated with the project have been assessed in accordance with the *Heritage Act 1977*.	Impacts to historic heritage as a result of the project are discussed in *Chapter 15 (Historic heritage)*

Legislation	Applicability to the project	Where addressed in EIS
NSW *Land Acquisition (Just Terms Compensation) Act 1991*	The NSW *Land Acquisition (Just Terms Compensation) Act 1991* (Land Acquisition Act) controls the acquisition of land on just terms by authorities of the State. The objectives of the Land Acquisition Act include simplifying and expediting the compulsory acquisition process while ensuring compensation on just terms for the owners of land that is acquired by an authority of the State when the land is not available for public sale. EnergyCo is an authority of the State for the purposes of the Land Acquisition Act and can acquire land by agreement or compulsory processes for the purposes of the *Energy and Utilities Administration Act 1987* or any other act administered by the Minister for Energy. To deliver the project, EnergyCo would need to: • secure temporary easements for construction • secure permanent easements for operation • acquire land for new infrastructure, such as the new Bayswater South and Olney switching stations • lease land for ancillary construction infrastructure • secure access to easements. Wherever possible, EnergyCo will try to reach a suitable agreement with landowners. However, in some cases EnergyCo may need to acquire land under the Land Acquisition Act.	Further discussion of potential land acquisition associated with the project is included in *Chapter 14 (Project description)* and *Chapter 12 (Land use and property)*

Legislation	Applicability to the project	Where addressed in EIS
NSW *National Parks and Wildlife Act 1974*	The NSW *National Park and Wildlife Act 1974* (NPW Act) establishes statutory provisions for the preservation and management of National Parks, historic sites and certain other areas, as well as the protection of certain Aboriginal objects. The NPW Act provides for the conservation of elements of the natural environment, as well as the conservation of objects, places or features of cultural value to Aboriginal people and the people of NSW. Under the provisions of section 86 of the NPW Act, a person must not harm or desecrate a known Aboriginal object unless authorised by an Aboriginal Heritage Impact Permit (AHIP) issued under section 90 of the NPW Act. As is outlined above, under section 5.23 of the EP&A Act, a permit that would otherwise be required under section 90 of the NPW Act is not required for approved SSI projects. Nevertheless, a detailed assessment of potential impacts to Aboriginal heritage associated with the project has been undertaken. Under the provisions of section 153 of the NPW Act, the Minister administering the NPW Act (the NSW Minister for Environment and Heritage) has the power to grant an easement through a State conservation area for the 'erection of standards, posts, wires and appliances for the conveyance or transmission of electricity'. This is relevant where the project is located within the Jilliby State Conservation Area.	A detailed assessment of the potential impacts of the project on Aboriginal heritage is provided in *Chapter 9 (Aboriginal heritage)*, and a discussion of the potential impacts of the project on land managed under the NPW Act is included in *Chapter 12 (Land use and property)* Consultation that has been carried out to date with NSW National Parks and Wildlife Service is detailed in *Chapter 6 (Engagement)*
NSW *Native Title Act 1994*	The NSW *Native Title Act 1994* provides for the recognition of native title in relation to land or waters in NSW in accordance with the Commonwealth *Native Title Act 1993*. The Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010a) stipulates that where relevant; consultation must be conducted with native title holders or registered native title claimants in accordance with the NSW *Native Title Act 1994*.	Native title is considered in *Chapter 12 (Land use and property)*, while the potential impacts of the project on Aboriginal cultural heritage are discussed in *Chapter 9 (Aboriginal heritage)* Consultation carried out with Aboriginal stakeholders is outlined in *Chapter 6 (Engagement)* and *Chapter 9 (Aboriginal heritage)*

Legislation	Applicability to the project	Where addressed in EIS
NSW *Pipelines Act 1967*	High pressure pipelines are designed, constructed, tested, operated and maintained in accordance with Australian Standard AS 2885 and licenced under the NSW *Pipelines Act 1967*. In line with section 2.77 of the Transport and Infrastructure SEPP, the potential impacts of the project on pipelines have been assessed. These considerations have included: • undertaking an initial identification assessment using Before You Dig Australia (BYDA) requirement. Additional, detailed BYDA checks would be undertaken as part of detailed design • operator consultation – consultation with the relevant pipeline operator has begun.	Consideration of impacts to pipeline infrastructure in included in *Chapter 12 (Land use and property)*
Rail Safety National Law (NSW) No 82a of 2012	The principal object of the Rail Safety National Law (NSW) No 82a of 2012 of relevance to the project is the regulation of various activities within railway corridors. The project would cross a rail corridor in one location; this would primarily involve stringing activities. As part of the ongoing refinement of the project construction methodology, the proponent and the contractor would consult with the relevant rail authority where rail crossings are required.	Consideration of the potential impacts of the project on transport infrastructure, including rail corridors, is included in *Chapter 11 (Traffic and transport)*
NSW *Waste Avoidance and Resource Recovery Act 2001*	The NSW *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) aims to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development. During construction and operation, the project would consume some natural resources and would produce waste.	Waste impacts associated with the construction and operation of the project are included in *Chapter 22 (Other matters)*

Legislation	Applicability to the project	Where addressed in EIS
NSW *Water Management Act 2000*	The overarching objective of the NSW *Water Management Act 2000* (WM Act) is to provide for the sustainable and integrated management of the water resources of the State, including the application of the principles of ecologically sustainable development. As outlined above, under section 5.23 of the EP&A Act, a water use approval pursuant to section 89 of the WM Act, a water management work approval pursuant to section 90 of the WM Act, and an activity approval (other than an aquifer interference approval) pursuant to section 91 of the WM Act are not required and do not apply to approved SSI projects. Nevertheless, the potential impacts of the project on surface water, groundwater and flooding have been assessed as part of this EIS.	The potential impacts of the project on surface water are included in *Chapter 17 (Surface water)* and the potential impacts of the project on groundwater are included in *Chapter 18 (Groundwater)*. The potential impacts to the project from flooding and potential changes in existing flooding regimes resulting from the project are included in *Chapter 19 (Flooding)*

5.2.3 Environmental planning instruments

Section 5.22 of the EP&A Act provides that environmental planning instruments (EPIs), such as Local Environmental Plans (LEPs) and certain State Environmental Planning Policy (SEPPs), do not apply to CSSI projects.

Notwithstanding, as a matter of good practice and for completeness in addressing environmental impacts, the following key EPIs have been considered as required in this EIS:

- State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP)
- State Environmental Planning Policy (Primary Production) 2021 (Primary Production SEPP)
- State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)
- State Environmental Planning Policy (Resources and Energy) 2021 (Resources and Energy SEPP)
- Muswellbrook Local Environmental Plan 2009
- Singleton Local Environmental Plan 2013
- Cessnock Local Environmental Plan 2011
- Central Coast Local Environmental Plan 2022
- Lake Macquarie Local Environmental Plan 2014.

5.3 Commonwealth approvals

The HTP has been declared a controlled action (EPBC 2024/09874) and as such requires assessment and approval under the EPBC Act. The relevant controlling provisions are for listed threatened species and communities, and Commonwealth land. The project will be assessed under the NSW Assessment Bilateral Agreement, which enables the project to be assessed by NSW on behalf of the Australian Government.

DPHI issued Supplementary Planning Secretary's environmental approval requirements (SEARs) on 14 March 2025 to include the Minister's requirements under the NSW Assessment Bilateral Agreement. This EIS has been prepared to address these requirements (see *Appendix A (Assessment requirements)*).

Listed threatened species and communities include the Central Hunter Valley Eucalypt Forest and Woodland, Warkworth Sands Woodland, Slaty Red Gum, Singleton Mint Bush, Scrub Turpentine, Native Guava, Brush-tailed Rock-wallaby, Regent Honeyeater, Swift Parrot, Koala and Littlejohn's Tree Frog, which are matters of national environmental significance the project has the potential to significantly impact.

Around 13 kilometres of the HTP transmission line traverses Singleton Military Area which is Commonwealth land owned by the Department of Defence. Assessment of Commonwealth land impacts are addressed in relevant technical assessments. Additionally, EnergyCo has completed the

site selection process with the Department of Defence to agree on the transmission line route through Singleton Military Area.

The Australian Government has endorsed the NSW Biodiversity Offsets Scheme which includes the BAM biodiversity credit system and offset rules as set out in the Biodiversity Conservation Regulation 2017 (NSW), enabling the project to meet its offset obligations through the one scheme.

Engagement

6

6 Engagement

This chapter outlines how the Energy Corporation of New South Wales (EnergyCo) has engaged with community and stakeholders prior to and during the preparation of the Hunter Transmission Project's (HTP, 'the project') environmental impact statement (EIS). It describes the activities that were completed, the feedback received, how that feedback has been incorporated into the EIS and how EnergyCo plans to engage during subsequent stages of the HTP. Importantly, it demonstrates that EnergyCo has delivered a robust, transparent and adaptive EIS engagement program consistent with Department of Planning, Housing, and Infrastructure (DPHI) guidelines, Planning Secretary's environmental assessment requirements (SEARs) and the project's Communications and Engagement Plan (CEP).

6.1 Engagement approach

The HTP was declared critical State significant infrastructure (CSSI) in 2022 under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Since that time, EnergyCo has undertaken a comprehensive program of engagement with community members, impacted and neighbouring landowners, Cessnock, Lake Macquarie, Muswellbrook, Singleton and Central Coast councils, businesses, and other key stakeholders including community groups, Aboriginal parties, exploration licence holders, quarry operators, mineral title holders and relevant State and Australian Government authorities to inform project development.

EnergyCo's HTP EIS engagement program was developed to meet the suite of legislative and policy requirements for large-scale transmission projects in NSW:

- **SEARs** - Statutory consultation obligations required by DPHI for CSSI
- ***Undertaking Engagement Guidelines for State Significant Projects*** **(DPHI 2024)** - Best-practice principles covering timing, methods and reporting of community input
- **EP&A Act** - The overarching statutory framework for environmental assessment
- **NSW *Electricity Infrastructure Investment Act 2020* (EII Act)** - Explicitly embeds engagement in the Act's goals by requiring proponents to 'foster local community support for investment' (s 3(1)(d)) and, for Parts 4-6 projects, to 'promote consultation and negotiation with the traditional Aboriginal owners of land' (s 3(2)(b)) - both of which underpin the HTP's stakeholder-engagement activities
- **NSW Premier's Department *Regional Communities Consultation Guide* (2025)** - Provides clear principles for respectful, inclusive, place-based engagement with regional communities affected by energy infrastructure projects. The HTP program has been aligned with this emerging guidance to further strengthen community outcomes

- **sector-wide and regulator-led guidance** - Including stakeholder-engagement approaches published by the Australian Energy Regulator (AER) and Australian Energy Market Operator (AEMO), which were used to benchmark our program against national best practice.

Building on the early engagement work when HTP was launched in 2022, the EIS engagement program has evolved with each phase of the project. At each key milestone (corridor refinement, technical studies, draft EIS), tailored communications and feedback loops ensured landowners, Cessnock, Muswellbrook, Lake Macquarie, Singleton and Central Coast Councils, Registered Aboriginal Parties (RAPs) and government agencies including the NSW Rural Fire Service (RFS), NSW Environment Protection Authority (EPA), NSW Department of Climate Change, Energy and the Environment and Water (DCCEEW) and other relevant authorities could meaningfully participate and shape project outcomes.

The HTP corridor was divided into 3 geographic zones: North, Central and South. These zones were developed based on local land use, community profile, environmental context, and the nature of potential project impacts.

The engagement process involved early identification of and consultation with affected stakeholders, proximity-based analysis of community concerns, and clear documentation of how feedback informed project planning and impact mitigation. This approach has seen involvement throughout the community and provided valuable feedback that has helped to refine and shape the HTP.

6.1.1 Engagement principles and objectives

EnergyCo developed guiding principles for the HTP. These set the scene for early engagement and continue to govern the way interactions have been undertaken with the community and stakeholders during the environmental impact assessment process for the project.

The engagement approach was underpinned by the following principles:

- respectful and inclusive engagement that recognised different community needs
- proportionality - focusing effort based on likely project impacts and levels of community interest
- transparency about what could and could not be influenced
- multiple pathways for participation (digital, face-to-face, written).

The engagement for the EIS has been guided by the objectives developed for the HTP. These engagement objectives are to:

- keep stakeholders informed – provide accurate, timely and clear information about the project, keep stakeholders informed of project progress
- create opportunities for engagement – ensure affected landowners and community members can interact with the project team, ask questions, and provide feedback to help refine the project
- make engagement proportionate – tailor engagement efforts to reflect the project's potential impacts and the level of community interest, ensuring efforts are focused where they matter most

- ensure engagement is effective – facilitate meaningful participation by providing clear, accessible information and demonstrating how feedback has influenced project outcomes - offer multiple platforms and tools for stakeholders to share their feedback
- be clear about influence – clearly communicate which aspects of the project are open to community input and which are not.

6.1.2 Phases of engagement

The engagement program for the project consists of 3 key phases aimed at ensuring meaningful engagement throughout the planning, assessment and delivery stages of the HTP (see Figure 6.1).

Phase 1 was to raise awareness and seek early input. Phase 2 is to support the preparation of the EIS and public exhibition. Phase 3 will support future communications and engagement that would be undertaken pending approval of the HTP.

This chapter focuses on Phase 2 – the engagement undertaken to support the preparation of the EIS.

Figure 6-1 Phases of engagement

6.2 Key stakeholders

Key stakeholders consulted during project development and in support of the EIS are listed in Table 6.1. They include key interest groups such as RAPs, Native Title holders, Cessnock, Lake Macquarie, Muswellbrook, Singleton and Central Coast councils, Australian government agencies including DCCEEW, Department of Defence, Civil Aviation Safety Authority (CASA), Australian Rail Track Corporation (ARTC), NSW government agencies including DPHI, DCCEEW, National Parks and Wildlife Service (NPWS), Forestry Corporation of NSW (FCNSW), Transport for NSW (TfNSW), RFS, EPA, Crown Lands, NSW Department of Primary Industries (DPI), environmental groups including Hunter Wildlife Rescue and Hunter Bird Observers, businesses, exploration licence holders, mineral title holders and regional and State-wide stakeholders including Nature Conservation Council of NSW, Birdlife Australia and Australian Energy Council.

Additional stakeholders consulted for the HTP are identified in *Appendix D (Community engagement outcomes)*.

The engagement requirements identified in the SEARs are listed in Table 6.1.

Table 6.1 Engagement SEARs

Stakeholders identified in the SEARs	Outcomes summarised in
Transport for NSW and ARTC	Table 6.10
Relevant local government	Table 6.11
Relevant State government	Table 6.10
Relevant Commonwealth government	Table 6.10
Service providers/network operators	Table 6.12
Community groups	Table 6.6
Affected landowners	Table 6.4
Native title holders	*Chapter 12 (Land use and Property)*
Exploration licence holders	*Chapter 12 (Land use and Property)*
Quarry operators	Table 6.8
Mineral title holders.	Table 6.8

The outcomes of consultation with stakeholders, including those identified in the SEARs is provided in Table 6.4 to Table 6.13. How EnergyCo has engaged with stakeholders including those identified in the SEARs is outlined in Table 6.2.

Table 6.2 Key stakeholders

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Affected landowners (SEARs identified)				
Directly impacted landowners in the HTP corridor	Local <5 km	High	• Easement and land acquisition • Compensation • Land-use impacts • Visual, biodiversity, noise and vibration, traffic/access impacts • Bushfire and hazards • Construction impacts • Community and employment benefits	• Dedicated Place and Property Managers • Landowner letters and notifications • Face-to-face meetings and small group sessions • Fact sheets, FAQs, maps, newsletters • Property access agreements • Website and interactive corridor map
Mining, industrial and government land: • Yancoal, Glencore, Centennial; Origin, AGL, FCNSW • Exploration licence holders, quarry operators and mineral title holders	Local <5 km	High	• Easement and land acquisition • Compensation • Land-use impacts • Impacts to operations	• Dedicated Place and Property Managers • Landowner letters and notifications • Meetings/briefings/ workshops • Property access agreements

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Landowners just outside easement (neighbours, access-road residents)	Local <5 km	High	• Visual impacts • Noise and vibration • Traffic and access impacts • Construction impacts • Community and employment benefits	• Near neighbour campaign ongoing (visual, noise) • Information stalls in nearby towns • Direct mailouts, letters and emails • Webinars on EIS topics and management measures • Fact sheets, FAQs, maps, newsletters • Website and interactive map • Briefings as requested
Aboriginal stakeholders (SEARs identified)				
Wanaruah, Mindaribba, Awabakal, Biraban, Darkinjung Local Aboriginal Land Councils (LALCs), RAPs, Knowledge holders and Elders, Aboriginal stakeholders and organisations, Aboriginal businesses	5–100 km	High	• Cultural-heritage impacts and protocols • Biodiversity stewardship • Employment and business opportunities • Ranger and training programs	• Dedicated Aboriginal Engagement Officer • Cultural-mapping workshops and site walk overs • Aboriginal focus group meetings • Letters, emails, webinars, fact sheets, FAQs, newsletters • Website and interactive map

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Local community (<5 km)				
Residents of Singleton, Mount Thorley, Broke, Cessnock, Millfield, Laguna, Cooranbong, Martinsville, Morisset		Low – Medium	• Visual, biodiversity, noise and vibration impacts • Traffic and access impacts • Bushfire and other hazards • Community and employment benefits	• Information stalls at community events • Monthly e-newsletter • Advertising campaigns • Direct mailouts, letters and emails • Webinars on EIS topics and management measures • Fact sheets, FAQs, maps, newsletters • Website and interactive map • Briefings as requested
Environmental groups (SEARs identified)				
Experts in aquatic and terrestrial ecosystems, water quality and fish habitat conservation experts, Birdlife Australia, Community Environment Network, Congewai Valley Landcare, Hunter Community, Environment Centre, EcoNetwork Port Stephens, Central West Environment Council, Hunter Environment Lobby, Hunter Bird Observers Club, Hunter Wildlife Rescue, Nature Conservation Council of NSW, Sydney Basin Koala Network	5–100 km	Medium	• Biodiversity and habitat corridors • Fauna rescue provisions/protocols • Potential impacts to environmental values and recreational use within nature reserves (NPWS) and State Forests	• Targeted webinars • Specialist briefings • Joint field surveys

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Broader Hunter Region				
Hunter Region stakeholders – residents, businesses, community LGAs of Maitland, Port Stephens, Newcastle, Upper Hunter	5–100 km	Low	• Wider construction-stage impacts on people and environment • Community and employment benefits • Accommodation for project construction workforce and impacts to short term housing supply	• Regional event stalls (renewables conferences) • Advertising campaigns • Monthly e-newsletters • Webinars on EIS topics and management measures • Fact sheets, FAQs, maps, newsletters • Website and interactive map
NSW community				
Citizens beyond Hunter Region	>100 km	Low	• Broad environmental and social impacts • NSW energy transition	• Monthly e-newsletters • Webinars on EIS topics and management measures • Fact sheets, FAQs, maps, newsletters • Website and interactive map

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Regional Reference Group				
Independent Chair Mayors of Singleton, Cessnock, Muswellbrook and Lake Macquarie; local community representatives from Singleton, Cessnock, Lake Macquarie and Newcastle LGAs, a business, environment and Aboriginal representative	5–100 km	Medium	• Project-wide impacts, regional employment and education benefits, opportunities for Hunter industry and businesses • Co-ordination with other related EnergyCo projects such as HCC REZ, Port to REZ and New England REZ • Construction traffic, support sites and temporary workforce accommodation	• Quarterly in-person/online meetings (secretariat by EnergyCo) • Extraordinary meetings as required (secretariat by EnergyCo) • Presentations by landowners and interest groups • Fact sheets, FAQs, maps, newsletters • Website updates

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Community and interest groups (SEARs identified)				
Peak environment bodies **Recreational user groups (bushwalkers, mountain-bikers, 4WD, horse riders)** **Business and tourism associations** 4WD Clubs – Maitland and District 4WD Club, Port Hunter 4x4 Club, Hunter Region 4WD Council, Australian Climbing Association Newcastle and Central Coast, Broke Residents Community Association, Cooranbong Community Services Centre, Historical societies – Cessnock District Historical & Family History Society, Muswellbrook Shire Local & Family History Society Inc, Singleton Historical Society and Museum Inc, Hunter Valley Gliding Club, Horse riders - Hunter Valley Horse Riders Club, Lake Macquarie Pack and Trail Horse Riders, Morpeth Horse Riders Club, Hunter Mountain Bike Association, Mulbring Community Forum, Pokolbin Mountains Road Residents, Landholders and Users, Rotary Club of Morisset, Walking clubs – Lake Macquarie Bushwalkers, Newcastle Bushwalking Club, Wollombi Progress Association, Wollombi Valley Community Association, Wollombi Valley Tourism.	5–100 km	Medium	• Environmental and land-use impacts • Tourism and recreational amenity • Business and investment opportunities • Job opportunities	• Fact sheets, FAQs, maps, newsletters • Website and interactive map • Targeted workshops and site tours • Presence at industry and community events • Webinars on EIS topics and management measures • Briefings as required

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Community - other				
Unions, jobs advocates, major industry (Port of Newcastle)	Regional 5–100 km Statewide >100 km	Low	• Transparency of project impacts • Worker conditions • Local employment targets • Operational impacts and safety, transport and logistics integration	• Meetings / briefings • Union-advocate roundtables • Private briefings and technical workshops
Elected representatives – corridor				
Federal: Member for Hunter **NSW:** Members for Upper Hunter, Cessnock, Lake Macquarie, Wyong	5–100 km	Medium - high	• Corridor-specific impacts on constituents and landowners • Environmental and land-use impacts • Project milestones and media opportunities • Social licence and benefit initiatives	• Regular technical briefings and one-on-ones meetings • Regular communication packs • Items raised by elected representatives via their constituents are shared with the project team and where appropriate, discussed through the RRG to ensure alignment and local perspectives are considered.
Elected representatives – outside corridor				
Federal: Members for Paterson, Newcastle, Dobell, Shortland **NSW:** Members for Maitland, Newcastle, Wallsend, Swansea	5–100 km	Low	• Wider community impacts during construction • Regional economic opportunities	• Briefings and meetings as needed • Communications packs at key release points

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Local government – elected councillors and officers (SEARs identified)				
Councillors and officers of Muswellbrook, Singleton, Cessnock, Lake Macquarie, Central Coast	5–100 km	Medium - high	• Impacts on council assets (roads, waste) • Cumulative impacts and community benefits • Local procurement and housing/construction accommodation needs	• Council workshops and field tours corridor/site briefings • Briefings with officers and information sharing sessions on key topics such as traffic and transport, accommodation facilities • Fact sheets, FAQs, maps, newsletters, drop-in sessions
Local government – outside corridor				
Councillors and officers of Maitland, Newcastle, Port Stephens	5–100 km	Low	• Broader construction-stage impacts • Council funding and participation opportunities	• Proactive briefings with officers • Information sharing sessions
Government agencies – Australian (SEARs identified)				
Department of Climate Change Energy Environment and Water (DCCEEW), Department of Defence, Australian Energy Infrastructure Commissioner (AEIC), CASA, Airservices Australia	>100 km	Medium	• Regulatory and planning alignment • Environmental and aviation safety impacts	• Leadership-level briefings • Technical workshops and webinars, fact sheets and draft reviews

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Government agencies – NSW (SEARs identified)				
DPHI, DCCEEW (NSW), NPWS, FCNSW, TfNSW, EPA, WaterNSW, RFS, Fire and Rescue NSW (FRNSW), SafeWork NSW, Crown Lands	>100 km	Medium - high	• Planning approvals and land use and property impacts • Biodiversity, bushfire, aviation and heritage impacts • Traffic and emergency management	• Site inspections • Technical workshops and briefings • Fact sheets and newsletters • Items raised by agencies are shared with the project team and taken into account in design refinements and scope of EIS assessment and mitigation measures adopted.
Energy sector and market bodies				
AEMO, AER, Australian Energy Market Commission (AEMC), Australian Energy Infrastructure Commissioner (AEIC), Energy Security Board (ESB), Australian Renewable Energy Agency (ARENA), Energy Consumers Australia, Clean Energy Council, Generators, Large energy users	>100 km	Medium	• Network capacity and REZ integration • Market regulation and consumer impacts • Transition planning and Long-Term Energy Service Agreements (LTESAs)	• Strategy workshops and technical briefings • Draft report reviews
Utilities (SEARs identified)				
Transgrid, Ausgrid, Essential Energy, Jemena, NBN/Telstra	Regional 5–100 km Statewide >100 km	Low	• Impacts on existing utilities, potential utility changes/relocation and adjustments • Potential network disruptions during construction	• Technical briefings and workshops • Site tours and joint planning

Stakeholder groups	Proximity	Impact	Issues and interests	EIS engagement approach
Peak bodies and advocacy groups				
Clean Energy Council, Industry chambers, Hunter Jobs Alliance, Unions, Chambers of commerce Hunter Valley Wine Tourism Association	5–100 km >100 km	Low	• Industry development and workforce issues, renewable transition opportunities • Land-use impacts; environmental and visual impacts • Access and transport impacts	• Webinars and roundtables • Email bulletins
Education and training providers				
University of Newcastle; TAFEs, registered training organisations	5–100 km >100 km	Low	• Skills gaps and workforce development • Worker safety and access protocols	• Briefings and meetings • Email updates

6.3 Regional reference group

In addition to tailored engagement and inclusive access, EnergyCo has established a dedicated forum to support ongoing regional collaboration: the Regional Reference Group (RRG).

The RRG was established in 2024 to ensure that local knowledge and community priorities were integrated into the planning and mitigation of the HTP. It provides a forum for strategic input and 2-way dialogue between EnergyCo, local councils, community representatives and regional stakeholders.

The group was formed after consultation with local councils and regional organisations. It initially comprised 10 members: An independent Chair, 3 local Mayors (Singleton, Cessnock, Lake Macquarie), one community representative each from the HTP North, Central and South zones, and a regional business, environment and Aboriginal representative.

The RRG has provided input into route refinement, mitigation measures, communication approaches and regional benefit opportunities.

In May 2025, membership was expanded to 12 members to strengthen regional representation, adding the Mayor of Muswellbrook and a community representative from the Newcastle LGA.

The group was recently renamed the Hunter-Central Coast Regional Reference Group (HCCRRG), facilitated by EnergyCo to support coordination and engagement across the portfolio of EnergyCo's projects in the region. The RRG's evolution reflects the region's growing role in NSW's energy transition and the importance of coordinated and transparent engagement across projects.

Since its first formal meeting in February 2024, the RRG has met 10 times. This includes 4 extraordinary meetings held outside of the standard quarterly meeting schedule to address specific issues.

6.4 Engagement to date

Engagement during preparation of the EIS began with the submission of the Scoping Report in May 2024 and will conclude after the public exhibition of the EIS in 2025 (Phase 2).

Communication and engagement activities to date include meetings/briefings, information sessions, workshops, phone calls, letters, emails, website updates and newsletters (see Image 6.1). These have been supported by community feedback channels, including a project-specific phone number and email address.

Other targeted activities were also undertaken to support technical studies, including social impact surveys and consultation with RAPS for the Aboriginal cultural heritage assessment (see C*hapter 14 (Social)* and *Chapter 9 (Aboriginal heritage)*).

A summary of the communication and engagement activities undertaken since mid-2022 through to July 2025 is provided in Table 6.3. Further details are provided in *Appendix D (Community engagement outcomes)*.

Image 6.1 Community information session at Singleton

Table 6.3 EIS engagement activities

EIS engagement activity	Stakeholder group	Description of activity	Reach or outcome
Advertising	All stakeholders	Advertising media included local radio (2NM, Power 98.1FM, 2HD, NewFM, 2NURFM, 2CHR 96.5FM, Triple M 102.9 Newcastle, Hit 106.9 Newcastle), local print media (Newcastle Herald, Singleton Argus, Hunter River Times, Maitland Mercury and Coast Community News) and digital channels such as podcasts including multiple placements across major Hunter media outlets.	Advertising reached a potential cumulative audience of more than 8 million. * Estimates reflect total impressions across all media buys, not unique individuals. Spikes in website visitation around this time demonstrated increased interest and awareness in the project.
Briefings	Government agencies, elected representatives, landowners, Aboriginal stakeholders and communities, councils, community, groups, business and industry	Briefings were used to provide an overview of the project and updates on key issues. Generally, there was greater engagement at face to face meetings than online meetings. Engagement with councils, agencies and Aboriginal groups was co-ordinated as part of this activity.	About 200 briefings were held, both online and in person, with a range of stakeholders to update them on key issues.
Bulk mailouts	Within 5 km of project impact area	Two bulk mailouts were distributed to households and businesses.	Tailored updates provided to landowners and key groups. Around 14,000 delivered in May 2024 and 32,000 in November 2024.
Communications packs	Key stakeholders, elected representatives	Two rounds of communication packs for elected representatives.	These were sent in Dec 2024 and March 2025 to share updated project information and briefings held as requested.

EIS engagement activity	Stakeholder group	Description of activity	Reach or outcome
Door knock	Landowners, community, groups, business and industry	Two rounds of door knocks.	Door knocks were conducted to directly provide advice and information to affected landowners. August 2024 – visual impact inspections completed with 13 stakeholders in Watagan, Maison Dieu, Gouldsville and Broke. April 2025 - update on visual impacts provided to 4 properties in the Broke area.
Email	All stakeholders	Email correspondence was used to inform, liaise with and respond to stakeholders and community members.	1400+ logged enquiries in CRM.
E-newsletter (monthly)	Subscribers to the news update	E-newsletters provided tailored updates to subscribers.	900+ subscribers Thirteen eNewsletters sent. For copies, visit: www.energyco.nsw.gov.au/projects/hunter-transmission-project
Feedback form	Participants at events	Feedback forms were used at drop-in sessions and after webinars to capture stakeholder suggestions and event feedback.	30 completed.
Information sessions	Landowners, community, groups, business and industry	Community drop-in sessions provided project information and opportunities for stakeholders to speak directly with project team members.	Community drop-in session held in: • Singleton - March 2025 • Cessnock - March 2025 • Cooranbong - March 2025. Around 40 stakeholders including landowners, job hunters, community/environmental groups, councils and broader community attended.

EIS engagement activity	Stakeholder group	Description of activity	Reach or outcome
Meetings	Government agencies, elected representatives, landowners, councils, community, groups, business and industry	Meetings provided stakeholders with the opportunity to discuss project issues in a more interactive format.	About 200 meetings with landowners and stakeholders.
Notifications (fieldworks)	Landowners within the project impact area	Outgoing emails, letters and calls regarding fieldwork notification requests on private property.	255 outgoing emails and letters. 138 outgoing calls.
Online survey and submission form	All stakeholders wanting to provide a detailed submission	Collect structured feedback on early consultation and EIS findings.	Survey open until close of EIS public exhibition. Provides an accessible channel for stakeholders across all zones including those unable to attend events to share in-depth feedback. Supports a transparent record of community and stakeholder issues and enables tracking of how submissions have informed the project.
Phone calls	All stakeholders	Inform, liaise with and respond to stakeholders and community members – either proactively or in response to contact or complaints.	900 phone calls (in/out).

EIS engagement activity	Stakeholder group	Description of activity	Reach or outcome
Pop-up stalls	All interested stakeholders within 5 km of the project impact area	Pop-up stalls provided project information and opportunities for interested community members to engage with the project team.	Twelve pop-up stalls. Held at regional shows, local shopping centres and markets: • October 2024 – Singleton, Morisset and Cessnock • November 2024 – Singleton, Morisset and Cessnock • December 2024 – Jerrys Plains, Singleton, Morisset • February 2025 – Cessnock, Muswellbrook • May 2025 - Paterson
Regional Reference Group	Impacted councils, business, environment, community, Aboriginal stakeholders	The RRG provided a forum for strategic discussion on the HTP in accordance with the group's terms of reference.	Meetings held bi-monthly: • May 2024 • July 2024 • August 2024 • October 2024 • November 2024 • December 2024 (extraordinary meeting) • February 2025 Minutes found here: https://www.energyco.nsw.gov.au/our-projects/hunter-central-coast-projects/hunter-central-coast-regional-reference-group.

EIS engagement activity	Stakeholder group	Description of activity	Reach or outcome
Surveys	Directly impacted landowners, businesses, Aboriginal stakeholders, environment and recreational users	Sentiment survey measured if views on project had changed over time.	About 200 stakeholders contacted by email and telephone.
Webinars	Landowners, councils, business, environment, community, Aboriginal stakeholders, government agencies	Webinars provided targeted information on topics of high interest or impact and invited feedback from participants.	Six webinars hosted between March and May 2025 with 77 participants/ attendees. Topics included: • bushfire and hazards (13 participants) • planning and approvals (9 participants) • biodiversity (10 participants) • Aboriginal cultural heritage (7 participants) • noise and air quality (5 participants) • visual amenity (26 participants) • traffic and transport (7 participants).
Website	All stakeholders	Central source of information about the HTP and the HTP EIS including engagement opportunities.	31,102 visits to the HTP website.

6.5 Engagement outcomes

6.5.1 Overview of feedback

EnergyCo had more than 2300 interactions (defined as any discrete contact event such as a face-to-face meeting, phone call, email exchange, workshop, online webinar, site inspection, or formal submission) with community members and other stakeholder groups including government agencies between mid-2022 and April 2025. This engagement was guided by the commitments set out in the HTP Community Engagement Plan (see *Appendix D (Community engagement outcomes)*).

6.5.2 Feedback and sentiment

To understand the nature and intensity of issues raised, stakeholder feedback was analysed by proximity to the HTP:

- **less than 5 kilometres (local impact area)** - represented 86% of feedback, with 33% raising concerns about land access, acquisition, construction impacts and visual amenity
- **5 to 100 kilometres (regional impact area)** - represented 8% of total feedback, sentiment was more balanced, with traffic, regional access and employment opportunities raised
- **greater than 100 kilometres (statewide/general interest area)** - represented 5% of feedback, primarily focused on network design and strategic energy planning.

Sentiment by proximity to the HTP corridor is shown in Figure 6.2.

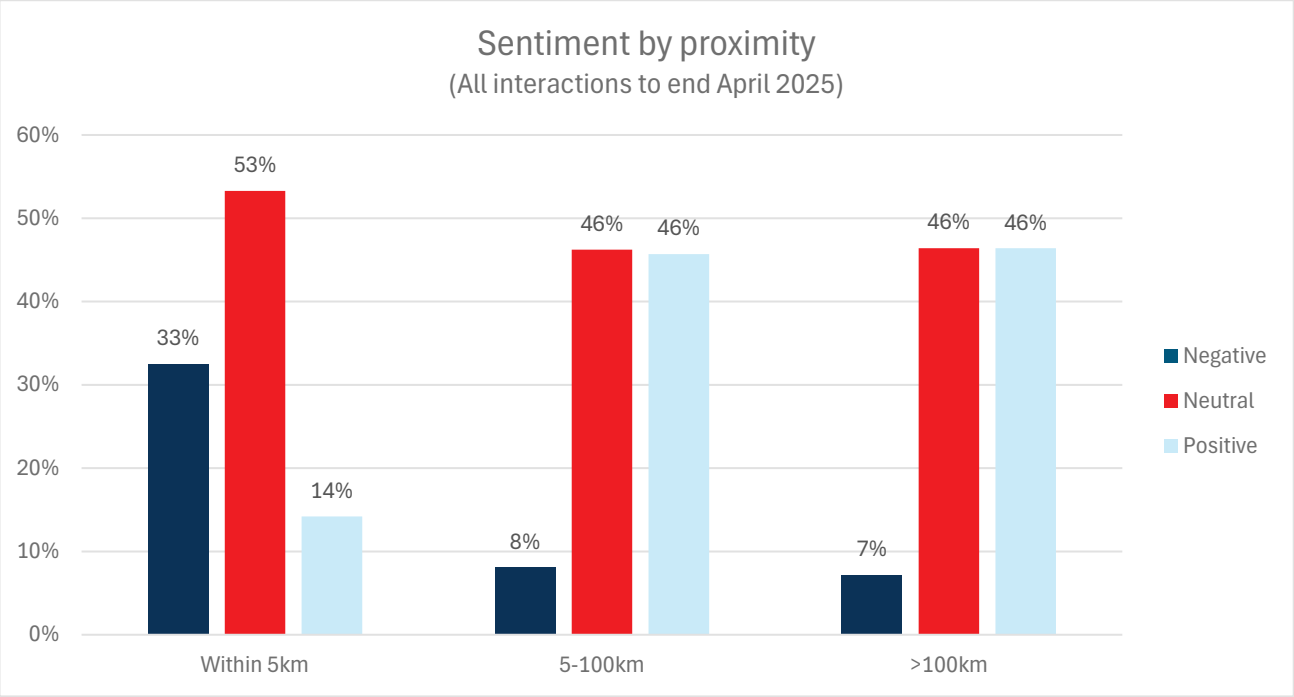


Figure 6-2 Sentiment by proximity to the HTP

6.5.3 Feedback by theme

Key themes raised through consultation with community, landowners and other stakeholders included:

- **land use and property** - property access, acquisition and compensation processes, impacts on farming operations, desire for greater clarity through tailored maps and design details
- **environmental impacts** - biodiversity and habitat protection, bushfire risk, vegetation clearing, cumulative environmental impacts, and interest from environmental groups in contributing to project delivery (e.g. pre-clearance surveys)
- **visual and landscape impacts** - visual prominence of infrastructure near valued landscapes and tourism areas (particularly in HTP Central)
- **cultural heritage** -protection of culturally significant places, requests for additional assessments, and opportunities for Aboriginal businesses and Local Aboriginal Land Councils (LALCs) to be involved
- **construction impacts** - traffic management, road safety, noise, dust, and disruption to recreational access
- **project justification and alternatives** -requests for information on undergrounding, existing easement use, route selection rationale and project interaction with the Hunter-Central Coast Renewable Energy Zone (REZ) and existing 330 kV infrastructure
- **community engagement** -desire for clear and timely communication and recognition that some design information will be confirmed during the detailed design phase.

Community, landowner and stakeholder feedback has played a central role in shaping the HTP's design prior to commencement of planning approval. Key project refinements and commitments have resulted from this feedback including:

- reduction in private property impacts from 78 directly affected properties to about 20 at EIS stage
- relocation of the switching station to Olney State Forest (removing more than 30 private properties from the corridor in HTP South)
- corridor adjustments to avoid sensitive properties, cultural heritage sites and areas of high biodiversity value
- visual and landscape mitigation including adjusted tower siting off ridgelines
- biodiversity offsets and mitigation commitments
- strengthened traffic and access management measures
- enhanced cultural heritage protection
- ongoing improvements to engagement materials, mapping and transparency.

A summary of the feedback received, how the feedback has been addressed, and where it is addressed in this EIS is provided in the remainder of this chapter. Additional detail is provided in *Appendix D (Community engagement outcomes)*.

6.5.4 Directly affected landowners

EnergyCo engaged with both directly affected private landowners and a diverse range of organisational landowners including major generators, mining operators, Department of Defence, Forestry Corporation NSW and other key stakeholders, to understand their specific operational, land-use, safety and heritage concerns.

Key themes raised by private landowners and residents included:

- easement access, acquisition processes and compensation engagement processes
- impacts on farming operations and land use
- visual and landscape concerns about tower siting and access tracks
- local traffic safety, dust, noise and general construction impacts.

Key themes raised by organisational landowners included:

- maintaining operational access and site safety during construction
- protecting Aboriginal cultural heritage and historic heritage assets
- minimising biodiversity impacts and coordinating offset opportunities
- traffic and haulage protocols to align with existing industrial operations
- bushfire risk mitigation and emergency access.

This feedback informed the assessment methodologies, identified opportunities for mitigations and management measures and identified requirements for ongoing consultation during detailed design and delivery.

Table 6.4 Summary of feedback from directly affected landowners

Theme	Issues and feedback	How addressed	Where addressed in EIS
Community engagement process	Frustration over inconsistent communication timelines	Implemented new response protocols, including regular project updates via monthly e Newsletters, changes to location and format of drop-in sessions, targeted mail-outs and clearer explanations of what can and cannot be influenced through the EIS process.	*Chapter 6 (Engagement)* *Technical Report 6 – Social impact assessment*
	Late awareness of project in rural pockets	Rolled out broader communications campaign – posters placed in shopping centres and on community notice boards, drop-in events, targeted mail-outs and expanded bulk mailout, info sessions to reach less engaged communities.	*Chapter 6 (Engagement)*
Construction impacts	Heavy-vehicle use of Hebden Road	Detailed assessments of traffic and transport and construction undertaken to avoid and minimise impacts. Mitigation measures during construction will be implements within localised traffic management plans (including time of day restrictions, speed limits and dilapidation surveys).	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport*
	Concerns about road damage, noise, dust and vibration Road degradation and safety on rural roads	Detailed assessments of construction impacts undertaken. Mitigation measures during construction will be implemented through localised traffic management plans (including dilapidation surveys, road/intersection upgrades, designated heavy vehicle routes, dust suppression measures, vibration-monitoring protocols and noise-mitigation measures).	*Chapter 11 (Traffic and transport)*

Theme	Issues and feedback	How addressed	Where addressed in EIS
Cultural heritage	Need for greater RAP consultation	Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible. During construction activities and ongoing engagement will be monitored to ensure they are culturally appropriate. Mitigation measures during construction will be outlined within the Aboriginal cultural and heritage management plan.	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
	Protection of known cultural sites	Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible. During construction activities and ongoing engagement will be monitored to ensure they are culturally appropriate, including micro-siting towers to avoid mapped sites.	*Chapter 6 (Engagement)* *Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
Design and route selection	Questions about undergrounding vs overhead lines	Detailed assessment of alternatives, including undergrounding. Alternatives and options incorporated into engagement materials and discussed with community members	*Chapter 3 (Alternatives and options)*
	Greater use of existing easements	Detailed assessments for transmission line locations undertaken to avoid and minimise impacts where possible. Itigation measures include the use existing easements and minimising impacts on environment.	*Chapter 3 (Alternatives and options)*

Theme	Issues and feedback	How addressed	Where addressed in EIS
Environmental impacts	Effects on biodiversity Bushfire risk concerns Clearing of native vegetation and habitat corridors	Detailed assessment of biodiversity and bushfire undertaken to avoid and minimise impacts where possible. Mitigation measures will be implemented during construction (including micro-siting of the transmission line infrastructure and work sites, pre-clearing surveys, retention of habitat features and establishment of biodiversity exclusion zones).	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report* *Technical report 14 – Bushfire and risk assessment*
	Effects on grazing land	Refined corridor to reduce impacts on agricultural land.	*Chapter 12 (Land use and property)* *Chapter 13 (Agriculture)* *Technical Report 5 - Agriculture impact assessment*
	Siting towers on scenic ridgelines	Adjusted design to increase setbacks from key vantage points and avoid prominent ridges.	*Chapter 10 (Landscape and visual)* *Technical Report 3 - Landscape character and visual amenity*
	Visual intrusion from new structures	Retained and enhanced vegetation screens; undertook visual impact assessment photomontages with impacted landowners and scheduled return to show photomontages and screening examples.	*Chapter 10 (Landscape and visual)* *Technical Report 3 - Landscape character and visual amenity*

Theme	Issues and feedback	How addressed	Where addressed in EIS
	Perceived Electro-Magnetic Fields (EMF) risks affecting rural vistas	Included an EMF assessment in the EIS and published plain-language fact sheets explaining safety standards.	*Technical Report 17 – EMF impact assessment*
Land use and property	Need for clear corridor and easement maps	Held one-on-one briefings with affected landowners supported by property-specific fact sheets and bespoke maps showing the preferred corridor, easement footprints and compensation entitlements.	*Chapter 12 (Land use and property)*
	Impacts on grazing and dairy operations	Explored alternative easement options to minimise loss of productive land; incorporated landowner feedback into the reference design.	*Chapter 13 (Agriculture)*
	Requests for timely acquisition updates	Established a regular update protocol via email and phone, with documented timelines for opening-letter issuance and follow-up meetings.	*Chapter 6 (Engagement)*

Theme	Issues and feedback	How addressed	Where addressed in EIS
Social and economic	Cumulative housing impacts, local housing supply and affordability and need for local housing legacy	Detailed assessment of social impacts including potential future use of temporary worker accommodation.	*Chapter 14 (Social)* *Technical Report 6 - Social impact assessment* Future use of temporary worker accommodation following completion of construction is outside the scope of the EIS
		Implementation of mitigation and management measures during construction to manage potential social impacts (such implementation of Accommodation and Employment Strategy).	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
Strategic context	Confusion between HTP and Hunter-Central Coast REZ	Delivered regional briefings and issued clear explanatory materials differentiating the HTP scope from the REZ work. Introduced regional co-ordination meetings across EnergyCo projects with councils.	*Chapter 3 (Alternatives and options)*

6.5.5 Aboriginal stakeholders

Between November 2023 and March 2025, the HTP team conducted over 1000 direct interactions—comprising around 600 days of on-Country activities—with 48 Registered Aboriginal Parties (RAPs) and other Aboriginal stakeholders including the 5 associated Local Aboriginal Lands Councils for the project. This intensive program, carried out under the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a), and additional project-specific engagement strategies, ensured transparent 2-way dialogue on representation, field methods, site impacts and benefit-sharing.

Table 6.5 summarises the key themes, topics raised, how each was addressed and the relevant part of the EIS.

Table 6.5 Summary of feedback from Aboriginal stakeholders

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Registered Aboriginal Parties (RAPs)			
Cultural heritage	Who speaks for Country; identification of representative bodies	• Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible • Representative bodies were identified through face-to-face meetings and anthropologist interviews	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
	Potential impacts to Dreaming places and sacred sites	• Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible • During construction activities ongoing engagement will be monitored to ensure they are culturally appropriate • Mitigation measures will be outlined within the Aboriginal cultural heritage management plan (including micro-siting infrastructure) which will be developed post approval by a heritage specialist and in consultation with the RAPs	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
	Approach to archaeological test pitting and salvage	• RAP participation in test excavations; archaeological method statement that will continue post approval	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
Community engagement process	Desire for continuous dialogue through approvals	• Iterative workshops; regular briefings; incorporation of feedback into design development • An Aboriginal cultural heritage management plan will be prepared post-approval in consultation with RAPs	*Chapter 6 (Engagement)* *Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
Wanaruah, Mindaribba, Biraban, Awabakal, Darkinjung Local Aboriginal Land Councils			
Social and economic	Community benefit packages Local enterprise development Inclusion in regional supplier database Visibility of upcoming contract opportunities	• Established online supplier portal • Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible • Mitigation measures during construction will be outlined within the Aboriginal cultural heritage management plan (including regular updates via e-newsletter and RRG meetings and industry briefing sessions) • EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Community engagement process	Desire for continuous dialogue through approvals	• Iterative workshops; regular briefings • Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible • During construction, activities and ongoing engagement will be monitored to ensure they are culturally appropriate • Mitigation measures during construction will be outlined within the Aboriginal cultural heritage management plan	*Chapter 6 (Engagement)* *Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
Cultural heritage	On-Country mapping protocols; survey methodology	• Collaborative cultural-mapping workshops; joint field surveys • Mitigation measures during construction will be outlined within the Aboriginal cultural heritage management plan	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
	Potential impacts to Dreaming places and sacred sites	• Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible • During construction, activities and ongoing engagement will be monitored to ensure they are culturally appropriate • Mitigation measures during construction will be outlined within the Aboriginal cultural heritage management plan (including micro-siting of infrastructure)	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
First Nations businesses			
Social and economic	Community benefit packages Local enterprise development Inclusion in regional supplier database Visibility of upcoming contract opportunities	• Established online supplier portal • Mitigation measures during construction will be outlined within the Aboriginal cultural heritage management plan (including regular updates via e-newsletter and RRG meetings and industry briefing sessions) • EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
	Local opportunities Achievement of government targets for Aboriginal participation	• EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region • Details will be outlined within the Local Business and Employment Strategy and included in the Aboriginal Participation Plan	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*

6.5.6 Community organisations and recreational groups

Feedback from community members, local groups, and recreational users directly shaped key aspects of the HTP. Input from these stakeholders, particularly those within 5 kilometres of the proposed corridor (see below), led to measurable changes in the project's design and plan for delivery. The corridor was refined to reduce impacts on private properties, avoid prominent ridgelines and protect high-use recreational areas, including 4WD and camping areas. Concerns about visual amenity, land use and construction impacts were addressed through design adjustments, and input into construction access planning. The project team also simplified and expanded public-facing materials in response to requests for clearer information, ensuring the community could easily understand the project and its impacts.

Stakeholders include:

- 4WD Clubs – Maitland and District 4WD Club, Port Hunter 4x4 Club, Hunter Region 4WD Council
- Australian Climbing Association Newcastle and Central Coast
- Broke Residents Community Association
- Cooranbong Community Services Centre
- Historical societies – Cessnock District Historical and Family History Society, Muswellbrook Shire Local and Family History Society Inc, Singleton Historical Society and Museum Inc,
- Hunter Valley Gliding Club
- Horse riders - Hunter Valley Horse Riders Club, Lake Macquarie Pack and Trail Horse Riders, Morpeth Horse Riders Club
- Hunter Mountain Bike Association
- Mulbring Community Forum
- Pokolbin Mountains Road Residents, Landholders & Users
- Rotary Club of Morisset
- Walking clubs – Lake Macquarie Bushwalkers, Newcastle Bushwalking Club
- Wollombi Progress Association
- Wollombi Valley Community Association
- Wollombi Valley Tourism.

Table 6.6 Summary of feedback from community, local groups and recreational users

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Community engagement	Requests for timely updates, access to project staff, and clear communication	• Delivered community newsletters, drop-in sessions, webinars, and direct emails; community updates summarised feedback and outcomes • Detailed community engagement processes have been completed and are outlined within this chapter • Planned community engagement activities are reflected in the Communications and Engagement Plan for Public Exhibition	*Chapter 6 (Engagement)*
Construction impacts	Concern about road safety, dust, noise, and traffic during construction	• Detailed traffic and transport assessments were undertaken to avoid and minimise risks where possible. • During construction, mitigation measures will be implemented. These will be outlined in the localised traffic management plans that will be developed post approval (including dilapidation surveys, road/intersection upgrades, designated heavy vehicle routes, and time-of-day restrictions for heavy vehicles in certain locations)	*Chapter 6 (Engagement)* *Chapter 11 (Traffic and transport)* *Chapter 16 (Noise and vibration)* *Chapter 22 (Other matters)* *Technical Report 4 – Traffic and transport* *Technical Report 8 – Noise and vibration* *Technical Report 18 – Air quality and greenhouse gas*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Construction impacts	Potential disruption to bushwalking tracks, trails, 4WD areas and public reserves	• Potential disruption from construction traffic will be considered and managed during construction • Access needs will be identified through engagement during detailed design and construction phase, with any temporary closures clearly signposted and advance notifications provided to affected users • Alternative access routes will be communicated where possible to minimise disruption • A Community and Engagement Management Plan will be finalised before construction begins that will take the above engagement needs into account	*Chapter 6 (Engagement)* *Chapter 11 (Traffic and transport)* *Chapter 14 (Social)* *Chapter 16 (Noise and vibration)* *Chapter 22 (Other matters)* *Technical Report 4 – Traffic and transport* *Technical Report 6 – Social impact assessment* *Technical Report 8 – Noise and vibration* *Technical Report 18 – Air quality and greenhouse gas*
Biodiversity and bushfire	Concern for local wildlife, vegetation clearing, and fire risk	• Detailed assessment of biodiversity and bushfire undertaken to avoid and minimise impacts where possible • Mitigation measures are documented in the EIS and will be implemented during construction (including micro-siting of the transmission line infrastructure and work sites, pre-clearing surveys, retention of habitat features and establishment of biodiversity exclusion zones)	*Chapter 6 (Engagement)* *Chapter 8 (Biodiversity)* *Chapter 21 (Hazards and risk)* *Technical Report 1 – Biodiversity development assessment report* *Technical Report 14 – Bushfire risk assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Landscape and visual	Impacts to landscape character	• A landscape character and visual impact assessment was undertaken, with mitigation measures developed to avoid or minimise impacts	*Chapter 10 (Landscape and visual)* *Chapter 14 (Social)* *Technical Report 3 -Landscape character and visual impact* *Technical Report 6 – Social impact assessment*
Aviation	Operational impacts to Hunter Valley Glider Club	• A detailed aviation assessment was undertaken, with mitigation measures developed to avoid or minimise impacts	*Chapter 6 (Engagement)* *Chapter 21 (Hazards and risk)* *Technical Report 16 – Aviation impact assessment*
Strategic context	Questions about need for new lines vs upgrading existing infrastructure	• Detailed analysis of alternatives is presented in the EIS • Alternatives and options incorporated into engagement materials and discussed with community members	*Chapter 6 (Engagement)* *Chapter 3 (Alternatives and options)*
Visual amenity	Visual intrusion of towers near homes, recreation areas, and scenic viewpoints	• Detailed assessment of visual impact and alternative locations • Alternatives and options incorporated into engagement materials and discussed with community members • Mitigation measures are documented in the EIS and will be implemented during construction of the project to minimise impacts on landscape and visual amenity (including minimising vegetation clearing between tourism and cultural viewpoints)	*Chapter 6 (Engagement)* *Chapter 10 (Landscape and visual)* *Technical Report 3 - Landscape character and visual impact*

6.5.7 Education/training, unions and jobs advocates

Between November 2023 and April 2025, EnergyCo engaged with education and training providers, unions and jobs advocates to shape workforce development and community benefit initiatives. Discussions focused on aligning training programs with project needs, setting local hiring targets, integrating health and safety standards, and supporting pre-employment readiness. The outcomes of these engagements are summarised in Table 6.7.

Table 6.7 Summary of education/training, unions and job advocate feedback

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Electricity Infrastructure Jobs Advocate			
Social and economic	Workforce metrics and policy Statewide skills-gap analysis Job-creation benchmarks for critical infrastructure	• Detailed assessment of social and economic impacts were undertaken • Mitigation measures are included in the EIS and how they will be implemented will be outlined in the Social Impact Management Plan, Local Business Strategy and Industry and Aboriginal Participation Plan • EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment* *Chapter 22 (Other matters)* *Technical Report 19 – Economic impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Hunter Valley Training Company			
Social and economic	On-site training facilities Workforce transition programs Local job targets SME engagement and supply-chain inclusion	• Detailed assessment of social and economic impacts was undertaken for the EIS • Key mitigation measures are to prepare a Social Impact Management Plan, Local Business and Employment Strategy and Industry and Aboriginal Participation Plans • EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the detailed design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 14 (Social)* *Chapter 22 (Other matters)* *Technical Report 6 – Social impact assessment* *Technical Report 19 – Economic impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Hunter Jobs Alliance			
Social and economic	Degree and research partnerships Graduate placement pathways	• Detailed assessment of social and economic impacts was undertaken for the EIS • Key mitigation measure is to develop a local business and employment strategy which will include the following initiatives: – identify local skills gaps and workforce skills and training requirements – set diversity and inclusion targets that align with the NSW Procurement Board Direction PBD 2023-01 Skills, Training, and diversity in construction (NSW Treasury 2023) – education and training partnerships, including with TAFE NSW and local high schools and the upcoming Cessnock Education Precinct to support energy transition career pathways – support tailored training and upskilling programs for residents, with a targeted focus on young people, Aboriginal people, candidates seeking career transition from existing local industries, and older people – investment in retraining and upskilling pathways for workers transitioning into renewable energy industries (e.g. technicians, infrastructure specialists)	*Chapter 6 (Engagement)* *Chapter 14 (Social)* *Chapter 22 (Other matters)* *Technical Report 6 – Social impact assessment* *Technical Report 19 – Economic assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
TAFE NSW			
Social and economic	Short-course modules for transmission construction Cert II/III	• Detailed assessment of social and economic impacts was undertaken for the EIS • Key mitigation measure is to develop a local business and employment strategy which will include the following initiatives: – identify local skills gaps and workforce skills and training requirements – set diversity and inclusion targets that align with the NSW Procurement Board Direction PBD 2023-01 Skills, Training, and diversity in construction (NSW Treasury 2023) – education and training partnerships, including with TAFE NSW and local high schools and the upcoming Cessnock Education Precinct to support energy transition career pathways – support tailored training and upskilling programs for residents, with a targeted focus on young people, Aboriginal people, candidates seeking career transition from existing local industries, and older people – investment in retraining and upskilling pathways for workers transitioning into renewable energy industries (e.g. technicians, infrastructure specialists)	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
Unions			
Health and safety	Health and safety standards Site access and induction processes	• Detailed assessment of hazards and risks associated with construction of the project has been included in the EIS	*Chapter 21 – Hazards and risks* *Technical report 15 – Preliminary risk screening* *Technical report 17 – Electric and magnetic fields*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Jobs advocates (e.g. local employment services)			
Social and economic	Pre-employment training needs Resume and interview coaching	• Detailed assessment of social and economic impacts was undertaken for the EIS • Key mitigation measure is to develop a local business and employment strategy which will include the following initiatives: – identify local skills gaps and workforce skills and training requirements – set diversity and inclusion targets that align with the NSW Procurement Board Direction PBD 2023-01 Skills, Training, and diversity in construction (NSW Treasury 2023) – education and training partnerships, including with TAFE NSW and local high schools and the upcoming Cessnock Education Precinct to support energy transition career pathways – support tailored training and upskilling programs for residents, with a targeted focus on young people, Aboriginal people, candidates seeking career transition from existing local industries, and older people – investment in retraining and upskilling pathways for workers transitioning into renewable energy industries (e.g. technicians, infrastructure specialists)	*Chapter 6 (Engagement)* *Chapter 14 (Social)* *Technical Report 6 – Social impact assessment* *Technical Report 19 – Economic impact assessment*

6.5.8 Energy and resources sector

EnergyCo engaged directly with major generators, mining operators including Glencore, Yancoal and Centennial Coal and other key stakeholders in the energy and resources sector, including AGL, Origin Energy, Glencore, Yancoal and Centennial Coal during preparation of the EIS. Engagement included targeted workshops, technical briefings and site visits, with a focus on operational integration, land use and access, safety, heritage management, and minimising potential impacts to existing operations.

Feedback from this sector informed corridor refinement, construction planning, environmental and heritage management measures, and co-ordination with other energy projects in the region. Table 6.8 summarises the issues raised and how they will be addressed through post-approval planning.

Table 6.8 Summary of energy and resource sector feedback

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
AGL Macquarie: Bayswater Power Station			
Community engagement process	AGL Macquarie request regular engagement co-ordination	• HTP Senior Acquisition Manager (or delegate) attended fortnightly AGL-EnergyCo co-ordination meetings to support ongoing property-related engagement and co-ordination	*Chapter 6 (Engagement)*
Construction impacts	Estimated daily number of people accessing each construction lease and temporary easement area	• Estimated light and heavy vehicle numbers and workforce numbers associated with construction support site at Hebden Road and Pikes Gully construction support sites has been provided in EIS	*Chapter 4 (Project description)* *Chapter 24 (Environmental Management)*
	AGL Macquarie confirmation that Bayswater Power Station's ability to generate electricity would not be restricted during HTP construction and commissioning	• Provided formal notice (and Transgrid advice) that no generator outages are required	*Chapter 4 (Project description)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
	AGL Macquarie requested confirmation whether HTP construction activities on its freehold land would trigger the need for EPL amendments	• Reviewed the final footprint; commitment to assist AGL if EPL revision is required	*Chapter 5 (Statutory context)* *Chapter 6 (Engagement)*
	AGL Macquarie sought assurance that potential cumulative impacts from multiple EnergyCo projects on Bayswater operations would be coordinated and managed consistently	• Fortnightly EnergyCo and AGL Liaison meetings held since 2023 • EnergyCo are in the process of developing a Third Party Agreement, details will be finalised through ongoing engagement • Commitment that there would be no impact to generating assets	*Chapter 23 (Cumulative impacts)* *Chapter 6 (Engagement)*
	AGL Macquarie requested information on any oversize/ overmass vehicles accessing AGL land: numbers, timing, duration	• Detailed traffic and transport assessments undertaken including assessment of OSOM routes	*Chapter 24 - Environmental Management* *Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport*
Australian Energy Market Operator (AEMO)			
Strategic context	REZ integration requirements System reliability standards	• Scenarios provided by AEMO have informed the EIS and ongoing coordination will be maintained during delivery	*Chapter 3 (Alternatives and options)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Australian Energy Regulator (AER)			
Strategic context	Electricity pricing and tariff arrangements Market compliance requirements	• The project is aligned with market compliance requirements and electricity pricing framework	*Chapter 4 (Project description)*
Centennial Coal			
Construction impacts	Identified two access points to the site and proposed a hard-stand area at the Freemans Drive construction support site	• Agreed to second entry/ exit point for emergency access at the Freemans Drive construction support site. to the site	*Chapter 4 (Project description)* *Chapter 12 (Land use and property)*
	Location for construction support site and worker accommodation	• Agreement with Centennial Coal for an appropriate footprint on site for construction compound activities and services	*Chapter 4 (Project description)* *Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport*
Glencore (Hunter Valley Operations)			
Environmental impacts	Overlapping of spring biodiversity surveys could disrupt operations	• Detailed assessments have been undertaken to avoid and minimise risk where possible. EnergyCo are committed to working collaboratively and sharing data during the project	*Chapter 6 (Engagement)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Land use and property	Separation of project from current operations to minimise impact	• Stakeholders requested segregation of the corridor and access roads to enhance mining-area safety and streamline property handover to the contractor	*Chapter 4 (Project description)*
	Impact of easement on mining operations, access across haul roads	• Ongoing consultation with operations team to refine corridor and timing of construction works; haul-road crossing protocols will be developed as part of traffic management requirements post planning approval	*Chapter 12 (Land use and property)* *Chapter 11 (Traffic and transport)* *Technical report 4 – Traffic and transport*
	Potential constraints on mine expansion (future operations)	• Feedback on the planned upgrade works for Lemington Road under the HVO Continuation Project highlighted the need to co-ordinate timing and access requirements to manage overlapping construction activities • EnergyCo will continue to co-ordinate with HVO closer to the start of construction to avoid conflicts and minimise impacts	*Chapter 23 (Cumulative impacts)*
Glencore (Bulga Coal)			
Design and route selection	Raised potential conflicts between HTP corridor and tenants and sought clarity on corridor interactions Impact on future land use and property value	• EnergyCo has committed to ongoing consultation with stakeholders to understand tenancy and operational constraints	*Chapter 4 (Project description)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Land use and property	Access to maintenance tracks Availability of laydown areas	• Consider shared use of Bulga Coal access road and allocated staging areas outside core mining footprint. The use of the access road is to be subject to ongoing engagement with Bulga Coal	*Chapter 4 (Project description)* *Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport*
	Concerns due to proximity of access roads to farming or operational areas	• Where possible avoid impacts to operations. Ongoing discussions taking place	*Chapter 12 (Land use and property)*
	Proximity and impacts of HTP on mining operations	• Operational matters will be considered in the development of site management plans, property management plans and to be agreed access protocols	*Chapter 12 (Land use and property)*
	Proximity of mining to Broke Road. Mining immediately beside the corridor at eastern Broke Road following tailings relocation, raising access and safety concerns	• Ongoing coordination with Bulga Coal and project to refine access permits, establish safe operating buffers, and update Environmental Management Strategy and subsequent plans	*Chapter 12 (Land use and property)*
Origin Energy, Eraring Power Station			
Land use and property	Avoid operational areas and access areas	• Detailed assessment of land use and property undertaken	*Chapter 12 (Land use and property)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Strategic context	Integration with Eraring Battery Energy Storage System Transgrid substation upgrades	• Ongoing coordination will continue through detailed design and delivery to ensure network integration is efficient and avoids operational conflicts • EnergyCo are in the process of developing a Third Party Agreement, details will be finalised through ongoing engagement	*Chapter 23 (Cumulative impacts)*
Yancoal (Mount Thorley–Warkworth)			
Construction impacts	Objections to the proposed Mount Thorley Warkworth laydown area due to surface-water ponding and drainage risks requiring engineering of drainage and construction standards to protect adjacent stockyard access and long-term land use	• Original laydown site abandoned; Alternative laydown location identified	*Chapter 3 (Alternatives and options)* *Chapter 11 (Traffic and transport)*
	Laydown footprint overlaps numerous potential Archaeological deposits and active Cultural Heritage Management Plan obligations	• Detailed assessment of Aboriginal and heritage impacts undertaken to avoid and minimise impacts where possible • During construction activities, ongoing engagement will be monitored to ensure they are culturally appropriate. Mitigation measures during construction will be outlined within the Aboriginal cultural heritage management plan to be developed in consultation with RAPs	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Design and route selection	Raised potential conflicts between HTP corridor and Yancoal tenants and sought clarity on corridor interactions Impact on future land use and property value	• EnergyCo are in the process of developing a Third Party Agreement, details will be finalised through ongoing engagement	*Chapter 3 (Alternatives and options)* *Chapter 12 (Land use and property)* *Technical Report – Agriculture impact assessment*
Environmental impacts	Yancoal raised concerns about using an area near its Austar operations as a temporary construction support site because of biodiversity and heritage constraints	• Following input from Yancoal's biodiversity team, the Austar option was removed from consideration and alternative temporary support sites were identified that avoid these sensitive areas	*Chapter 3 (Alternatives and options)* *Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*

6.5.9 Environmental groups

Environmental groups, including local conservation organisations, State-wide advocacy bodies, and issue-specific interest groups, provided valuable input throughout the planning of the HTP. These stakeholders played a critical role in identifying ecologically sensitive areas, advocating for the protection of biodiversity corridors and threatened species, and highlighting the importance of minimising impacts on conservation land, national parks, and natural landscapes.

Stakeholders included:

- experts in aquatic and terrestrial ecosystems
- water quality and fish habitat conservation experts
- Birdlife Australia
- Community Environment Network
- Hunter Community Environment Centre
- EcoNetwork Port Stephens
- Central West Environment Council
- Hunter Environment Lobby
- Hunter Bird Observers Club
- Hunter Wildlife Rescue
- Landcare – Hunter Valley Wine Country, Wollombi, Congewai Valley
- Nature Conservation Council of NSW
- Sydney Basin Koala Network.

Their feedback helped shape corridor decisions, informed the biodiversity and visual impact assessments, and contributed to refinements in offset strategies and fire risk management. Engagement with these groups occurred through written submissions, briefings, site visits, webinars and participation in consultation events across the Hunter and Central Coast regions.

Table 6.9 Summary of feedback from environmental groups

Theme	Issues and feedback	How topic has been addressed	Where addressed in EIS
Biodiversity and bushfire impacts	Cumulative impacts on biodiversity corridors and threatened species habitats	• Undertook biodiversity surveys; refined corridor in sensitive areas • Mitigation measures are documented in the EIS to avoid and minimise impacts on habitat corridors • Implementation of a habitat connectivity strategy; offsetting residual impacts through a Strategic Offset Delivery Agreement (SODA) guided by a regional conservation investment strategy to improve ecological connectivity	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Impacts on protected forests and ecological communities	• Avoided high-value conservation areas where possible • Adjusted corridor to reduce clearing and maintain habitat and minimise impacts on threatened ecological communities and species	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Stakeholders raised concerns about the corridor through State forests, biodiversity impacts of overhead versus underground options, and sought opportunities to contribute to surveys, pre-clearing activities, and information sharing	• Stakeholders sought minimisation of biodiversity impacts in sensitive areas, involvement in future biodiversity surveys, and ongoing representation through the environmental seat on the HCCRRG	*Chapter 2 (Strategic context)* *Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Bushfire risk and vegetation loss	• Integrated bushfire-resilient design and mitigation measures; firebreaks and emergency access routes included in design	*Chapter 4 (Project description)* *Chapter 21 (Hazards and risk)* *Technical Report 14 – Bushfire risk assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in EIS
Visual and landscape impacts	Visual intrusion in scenic and natural landscapes	• Detailed assessment of visual impact and alternative locations • Alternatives and options incorporated into engagement materials and discussed with community members • Implementation of mitigation/management measures during construction of the project to minimise impacts on landscape and visual amenity (including minimising vegetation clearing between tourism and cultural viewpoints)	*Chapter 10 (Landscape and visual)* *Technical report 3 -Landscape character and visual impact*
Project justification and alternatives	Feasibility of undergrounding in environmentally sensitive areas	• Detailed assessments were undertaken for alternative options, including undergrounding the transmission line • Undergrounding options were explored and provided comparison or impact and feasibility • Alternatives and options were incorporated into engagement materials and discussed with community members	*Chapter 3 (Alternatives and options)*
Strategic context	Consistency with environmental policy and NSW biodiversity strategies	• The EIS demonstrates how the project aligns with relevant NSW and Commonwealth environment and biodiversity requirements, including principles for impact avoidance, minimisation and offsetting	*Chapter 2 (Strategic context)* *Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in EIS
Construction impacts	Concerns about impacts to access tracks and conservation areas used by the public	• Identified access points and recreational zones during construction planning • Temporary closures to be managed with signage and stakeholder notification	*Chapter 6 (Engagement)* *Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Desire for continued input into offset planning and post-approvals management, including helping with pre-clearing activities and fauna relocation opportunities	• An offset advisory process will be established through EIS commitments, with ongoing opportunities for community group involvement in pre-clearing surveys and fauna management • EnergyCo are committed to providing regular updates and input through the HCCRRG and post-approval engagement	*Chapter 6 (Engagement)* *Chapter 8 (Biodiversity)*

6.5.10 Government agencies and departments

Since late-2022, EnergyCo has engaged extensively with Commonwealth and NSW government agencies, including the Department of Defence and Forestry Corporation NSW, to address operational, land use, safety and environmental matters. Engagement included targeted workshops, technical briefings and joint site tours, which informed corridor refinement, operational risk management, access and traffic protocols, and heritage and biodiversity planning.

Stakeholders include:

- NSW Department of Planning, Housing and Industry (DPHI)
- Heritage NSW
- NSW Environment Protection Authority (EPA)
- NSW Rural Fire Service (RFS)
- NSW Department of Primary Industries (DPI)
- Transport for NSW (TfNSW)
- NSW National Parks and Wildlife Service (NPWS)
- NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW)
- Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW)
- Civil Aviation Safety Authority (CASA).

Table 6.10 summarises the issues raised and how they will be addressed through post-approval planning.

Table 6.10 Summary of government department and agency feedback

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Commonwealth agencies			
Airservices Australia			
Construction impacts	Potential impacts to Precision/Non-Precision Navigation Aids, Anemometers, HF/VHF/UHF Communications, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links	• Airservices Australia indicated no objections to the project proceeding • Vertical obstacle notification will occur upon finalised design and prior to construction	*Chapter 21 (Hazards and risk)* *Technical Report 16 – Aviation impact assessment*
	Consultation on aviation safety and potential impacts; use of cranes, helicopters, drones during construction	• Detailed assessment of aviation impacts has been undertaken. The project would not impact any certified or non-certified aerodromes during construction or operation • Further consultation will be undertaken prior to construction to notify Airservices Australia, Department of Defence, Hunter Valley Gliding Club, NSW Ambulance Service, NSW National Parks and Wildlife Service, Forestry Corporation of NSW and NSW Rural Fire Service of planned use of cranes, helicopters and drones	*Chapter 21 (Hazards and risk)* *Technical Report 16 – Aviation Impact Assessment* *Chapter 6 (Engagement)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Australian Rail Track Corporation (ARTC)			
Construction impacts	Track crossing design standards Service interruption protocols	• Rail-crossing agreements will be developed in consultation with ARTC. Detailed rail possession planning will also be undertaken prior to construction	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport*
Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW)			
Environmental Impacts	Impacts to matters of national environmental signification (MNES)	• The Biodiversity Development Assessment Report (BDAR) assesses impacts to Commonwealth listed threatened species and communities and impacts to biodiversity on Commonwealth land in the Singleton Military Area	*Chapter 8 (Biodiversity)* *Chapter 9 (Aboriginal heritage)* *Technical Report 1 – Biodiversity development assessment report* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
	Impacts to Commonwealth land (Singleton Military Area) particularly noting controlling provisions of heritage, landscape and visual and biodiversity	• Impacts to biodiversity on Commonwealth land (Singleton Military Area) has been assessed in various technical reports included in the EIS	*Chapter 8 (Biodiversity)* *Chapter 10 (Landscape and visual)* *Technical Report 1 – Biodiversity development assessment report* *Technical Report 2 – Aboriginal cultural heritage assessment* *Technical Report 3 – Landscape character and visual impact assessment*
Department of Defence - Singleton Military Area			
Construction impacts	Impacts on Defence road network and traffic movements	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment* *Chapter 3 (Alternatives and options)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Cultural heritage	Impacts on cultural heritage within Singleton Military Area	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
Design and route selection	Corridor through the Singleton Military Area Land use impacts and concern about impacts to operational activities on Singleton Military Area	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 3 (Alternatives and options)* *Chapter 12 (Land use and property)* *Chapter 21 (Hazards and risk)*
Environmental impacts	Environmental and heritage risks within Singleton Military Area	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 8 (Biodiversity)* *Chapter 12 (Land use and property)* *Chapter 15 (Historic heritage)* *Technical Report 1 – Biodiversity development assessment report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Land use and property	Impacts on aviation operations, telecommunications systems, traffic, security and safety at Singleton Military Area	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 3 (Alternatives and options)* *Chapter 12 (Land use and property)* *Chapter 21 (Hazards and risk)*
	Impacts on roads	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Risks to technical, environment, engineering, traffic, security and safety	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 3 (Alternatives and options)* *Chapter 12 (Land use and property)* *Chapter 21 (Hazards and risk)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
	Concern over impacts to training grounds	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 12 (Land use and property)*
Project justification and alternative	Strategic planning, zone/master planning risks	• Options assessment undertaken in accordance with the Department of Defence requirements • Options included detailed assessment of onsite considerations (impact on current use and impact on infrastructure and services) • Defence Site Selection Board process completed • Preferred alignment through Singleton Military Area determined by Department of Defence	*Chapter 3 (Alternatives and options)* *Chapter 12 (Land use and property)*
NSW Government agencies			
Crown Lands			
Land use and property	Licence requirements on Crown reserves Public-land access controls	• Executed easement licences under the *Crown Land Management Act* • Detailed assessment of land use and property has been undertaken to avoid and minimise impact where possible • Mitigation measures during construction will be outlined in localised traffic management plans (including public access restrictions and communication strategies)	*Chapter 12 (Land use and property)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Conservation, Programs, Heritage and Regulation (CPHR)			
Environmental impacts	Vegetation mapping, candidate species and species survey methodology Approach to partial loss and potential for verification process to be included in approval Recommendation to use new Remote Assessment Guidelines to reduce assumed presence for impacted species Biodiversity offsets	• Extensive and regular engagement with CPHR 2024/2025 • Draft Biodiversity Development Assessment Report (BDAR) shared and collaborative revisions and updates progressed on the BDAR • In principle agreement reached regarding application of partial loss within BDAR and BAM-C and potential verification process • Commitment to reducing assumed presence through additional survey and/or Remote Assessment Guidelines • Biodiversity offsets to be secured through a Strategic Offset Delivery Agreement	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Department of Planning, Housing and Infrastructure (DPHI)			
Environmental impacts	EIS exhibition requirements EIS submissions formatting EIS mapping standards	• Produce materials per DPHI's "State significant development guidelines – preparing an environmental impact statement" • Host accessible drop-in events	*Chapter 1 (Introduction)* *Chapter 6 (Engagement)*
	Early agreement on biodiversity survey methodology and BDAR with Conservation Programs, Heritage and Regulation (CPHR)	• Extensive and regular engagement with CPHR since alternatives and options assessment and Scoping Report – 2024/2025 • Sought advice on survey methodology and shared early findings and draft BDAR with CPHR	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Impact avoidance and minimisation	• Biodiversity and Aboriginal heritage impact avoidance and minimisation has been prioritised through route refinement, project design and tower placement. Sensitive areas have been avoided where possible to reduce impacts	*Chapter 8 (Biodiversity)* *Chapter 9 (Aboriginal heritage)* *Technical Report 1 – Biodiversity development assessment report* *Technical Report 2 – Aboriginal cultural heritage assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
	Strategic offset delivery	• EnergyCo intends to enter into a SODA for the HTP with the Secretary of the NSW DCCEEW. Under this agreement, responsibility for delivering biodiversity offsets will be transferred to DCCEEW with commensurate funding	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
Construction impacts	Specific attention to be given to traffic and transport and social impact assessment	• Early engagement regarding traffic impacts, analysis and design with councils and Transport for NSW (TfNSW) • Mitigation measures will be included within traffic management plans post-approval (including dilapidation surveys, road/intersection upgrades, designated vehicle routes and time-of-day restrictions)	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
Social impacts	Specific attention to be given to traffic and transport and social impact assessment	• Extended engagement undertaken for social impact assessment and some immediate responses actioned including arranging local mental health support for landowners	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Department of Primary Industries – Agriculture			
Environmental impacts	Assessment of impacts on key fish habitat	• Detailed assessment of biodiversity undertaken to avoid and minimise impacts including a standalone aquatic biodiversity impact assessment • Implementation of mitigation measures during construction will be outlined in the biodiversity management plan • A letter summarising key EIS early findings on agriculture, biodiversity, contamination, soils and surface water and groundwater was sent to DPI in May 2025 with an opportunity to receive a project briefing	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
Land use and property	Potential impacts on agricultural land use, farming operations, biosecurity and long-term productivity	• DPI Agriculture provided advice about the assessment of the project's impacts on agricultural land • Detailed assessment of agriculture impacts have been undertaken to minimise and avoid impacts where possible including mitigation measures to manage impacts	*Chapter 12 (Land use and property)* *Chapter 13 (Agriculture)* *Technical Report 5 – Agriculture impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Environment and Heritage NSW			
Cultural heritage	Archaeological methodology Management of known and potential heritage sites	• Prepared Archaeological Method Statement for test excavations including defined monitoring and salvage requirements • Detailed assessment of cultural heritage impacts have been undertaken to avoid and minimise impacts where possible including mitigation measures to manage direct and indirect impacts	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 – Aboriginal cultural heritage assessment* *Chapter 15 (Historic heritage)* *Technical Report 7 – Historical heritage impact assessment*
Environment Protection Authority (EPA)			
Construction impacts	Air quality and emissions Dust modelling criteria Emission control measures	• The air quality impact assessment completed as part of the EIS addresses these issues • An Air Quality Management Plan will be prepared post-approval to address dust-suppression measures	*Chapter 22 (Other matters)* *Technical Report 18 – Air Quality and Greenhouse Gas Report*
Fire and Rescue NSW			
Construction impacts	Fire safety planning Construction-phase fire safety standards	• Detailed assessment of bushfire impacts have been undertaken. Mitigation measures will be outlined within a bushfire emergency management plan, post approval	*Chapter 21 (Hazards and risk)* *Technical Report 14 – Bushfire risk assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Forestry Corporation NSW (FCNSW)			
Community engagement process	FCNSW requested the opportunity to review and approve all proposed external engagement materials that reference FCNSW, its land, or its operations, prior to public release	• FCNSW actively reviews and comments on relevant draft materials prior to external release, in line with the agreed engagement protocol documented in the FCNSW Memorandum of Understanding	*Chapter 6 (Engagement)*
Construction impacts	Heavy-vehicle use of Martinsville Hill Rd and interaction with FCNSW harvesting schedules	• Detailed traffic and transport assessment undertaken to avoid and minimise impacts • Mitigation strategies during construction will be outlined within localised traffic management plans (including dilapidation surveys, road/intersection upgrades, designated heavy vehicle routes, and time-of-day restrictions for heavy vehicles in certain locations) • The project design was further refined to reduce clearing and biodiversity impacts compared to the other options considered in the area; and reduces potential impacts to FCNSW operations as compared to the initial concept design	*Chapter 11 (Traffic and transport)* *Chapter 24 (Environmental management)* *Technical Report 4 – Traffic and transport impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
	Timber harvest scheduling Recreation access planning	• Detailed traffic and transport assessment undertaken to avoid and minimise impacts • Mitigation strategies during construction will be outlined within localised traffic management plans (including dilapidation surveys, road/intersection upgrades, designated heavy vehicle routes, and time-of-day restrictions for heavy vehicles in certain locations)	*Chapter 11 (Traffic and transport)* *Chapter 12 (Land use and property)* *Chapter 14 (Social)* *Technical Report 4 – Traffic and transport impact assessment* *Technical Report 6 – Social impact assessment*
	Alternate ways to access tower locations in Olney State Forest	• While EnergyCo has tried to accommodate the proposed access points, where possible, not all routes are feasible due to the key environmental, construction and planning constraints	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Martinsville Hill Road haulage and access impacts	• Haulage routes assessed; post construction assessment surveys proposed; maintenance schedule agreed • Final protocols to be confirmed during detailed design	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Access to forestry operations during construction	• Construction access routes discussed with FCNSW • Operational access needs to be confirmed prior to construction • Traffic management to include forestry users	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
Cultural heritage	Potential impacts on Wishing Well archaeological site	• Archaeological method statement prepared • Salvage excavation will be completed prior to access-track upgrades • Heritage recording lodged	*Chapter 15 (Historic heritage)* *Technical Report 7 – Historic heritage*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Environmental impacts	Avoiding sensitive valley floor routes towards Dooralong and minimising disturbance in conservation areas	• Confirmed corridor stays on ridgetop tracks; adjusted corridor to reduce environmental disturbance	*Chapter 3 (Alternatives and options)*
	Bushfire risk near switching station and transmission line in Olney State Forest	• Corridor and buffer adjustment to maintain fire-fighting access; bushfire-resilient design measures adopted in construction specifications	*Chapter 21 (Hazards and risk)* *Technical Report 14 – Bushfire risk assessment*
Land use and property	Timber-harvest interruptions Impacts on recreational users	• Regular operational-planning meetings to agree to contractor access windows • Traffic-management plans will include designated forestry-vehicle routes • Ongoing consultation and notifications to user groups prior to and during construction	*Chapter 14 (Social)* *Chapter 12 (Land use and property)* *Technical Report 6 – Social impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Hunter Water			
Design and route selection	Stakeholders flagged potential impacts on network reliability and continuity	• Minor works to protect or adjust Hunter Water assets will be identified through final design and communicated to the construction contractor as part of detailed construction and utility management planning	*Chapter 4 (Project description)*
Construction impacts	Raised concerns about water use, including sourcing for construction camps and potential impacts on local water supplies and infrastructure	• Consideration of water supply and licensing. Investigations identified water supply options with sufficient water flows and reliable yield • Surface water supply options will be subject to negotiation and agreement with the owners of the supply • The feasibility of surface water extraction locations to be confirmed as part of the detailed design and construction planning	*Chapter 17 (Surface water)* *Technical Report 10 – Surface water*
NSW Ambulance			
Construction impacts	Bushfire risk management, emergency vehicle access and operational interfaces	• Emergency services stakeholders, including NSW Rural Fire Service, Fire and Rescue NSW and NSW Ambulance Service, were engaged on bushfire risk management, emergency vehicle access and operational interfaces • Further consultation will be undertaken with these agencies during post-approval planning to finalise a bushfire emergency management and evacuation plan • Emergency egress routes and emergency helipads have been identified for the purposes of emergency scenario planning	*Chapter 4 (Project description)* *Chapter 11 (Traffic and transport)* *Chapter 21 (Hazards and risk)* *Technical Report 4 – Traffic and transport impact assessment* *Technical Report 14 – Bushfire risk assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW)			
Environmental impacts	Threatened species	• Detailed assessment of biodiversity impacts (including threatened species) • Avoidance and minimisation of impacts a priority in the design of the project • Implementation of mitigation and management measures during construction and operation to minimise impacts on biodiversity including implementation of biodiversity management plan • Biodiversity offsets would be required to offset impacts of the project on threatened species	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Aquatic ecology	• Detailed assessment of biodiversity impacts (including aquatic ecology) • Avoidance and minimisation of impacts a priority in the design of the project • Appropriate ground disturbance and water management measures will be implemented during construction and operation to minimise impacts on aquatic ecology and included in a soil and water management plan and/or biodiversity management plan	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
National Parks and Wildlife Service (NPWS)			
Environmental impacts	Habitat connectivity Koala corridor linkages Biodiversity offsets	• Mitigation measures to avoid and minimise impacts on habitat corridors, including a connectivity strategy and installation of under-transmission line glider poles, retained tall tree stumps and/or rope bridges) • EnergyCo intends to enter into a SODA for the HTP with the Secretary of the NSW DCCEEW. Under this agreement, responsibility for delivering biodiversity offsets will be transferred to DCCEEW with commensurate funding	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Minimising impacts to Corrabare North Flora Reserve and Jilliby State Conservation Area Minimising impacts to biodiversity and Aboriginal heritage	• Design changes in the south to avoid placing the new transmission line in Jilliby State Conservation Area • Sharing early findings for Aboriginal heritage and biodiversity within Corrabare North Flora Reserve and Jilliby State Conservation Area	*Chapter 3 (Alternatives and options)* *Chapter 8 (Biodiversity)* *Chapter 9 (Aboriginal heritage)* *Technical Report 1 – Biodiversity development assessment report* *Technical Report 2 – Aboriginal cultural heritage assessment*
	Concerns about removing a historical site (Wishing Well)	• Mitigation measures will be outlined within the historic heritage management plan post approval, Mitigation measures may include: Interpretive signage or a memorial marker at or near the site • Digital heritage records (e.g. virtual models, photographs, historical documentation). Incorporating cultural knowledge into broader heritage education efforts	*Chapter 15 (Historic heritage)* *Technical Report 8 – Historic heritage*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
NSW Rural Fire Service (RFS)			
Construction impacts	Emergency-vehicle access corridors	• Emergency egress routes and emergency helipads have been identified for the purposes of emergency scenario planning • Traffic and transport management plan and bushfire emergency management and evacuation plan to be implemented during construction	*Chapter 21 (Hazards and risk)* *Technical Report 14 – Bushfire risk assessment* *Technical Report 4 – Traffic and transport impact assessment*
Environmental impacts	Fire-management zone requirements	• Asset protection zones within the transmission line easement and around switching stations sites, construction support sites and temporary worker accommodation incorporated into the design of the project • Bushfire emergency management and evacuation plan to be implemented during construction	*Chapter 21 (Hazards and risk)* *Technical Report 14 – Bushfire risk assessment*
SafeWork NSW			
Construction impacts	Construction site safety standards Worker induction and supervision requirements	• SafeWork Codes of Practice will be adopted in the Environment Management System • Mandatory safety inductions to be implemented for all workers	*Chapter 21 (Hazards and risk)* *Technical report 8 – Noise and vibration* *Technical report 15 – Preliminary risk screening* *Technical report 17 – Electric and magnetic fields*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Transport for NSW (TfNSW)			
Construction impacts	Heavy-vehicle routing	• Proposed heavy haulage routes assessed in consultation with TfNSW; regional and state road network capacity reviewed through updated traffic modelling • OSOM (oversize overmass) vehicle movements to be managed through approved haulage routes and time-of-day controls	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Intersection upgrades	• Intersections requiring upgrades identified (e.g. Freemans Drive/Wyee Road/Mandalong Road); concept designs prepared; further detailed design to be developed in consultation with TfNSW during the detailed design and construction phase	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Coordination with other planned upgrades	• Coordination meetings held to align HTP construction with other planned TfNSW upgrades (e.g. Mandalong Road) to minimise overlap and avoid cumulative congestion impacts	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Rail possessions and stringing over state rail corridors	• Safe stringing methodologies to be developed for crossings over rail lines • Construction timing and rail possessions to be planned in close coordination with Sydney Trains/ARTC and TfNSW • Protective barriers and safe working protocols to be included in contractor plans	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Construction Traffic Management Plan (CTMP) approval and oversight	• TfNSW will continue to be engaged during detailed design to review and approve CTMPs; plans will include haulage route protocols, intersection upgrades, road safety measures, and condition surveys for state road assets	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
	OSOM permits, notifications and road closures	• All OSOM movements and any required state road closures will be notified to TfNSW in advance • Approvals to be obtained through existing heavy vehicle permit processes • Public notifications will be implemented for any significant State road impacts	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
(Sydney Trains within TfNSW) Construction impacts	Understand impact of stringing over rail lines and operations	• Construction methodologies for rail works, including possessions, protective barriers, and safe working procedures to be developed as part of the EMS	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*

6.5.11 Local government

EnergyCo held targeted consultations with 5 local councils — Central Coast, Cessnock, Singleton, Lake Macquarie and Muswellbrook — to address their unique concerns and priorities.

Key topics included cumulative impacts from overlapping infrastructure projects, temporary workforce accommodation needs, impacts and upgrade requirements for council-owned roads, waste infrastructure capacity, construction water demand and legacy benefit opportunities for each local government area.

The outcomes of these discussions, including agreed mitigation measures and commitments, are summarised in Table 6.11.

Table 6.11 Summary of council feedback

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
Central Coast Council			
Construction impacts	Use of local roads through construction and access	• Detailed assessment of traffic and transport impacts • Mitigation and management measures will be implemented during construction of the project to minimise impacts on traffic/transportation (including dilapidation surveys, road/intersection upgrades, designated heavy vehicle routes, and time-of-day restrictions for heavy vehicles in certain locations) • Ongoing consultation with council during detailed design • Construction traffic management plan will be prepared and submitted to the council for review	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Need to review and approve sediment and erosion management plan	• Soil and water management plans will be prepared by and submitted to the council for review	*Chapter 17 (Surface water)*

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
	Traffic volumes on local roads; request for dilapidation surveys	• Pre- and post-construction assessment surveys will be undertaken and results shared with the council	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
Environmental impacts	Queries on vegetation removal data and biodiversity impacts	• Detailed assessment of biodiversity impacts • Avoidance and minimisation of impacts a priority in the design of the project • Mitigation and management measures will be implemented during construction and operation to minimise impacts on biodiversity including implementation of biodiversity management plan • Biodiversity offsets would be required to offset impacts of the project • Vegetation clearing prior to and during construction will be recorded	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
	Strategic offset delivery	• EnergyCo intends to enter into a SODA with the Secretary of the NSW Department of Climate Change, Energy, Environment and Water (NSW DCCEEW) for the HTP. Under this agreement, responsibility for delivering biodiversity offsets will be transferred to DCCEEW with commensurate funding	*Technical Report 1 – Biodiversity development assessment report*

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
Social and economic	Support for benefit-sharing strategy	• EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region. The project's construction phase represents a significant opportunity to deliver meaningful, long-term improvements to community infrastructure and services. Characteristics of the program, its delivery and key initiatives will be refined through stakeholder, community, and regulator engagement during project development and detailed design. The program will have a governance framework that underpins the allocation and management of funds and will ensure benefits are shared with the local communities hosting the renewable energy infrastructure, including the HTP, that will enable the renewable energy transition	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
Cessnock City Council			
Aboriginal heritage	Concern that cultural heritage sites may become more accessible	• Detailed assessment of Aboriginal heritage impacts • Avoidance and minimisation of impacts a priority in the design of the project • Mitigation and management measures will be implemented during construction and operation to minimise impacts on Aboriginal heritage including a site condition assessment (that will include consideration of increased access to Aboriginal sites and places as a result of the establishment and maintenance of the transmission easement) and the implementation of an Aboriginal cultural heritage management plan	*Chapter 9 (Aboriginal heritage)* *Technical Report 2 - Aboriginal Cultural Heritage Assessment Report*
Construction impacts	Queries on design and use of Wollombi Road support site	• Final site layout to be confirmed during detailed design. Council will continue to be engaged as the design develops	*Chapter 4 (Project description)*

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
	Use of local roads through construction and access	• Detailed assessment of traffic and transport impacts • Mitigation and management measures will be implemented during construction of the project to minimise impacts on traffic/transportation (including dilapidation surveys, road/intersection upgrades, designated heavy vehicle routes, and time-of-day restrictions for heavy vehicles in certain locations) • Ongoing consultation with council during detailed design • Construction traffic management plan will be prepared and submitted to the council for review	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Interaction with Wollombi Road upgrade	• Detailed assessment of cumulative impacts. Proposed Wollombi Road Upgrades do not overlap with construction timeframe of the HTP	*Chapter 23 (Cumulative impacts)*
	Concerns about Pokolbin Mountains Road and Mount Baker Road maintenance	• The project would rely on the use of existing public roads during construction and operation of the project. Upgrades are proposed to Mount Baker Road and Pokolbin Mountain Road • Road pre construction assessment surveys and routine inspections will be completed prior to construction and during construction along all nominated construction routes on local roads and existing access tracks to ensure that routes are maintained to safe standard during construction • Where rectification works are required due to project impacts, consultation with the appropriate road authority will be undertaken to confirm the scope of the work required	*Chapter 4 (Project description)* *Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
Environmental impacts	Impacts on tourism areas (vineyards, scenic routes)	• Visual Impact Assessment undertaken; mitigation measures detailed	*Chapter 10 (Landscape and visual)* *Technical Report 3 - Landscape character and visual impact*
	Request regular updates on offset strategy	• Ongoing briefings with both Council and RRG	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
Social and economic	Support for benefit-sharing package	• EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
Lake Macquarie City Council			
Construction impacts	Freemans Drive construction support site plan	• Proposed location of Freemans Drive construction support site including workers accommodation outlined in EIS • Final site layout/ plan will be done by the design-and-construction contractor	*Chapter 4 (Project description)*
	Use of local roads through construction and access	• Completed traffic and transport impact assessment. Ongoing consultation with council during detailed design. Will be detailed in the Traffic and Transport Management Plan	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
	Intersection upgrades at Freemans Drive/Wyee Road/Mandalong Road; impacts from nearby construction support site	• Transport for NSW-led upgrades identified. Detailed design for local road upgrades will be provided to the relevant council for review	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment* *Chapter 23 (Cumulative impacts)*
	Mandalong Road upgrade overlapping construction zones	• Coordination will be undertaken with Transport for NSW to minimise construction conflicts during detailed design and delivery phase	*Chapter 11 (Traffic and transport)* *Chapter 23 (Cumulative impacts)* *Technical Report 4 – Traffic and transport impact assessment*
Environmental impacts	Interest in biodiversity offsets for the project	• EnergyCo has provided regular updates on the project's biodiversity offset approach through council briefings and through the RRG • EnergyCo intends to enter into a SODA for the HTP with the Secretary of the NSW DCCEEW. Under this agreement, responsibility for delivering biodiversity offsets will be transferred to DCCEEW with commensurate funding	*Chapter 8 (Biodiversity)* *Technical Report 1 – Biodiversity development assessment report*
Social and economic	Support for benefit-sharing package	• EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
Muswellbrook Shire Council			

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
Construction impacts	Cumulative impacts of multiple simultaneous projects in Muswellbrook LGA	• Mitigation measures coordinated across overlapping works through regular briefings and regional coordination meetings between EnergyCo and Council, covering the full portfolio of projects within the LGA	*Chapter 23 (Cumulative impacts)*
	Peak-hour impacts on Hebden Road adjacent to support camp	• Traffic modelling confirmed mitigation needs; measures will be incorporated into a Traffic and Transport Management Plan	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Preference for treated wastewater at Hebden Road camp to reduce impacts on potable water	• Water use and management, including opportunities to use treated wastewater for non-potable purposes, will be addressed through the contractor's detailed design and site water management plans	*Chapter 4 (Project description)*
	Use of local roads through construction and access	• Completed traffic and transport impact assessment. Ongoing consultation with council during detailed design. Will be detailed in the Traffic and Transport Management Plan	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
Environmental impacts	Need for Golden Highway visual impact assessment and screening plans	• Visual Impact Assessment completed	*Chapter 10 (Landscape and visual)* *Technical Report 3 - Landscape character and visual impact*

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
Social and economic	Request Council representation on expanded RRG	• Mayor became a member of the RRG in May 2025	*Chapter 6 (Engagement)* *Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
	Support for legacy benefits and benefit-sharing strategy	• EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region. The project's construction phase represents a significant opportunity to deliver meaningful, long-term improvements to community infrastructure and services. Characteristics of the program, its delivery and key initiatives will be refined through stakeholder, community, and regulator engagement during project development and detailed design. The program will have a governance framework that underpins the allocation and management of funds and will ensure benefits are shared with the local communities hosting the renewable energy infrastructure, including the HTP, that will enable the renewable energy transition	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
	Temporary accommodation demand and local economic opportunities	• Proposed temporary construction support site including workers accommodation on Hebden Road included in EIS • EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 4 (Project description)* *Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
Singleton Council			
Construction impacts	Multiple overlapping projects in Singleton LGA	• Ongoing coordination with other EnergyCo projects and council to plan and manage construction impacts and reduce disruption where possible on local roads	*Chapter 23 (Cumulative impacts)*

Theme	Issues and Feedback	How topic has been addressed	Where addressed in this EIS
	Impacts on Pikes Gully Road, Lemington Road and Gouldsville Road, and requests for upgrades/intersection improvements	• Developed road-upgrade concept designs as part of the EIS. Detailed plans will be submitted for Council review during detailed design	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Use of local roads through construction and access	• Completed traffic and transport impact assessment. Ongoing consultation with council through detailed design. Will be detailed in the Traffic and Transport Management Plan	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Need for temporary construction camps and local economic benefit	• Proposed temporary construction support site including workers accommodation on Gouldsville Road included in EIS • Hunter-first procurement and employment commitments	*Chapter 4 (Project description)* *Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
	Council's own water infrastructure demands and need for timely information	• Committed to share designs related to council assets post-contractor appointment	*Chapter 4 (Project description)*
Social and economic	Desire for a meaningful benefit-sharing strategy	• EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter Central Coast region	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*

6.5.12 Network service providers and utility stakeholders

EnergyCo engaged with major network service providers and utilities to co-ordinate integration of the HTP with existing infrastructure. Workshops, technical briefings and site inspections addressed co-location, easement design, operational resilience and safety interface requirements. The outcomes of these consultations are summarised in Table 6.12.

Table 6.12 Summary of network service providers and utility stakeholder feedback

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
Transgrid			
Design and route selection	Co-location of high-voltage assets Easement widths	• Held joint corridor workshops • Agreed shared-use protocols and finalised easement dimensions	*Chapter 12 (Land use and property)* *Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
	Cut ins to 500 kV network and 330 kV network modifications	• Working closely with Transgrid to agree to designs	*Chapter 4 (Project description)*
Ausgrid			
Design and route selection	Modification of 11 kV distribution network Undercrossing of 66 kV and 132 kV sub-transmission network	• Initial coordination with Ausgrid has informed the reference design, with further detailed co-ordination to continue through delivery to plan modifications and manage any necessary outages	*Chapter 4 (Project description)* *Chapter 12 (Land use and property)*
Jemena			
Design and route selection	Modification and protection of Jemena assets	• Initial coordination with Jemena has informed the reference design, with further detailed co-ordination to continue through delivery to plan modifications and manage any necessary outages	*Chapter 21 (Hazards and risks)* *Chapter 12 (Land use and property)*

Theme	Issues and feedback	How topic has been addressed	Where addressed in this EIS
NBN/Telstra			
Design and route selection	Modification and protection of assets	• Initial coordination with NBN/Telstra has informed the reference design, with further detailed co-ordination to continue through delivery to plan modifications and manage any necessary outages	*Chapter 21 (Hazards and risks)* *Chapter 12 (Land use and property)*

6.5.13 Peak bodies, industry and business groups

Peak bodies, industry representatives, and regional business groups provided strategic feedback on the HTP, with a focus on economic development, land use, construction impacts particularly traffic disruption, visual impacts and opportunities for local participation in project delivery.

These stakeholders included chambers of commerce, tourism operators, regional business associations, and energy industry representatives. Their input helped shape aspects of the project related to route selection and corridor refinement near tourism and commercial precincts, regional workforce development, and the visibility and timing of construction activities.

Engagement occurred through targeted briefings, regional forums, written submissions, and ongoing liaison with sector representatives. Feedback from these groups informed the project's socio-economic impact assessment, visual mitigation measures, and benefit-sharing framework.

Table 6.13 Summary of feedback from peak bodies, business and industry

Theme	Issues and feedback	How addressed	Where addressed in EIS
Community engagement process	Requests for early and transparent communication to business owners	• Delivered direct mail, webinars, and local briefings to affected businesses; included business engagement in community updates	*Chapter 6 (Engagement)*

Theme	Issues and feedback	How addressed	Where addressed in EIS
Construction impacts	Potential impact on tourism and businesses due to traffic disruption	• A Traffic and Transport Management Plan will be prepared post approval and will include measures to reduce impact on local tourism and other businesses • Continue consultation with impacted stakeholders and provide notifications in advance of works	*Chapter 11 (Traffic and transport)* *Technical Report 4 – Traffic and transport impact assessment*
Project justification	Requests for transparency on route selection and undergrounding	• Presented detailed alternatives assessment, including trade-offs, at regional briefings and stakeholder forums	*Chapter 3 (Alternatives and options)*
Social and Economic	Concerns about overlap with other regional projects affecting infrastructure or business	• Co-ordinated consultation with REZ and other project teams; aligned communications on construction timing	*Chapter 23 (Cumulative impacts)*
	Interest in local procurement and SME opportunities	• Included business briefings in engagement program; highlighted procurement and employment pathways through the Hunter-first policy. Industry briefing and capability sessions were held. A supplier portal (ICN Gateway) was established • Industry briefings were held in August 2024 • Industry Briefing was facilitated in January 2025	*Chapter 14 (Social)* *Technical Report 6 – Social impact assessment*
Strategic context	Role of HTP in enabling regional investment and energy security	• Developed targeted messaging and included fact sheets outlining HTP's role in the NSW energy transition and benefits to regional economic growth	*Chapter 3 (Alternatives and options)*

6.6 Future engagement

6.6.1 Public exhibition

The next phase of engagement will occur during the public exhibition of the EIS. This is a formal statutory process led by DPHI, which invites community members, stakeholders, and government agencies to review the EIS and provide written submissions via the NSW Major Projects Planning Portal.

To support community participation, EnergyCo will host a series of community information sessions and drop-in events across the project impact area. These events will offer the opportunity to speak directly with subject matter experts, explore key EIS topics, and learn how to make a submission. Additional information will be shared through the project website, local displays, media and direct communication.

During the exhibition period, EnergyCo will also continue to engage with stakeholders ensuring that feedback channels remain open and accessible throughout the process.

Stakeholders will be able to continue contacting the HTP Community Team for information, and updates will remain available.

https://www.energyco.nsw.gov.au/projects/hunter-transmission-project

htp@energyco.nsw.gov.au

1800 645 972

6.6.2 Engagement after approval

If the project is approved, engagement will continue throughout detailed design, construction, operation, decommissioning, and rehabilitation.

EnergyCo will appoint a Network Operator (NO) who will be responsible for delivering the project. The NO will be required to:

- meet conditions of the planning approval
- maintain regular communication with stakeholders throughout construction
- manage impacts through site-specific engagement and mitigation strategies
- respond promptly and transparently to concerns.

Details of the key methods of engagement that may be used during future stakeholder engagement are presented in Table 6.14

Table 6.14 Engagement activities that may be used during project delivery (engagement Phase 3)

Engagement activity	Description/purpose
Infoline	A toll-free infoline to receive and respond to enquiries about project delivery (construction, operation, decommissioning and rehabilitation) from stakeholders – 1800 645 972 (9:00 am to 5:00 pm, Monday to Friday).
Email inbox	Dedicated email address to receive and respond to enquiries about project delivery from stakeholders – htp@energyco.nsw.gov.au
Website	To provide an overview of the project delivery activities; answers to frequently asked questions; and access to key documents.
E-newsletters	To update stakeholders on the progress of project delivery and to provide reference sources for further information.
Online interactive map	Allows stakeholders to understand where the project is located and how it interacts with other EnergyCo projects.
Meetings/briefings	To facilitate discussion about project delivery activities and timing; impact on the landowners/stakeholders; and to seek feedback and comments for consideration.

Approach to assessment

7

7 Approach to assessment

This chapter describes the flexible approach that was developed to enable ongoing refinement of design and construction methodology while allowing for robust assessment of potential environmental impacts associated with the construction and operation of the Hunter Transmission Project (HTP, 'the project').

Further details on the methodology for individual technical assessments (including details on surveys carried out and any key assumptions or limitations of the approach) are provided in each relevant environmental assessment chapter (see *Chapter 8 (Biodiversity)* to *Chapter 22 (Other matters)*).

7.1 Study areas used in the assessment of impacts

Within the environmental impact statement (EIS) various study areas have been adopted for the assessment of impacts for specific environmental matters. These study areas have been defined by technical specialists in response to relevant legislative, policy or guideline requirements and are generally larger than the area within which impacts from the project may occur (i.e. the project impact area – see *section 7.2*). This wider area assists with understanding the context of the project and assessment of impacts (direct, indirect and cumulative). The study areas and their use in each technical report are explained in the relevant environmental assessment chapter (see *Chapter 8 (Biodiversity)* to *Chapter 22 (Other matters)*).

7.2 Project impact area

A project impact area has also been used to define the likely areas to be affected by the construction and operation of the project, based on the project's concept design.

The general approach adopted for this EIS has been to conservatively assume that any area within the project impact area has the potential to be impacted by the project. This approach enables a level of flexibility for future design refinement while undertaking a rigorous level of impact assessment. The assessment therefore represents the potential 'worst case' impacts of the project. For example, the HTP corridor is 140 metres wide to account for the final easement (70 metres wide) plus construction works and ancillary sites (such as laydown areas and stringing sites). The entire 140 metre corridor would not be impacted by the project. This conservative approach to impact assessment is required because several aspects of the project design and construction methodology will continue to be refined and confirmed during detailed design.

The project impact area includes all areas that may be affected during construction and operation of the HTP. It includes:

- new Bayswater South and Olney switching station sites
- the transmission corridor connecting the new Bayswater South switching station to the Olney switching station (the corridor is around 140 metres wide however the transmission line easement would be 70 metres wide)
- the transmission corridor connecting the Bayswater South switching station to the existing 500 kilovolt (kV) transmission line near the Bayswater Power Station and the Olney switching station connecting to the existing 500 kV transmission line between Eraring Power Station and Kemps Creek
- upgrades to existing Bayswater and Eraring substations
- adjustments and upgrades to existing transmission lines
- access roads and tracks used during construction and operation of the project (existing and new)
- other ancillary works, including the establishment of temporary construction infrastructure such as construction support sites, laydown areas and stringing sites.

7.2.1 Construction impact area

The construction impact area represents the area proposed to be impacted during the construction of the project. The construction impact area is around 2351 hectares. A breakdown of the construction impact area is provided in Table 7.1.

Table 7.1 Area affected during construction of project

Project element	Construction impact area[1]
New transmission corridor	1573 ha
Adjustments and upgrades to existing transmission lines	303 ha
New switching stations (Bayswater South and Olney)	47 ha (26.6 ha Bayswater South and 20 ha Olney)
Upgrades to existing substation (Bayswater and Eraring)	1.4 ha (0.4 ha Bayswater and 1 ha Eraring)
Access tracks and road upgrades	459 ha
Construction support sites	69 ha
Ancillary works (laydown areas)	16 ha

1: Due to overlapping project elements, areas do not add up to 2351 hectares.

7.2.2 Operation impact area

The operation impact area is the area that may be impacted by the operation of the HTP and is much smaller than the construction impact area (i.e. around 1261 hectares). A breakdown of the operation impact area is provided in Table 7.2.

Table 7.2 Area impacted during operation of project

Project element	Operation impact area[1]
New transmission line easement	777 ha
Upgrades to existing transmission lines	303 ha
New switching stations (Bayswater South and Olney)	29 ha (15 ha Bayswater South and 14 ha Olney)
Upgrades to existing substations (Bayswater and Eraring)	1.4 ha (0.4 ha Bayswater and 1 ha Eraring)
Access tracks and road upgrades	249 ha

1: Due to overlapping project elements, areas do not add up to 1261 hectares.

7.3 Use of disturbance areas

The assessment of biodiversity impacts includes a disturbance area within the project impact area to provide a more accurate estimation of the likely magnitude of vegetation clearance required, and any associated biodiversity impacts. This assessment is in accordance with the requirements of the Biodiversity Assessment Method (BAM) 2020 (DPIE 2020c).

The disturbance area takes a more precise approach than the project impact area and represents areas of direct impacts such as full clearing at transmission towers and partial clearing within the transmission line easement. This approach was adopted to avoid a substantial overestimation of the likely biodiversity impacts and the associated quantity of biodiversity offsets required.

It is expected that the detailed design and final construction methodology for the project would result in biodiversity impacts that are similar or less than those indicated in this EIS. This is because the detailed design will continue to refine and reduce the disturbance area for the project.

The disturbance area is around 1266 hectares.

Different categories of disturbance are used in the biodiversity assessment, based on varying levels of vegetation impacts associated with different project activities. For further information on the application of the disturbance areas for the biodiversity assessment see *Chapter 8 (Biodiversity)* and *Technical Report 1 – Biodiversity development assessment report*.

7.4 Use of concept design for specialist assessments

The assessments in this EIS are informed by the project concept design, which includes transmission line design, tower foundation design, design of switching stations (Bayswater South and Olney), upgrade works at substations (Bayswater and Eraring) and a project constructability strategy (i.e. access tracks, construction support sites, worker accommodation facilities, stringing sites and laydown areas).

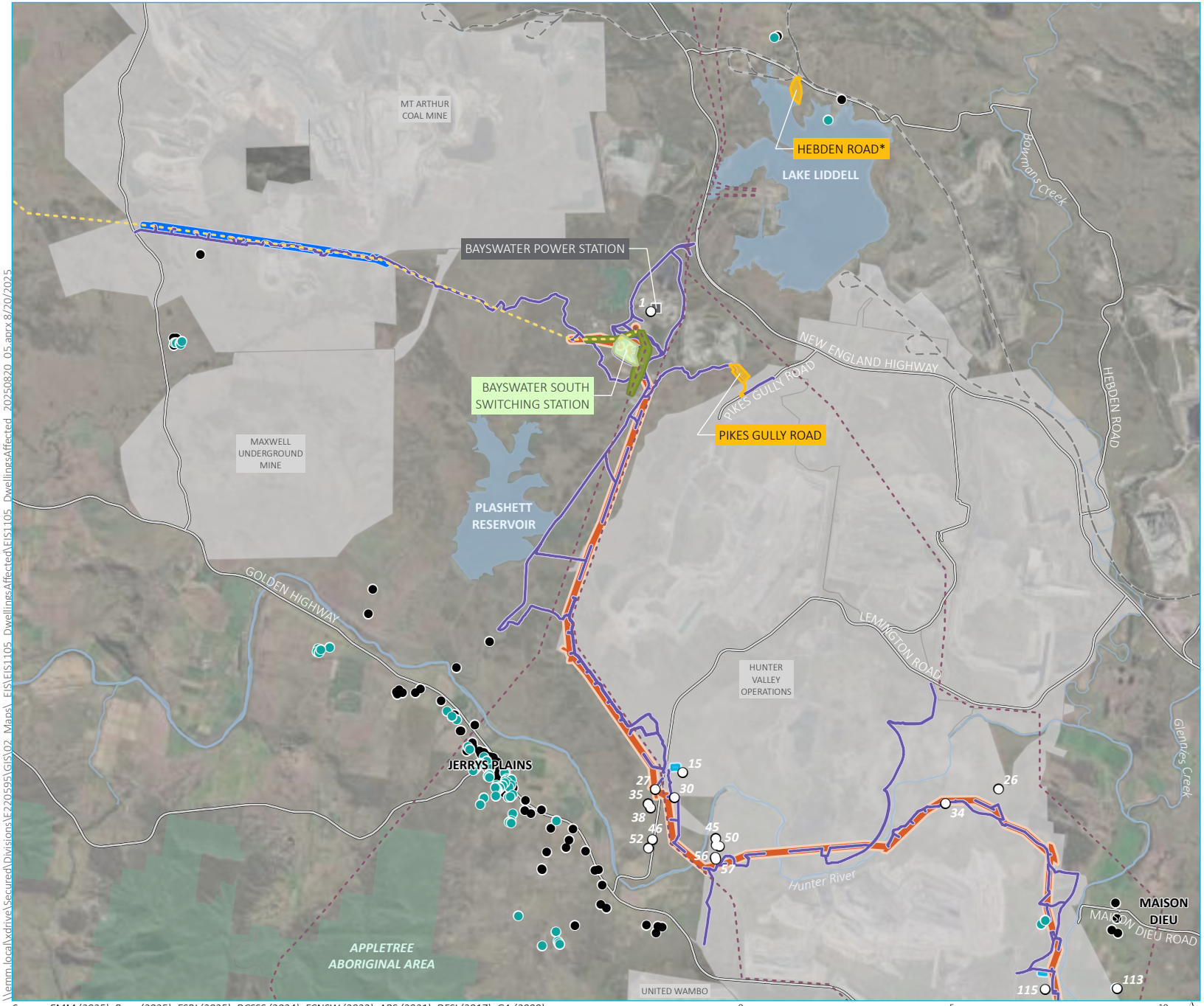
A corridor approach has been adopted for the transmission line rather than identification of individual tower locations to allow for maximum flexibility for detailed design to microsite towers to avoid and/or minimise adverse impacts. However, indicative locations for transmission line towers (from the project concept design) have been used by some specialist assessments, notably biodiversity and landscape character and visual amenity, to provide for more detailed analysis.

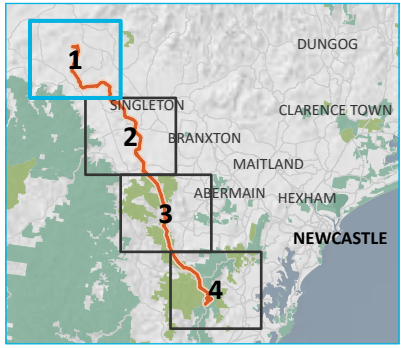
7.5 Sensitive receivers

For the purpose of this EIS, a sensitive receiver is defined as a location where people are likely to reside or work and includes residential dwellings, schools, hospitals, offices and public recreation areas. The sensitive receivers relevant to the assessment of the project were identified by reviewing aerial photography and where possible, or where uncertainties were identified in the aerial photography, these sensitive receivers were field validated. For some specific studies, the assessment of the project requires sensitive receivers to be defined using additional specific guidelines (such as the *Transmission Guideline, Technical Supplement for Landscape Character and Visual Assessment* (DPHI 2024a) (the Technical Supplement) for the visual impact assessment of private dwellings, and the Interim Construction Noise Guideline for noise and vibration impact).

Sensitive receivers for the assessment of the project, depending on the matter being considered (such as property and land use and visual impact), have also been defined as easement affected and non-easement affected.

The location of sensitive receivers relevant to the assessment of the project, including whether they are easement affected or non-easement affected are shown on Figure 7-1 below.





KEY

- Easement affected dwelling
- Non-easement affected dwelling
- Non-residential receiver

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

Sensitive receivers relevant to the assessment of the project
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 7.1

EMM
creating opportunities

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

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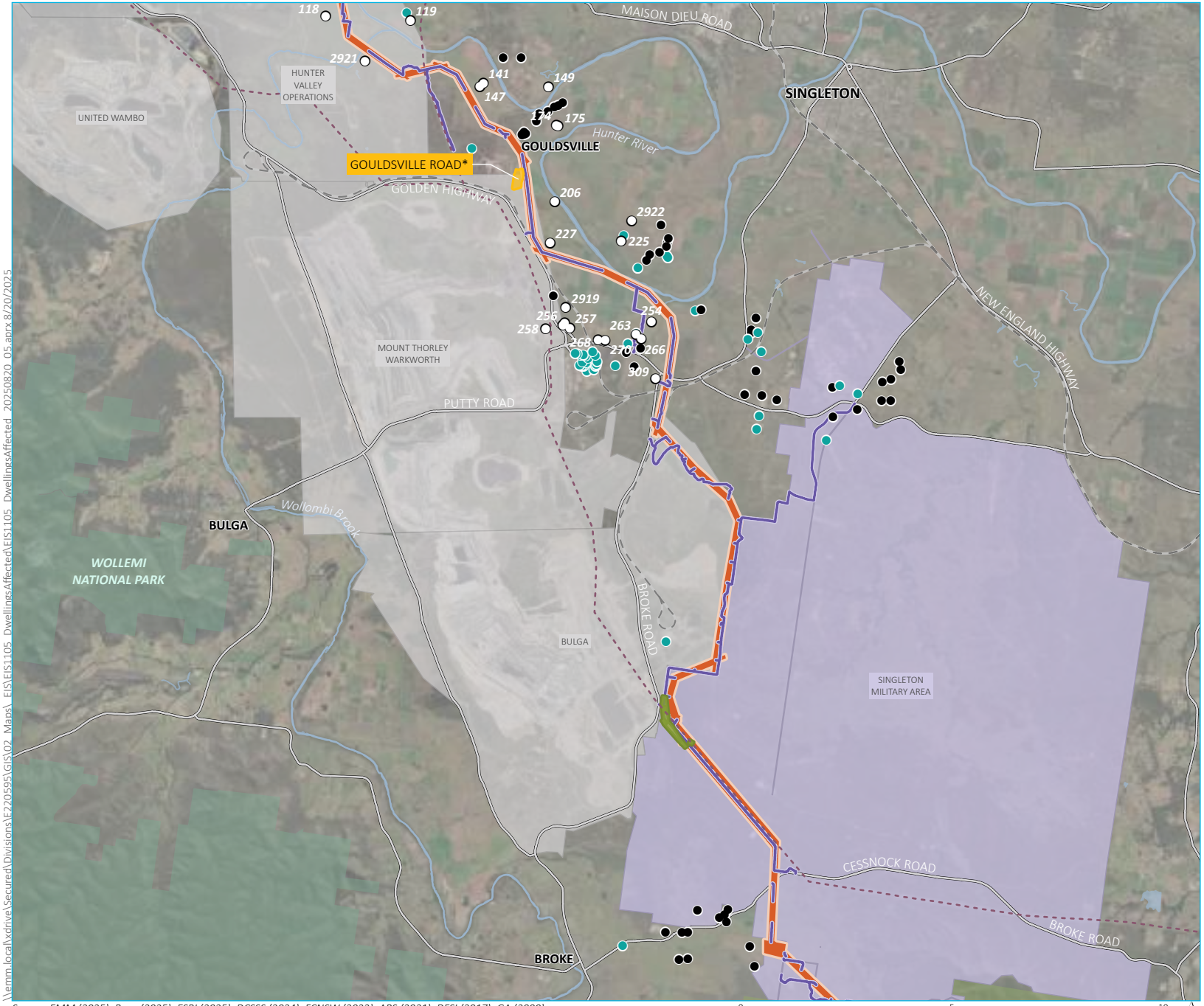

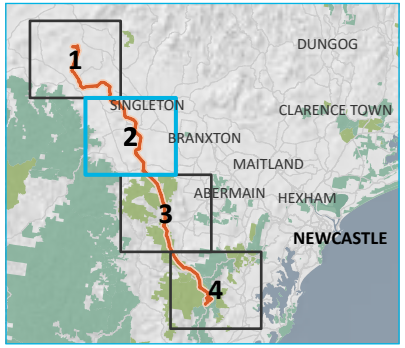

KEY

- Easement affected dwelling
- Non-easement affected dwelling
- Non-residential receiver

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

Sensitive receivers relevant to the assessment of the project
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 7.1

EMM
creating opportunities

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

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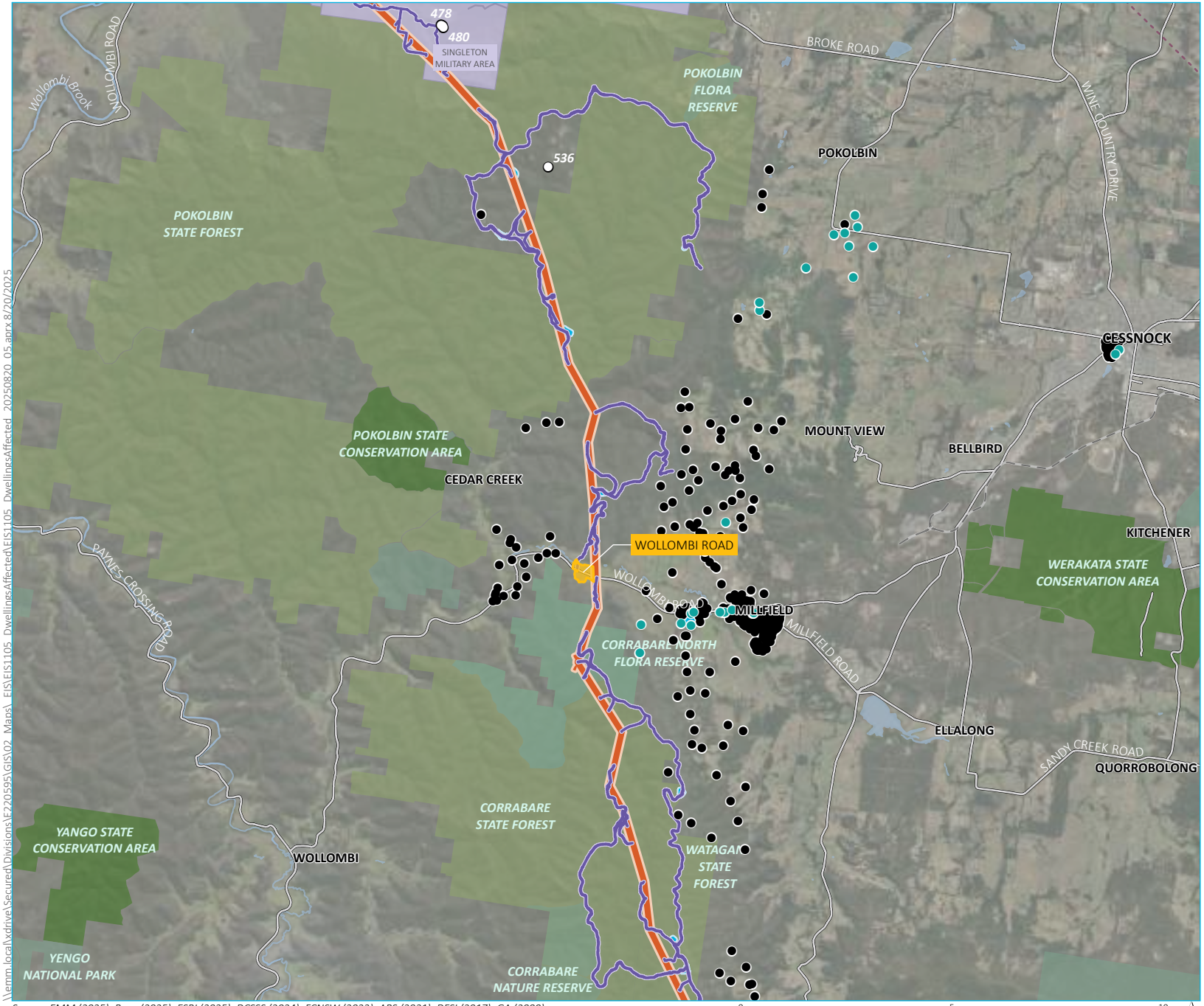

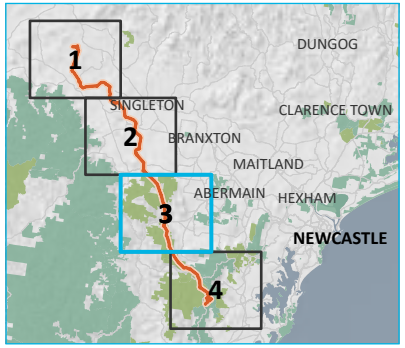

KEY

- Easement affected dwelling
- Non-easement affected dwelling
- Non-residential receiver

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

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

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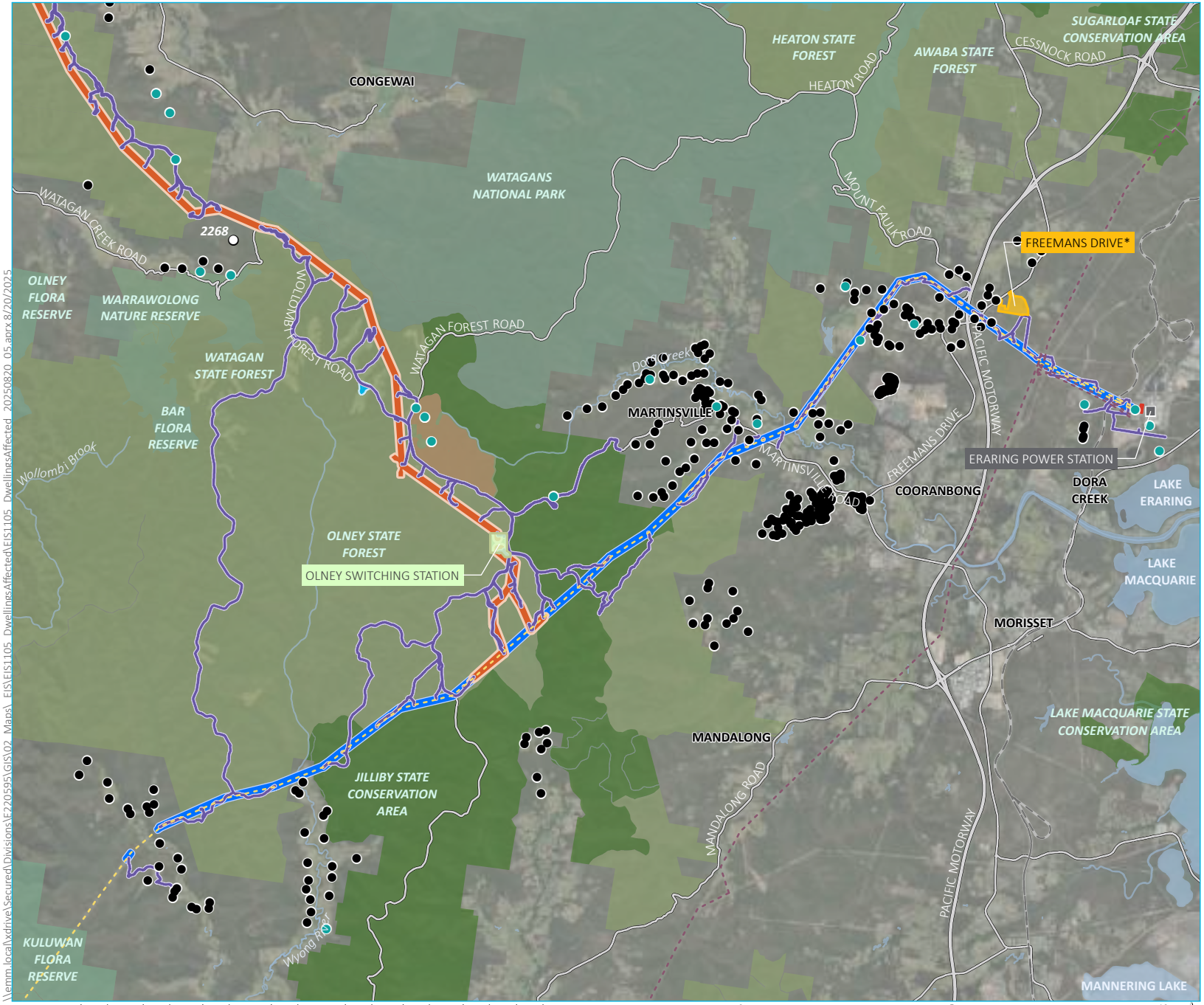
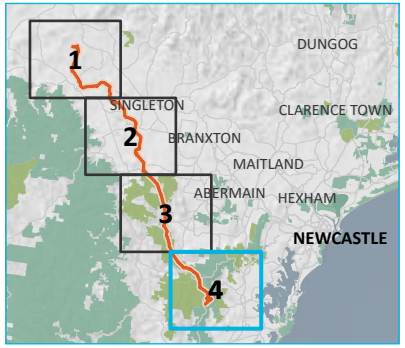
Sensitive receivers relevant to the assessment of the project
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 7.1

EMM
creating opportunities





KEY

- Easement affected dwelling
- Non-easement affected dwelling
- Non-residential receiver

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

Sensitive receivers relevant to the assessment of the project
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 7.1

EMM
creating opportunities

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

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Biodiversity

8

8 Biodiversity

This chapter provides a summary of the potential impacts of the Hunter Transmission Project (HTP, 'the project') on biodiversity and identifies appropriate mitigation and management measures. A detailed assessment is provided in *Technical Report 1 – Biodiversity development assessment report*. The relevant Planning Secretary's environmental assessment requirements (SEARs) as they relate to biodiversity, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance*).

The HTP was declared (EPBC 2021/9102) to be a controlled action in accordance with the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* due to likely significant impacts to listed threatened species and communities (sections 18 and 18A) and Commonwealth land (sections 26 and 27A). The relevant Supplementary SEARs as they relate to biodiversity, and where in the EIS these have been addressed, are detailed in *Appendix A (Assessment requirements compliance*).

8.1 Assessment approach

8.1.1 Legislation, plans, polices and guidelines

Potential biodiversity impacts resulting from the project, including potential impacts to native vegetation, threatened species, communities, and their habitats were assessed in accordance with the following legislation:

- *NSW Biodiversity Conservation Act 2016* (BC Act)
- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *NSW Biosecurity Act 2015*
- *NSW Fisheries Management Act 1994* (FM Act)
- *NSW Local Land Services Act 2013* (LLS Act).

Technical Report 1 – Biodiversity development assessment report was prepared with reference to numerous plans, policies, and guidelines, including:

- *Biodiversity Assessment Method (BAM) 2020* (DPIE 2020c)
- *BAM 2020 Operational Manual Stage 1* (DPE 2022a)
- *BAM 2020 Operational Manual Stage 2* (DPE 2023a)
- *Guidance for the Biodiversity Development Assessment Report Template* (DPE 2022b)
- *Biodiversity Assessment Method Calculator Version 1.4.0.00* (DPE 2022c)
- *BAM Calculator User Guide* (DCCEEW 2024a)
- *NSW BioNet Threatened Biodiversity Data Collection* (TBDC) (DPE 2022d)

- *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (DEWHA 2013)
- *Commonwealth Species Profiles and Threats Database* (DCCEEW 2024a)
- *Remote assessment of biodiversity values: Biodiversity Assessment Method guide* (DCCEEW, 2025)

BAM flora and fauna survey guidelines:

- *Threatened reptiles: Biodiversity Assessment Method survey guide* (DPE 2022e)
- *Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide* (DPE 2022f)
- *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020d)
- *Flora Species with Specific Survey Requirement*
- '*Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE 2021c)
- *NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE, 2020e)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC 2004).

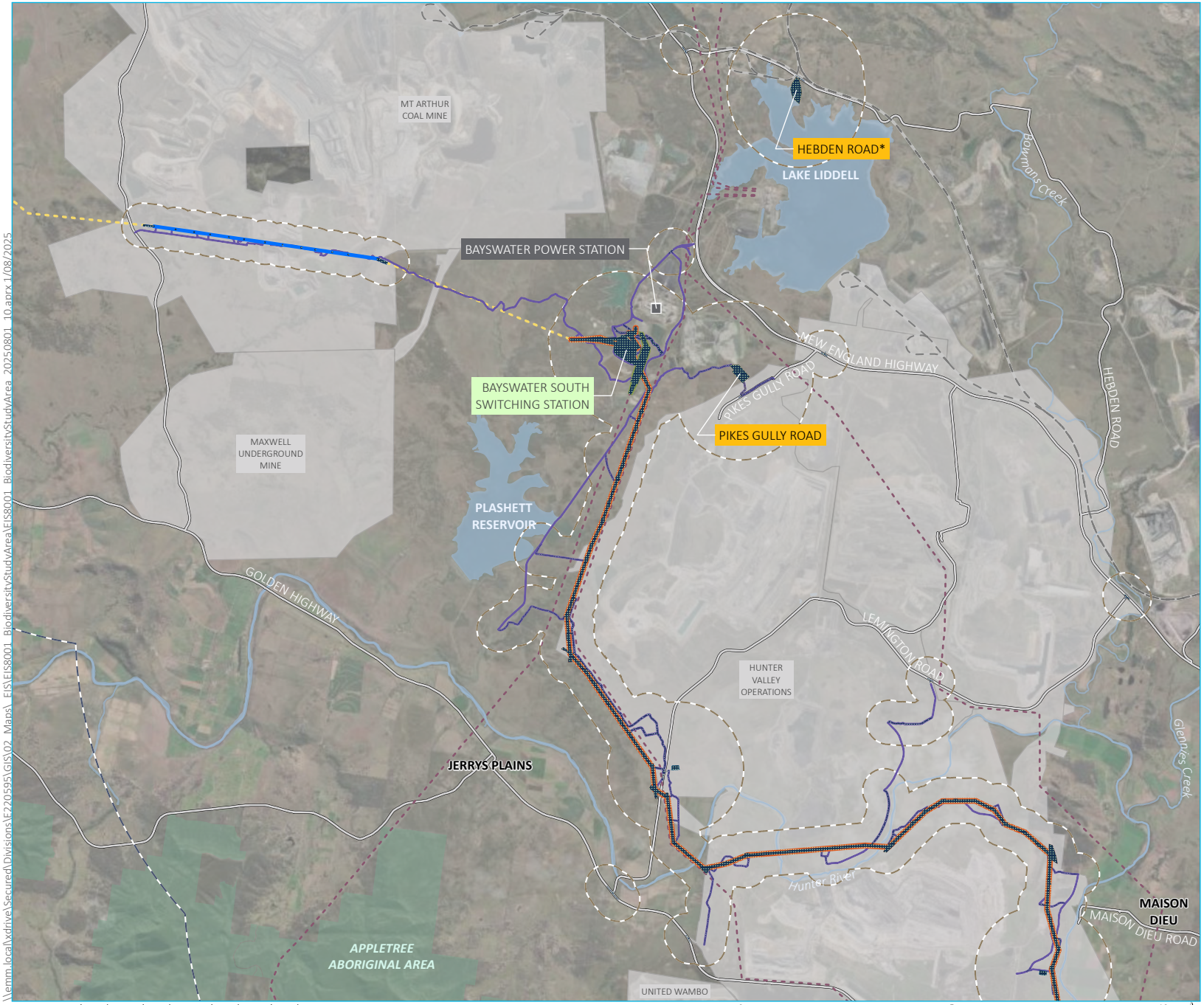
Technical Report 1 – Biodiversity development assessment report provides the full list of legislation, policies and guidelines used in assessing biodiversity impacts.

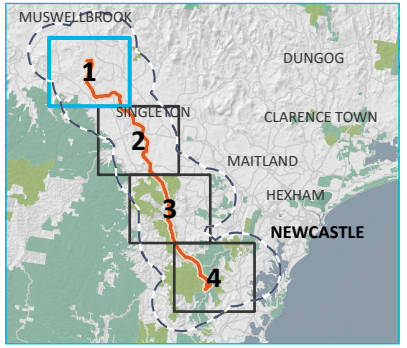
8.1.2 Study area

In accordance with the BAM, *Technical Report 1 – Biodiversity development assessment report* includes an assessment of the potential direct and indirect impacts on biodiversity values for the following areas:

- the locality, being the area within 10 kilometres of the subject land (or disturbance area), within which database searches and broader vegetation mapping was used to inform the desktop assessment
- the BAM site context assessment area, which includes all areas of land within 500 metres of the centreline of the transmission line, extending up to 1500 metres from the edge of the switching stations, construction support sites, laydown areas and access roads/tracks
- the biodiversity study area, which includes the disturbance area and HTP corridor, and was the area for which native vegetation mapping was undertaken (this area generally aligns with the construction impact area, but excludes access tracks and roads where no upgrades or disturbance would be required)
- the disturbance area (identified as the subject land *Technical Report 1 – Biodiversity development assessment report*), which includes all areas that would be directly impacted by the construction of the project and incorporates different project elements with varying degrees of physical disturbance to reflect construction and operational requirements (see *section 8.1.5* for a breakdown of the different disturbance areas).

These areas are identified in Figure 8.1.





KEY

- 10 km locality buffer
- Assessment area
- Biodiversity study area
- Disturbance area

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

Biodiversity study area detailed
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.1

Source: EMM (2025); Beca (2025); DCSSS (2024); ESRI (2025)

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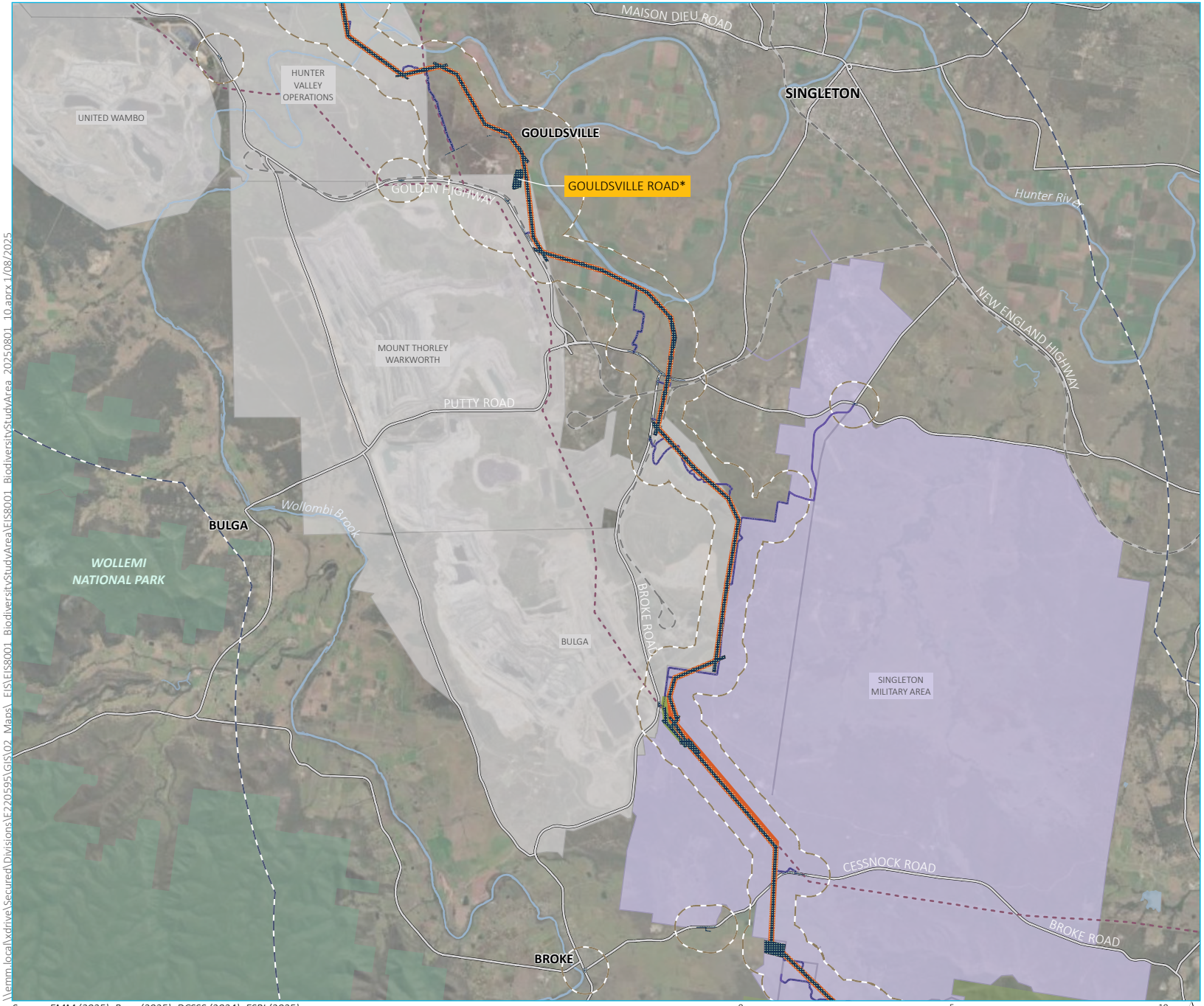

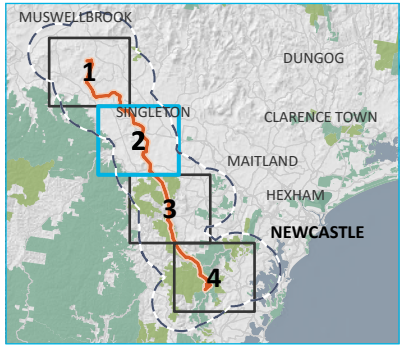

KEY

- 10 km locality buffer
- Assessment area
- Biodiversity study area
- Disturbance area

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

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Source: EMM (2025); Beca (2025); DCSSS (2024); ESRI (2025)

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Biodiversity study area detailed
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.1

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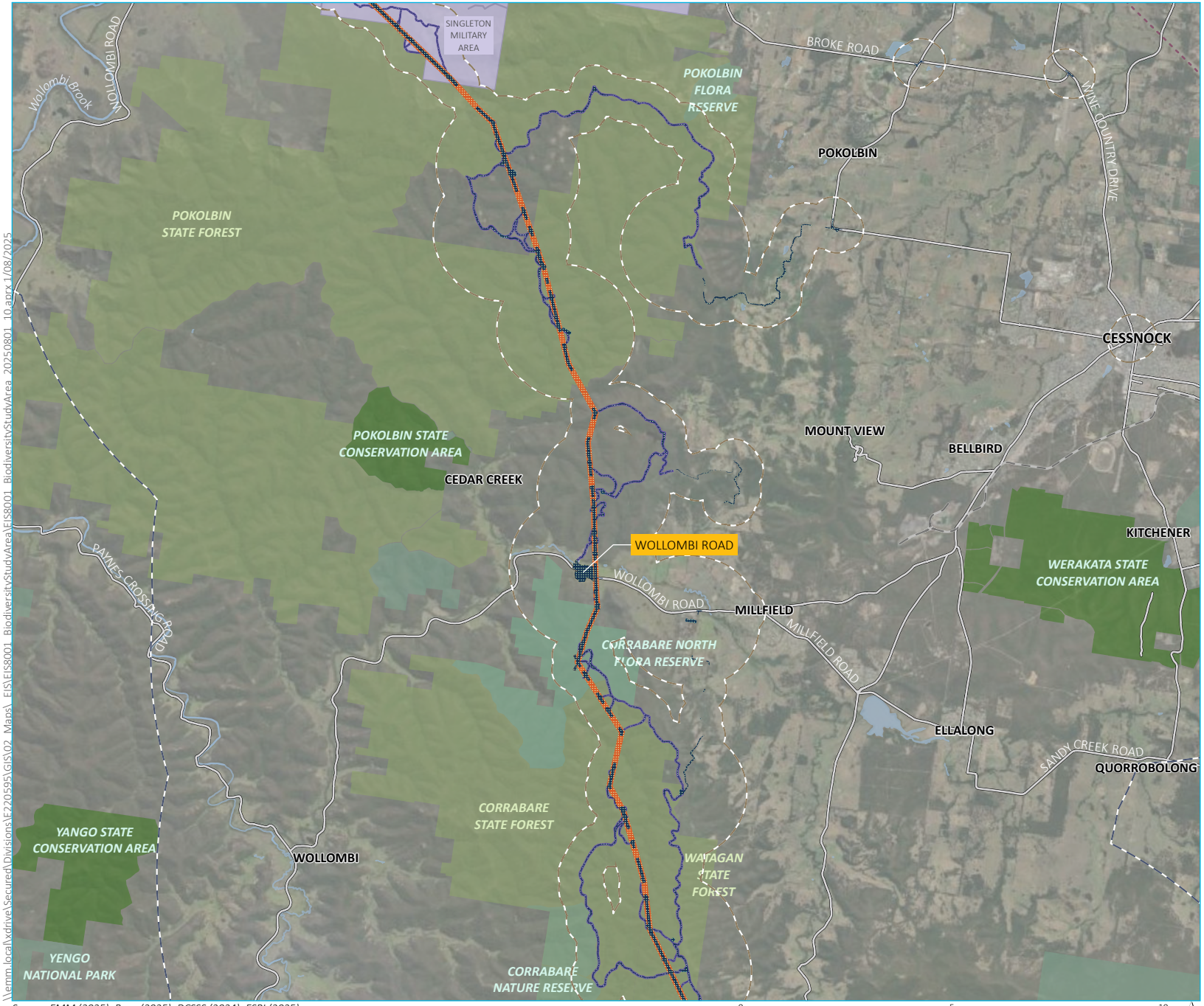
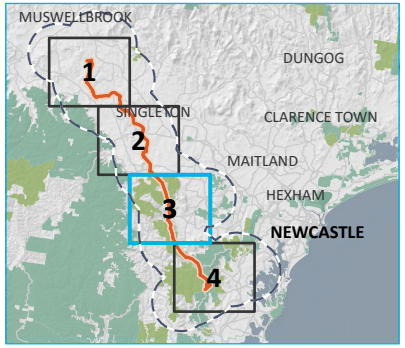
creating opportunities





KEY

- 10 km locality buffer
- Assessment area
- Biodiversity study area
- Disturbance area

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

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Source: EMM (2025); Beca (2025); DCSSS (2024); ESRI (2025)

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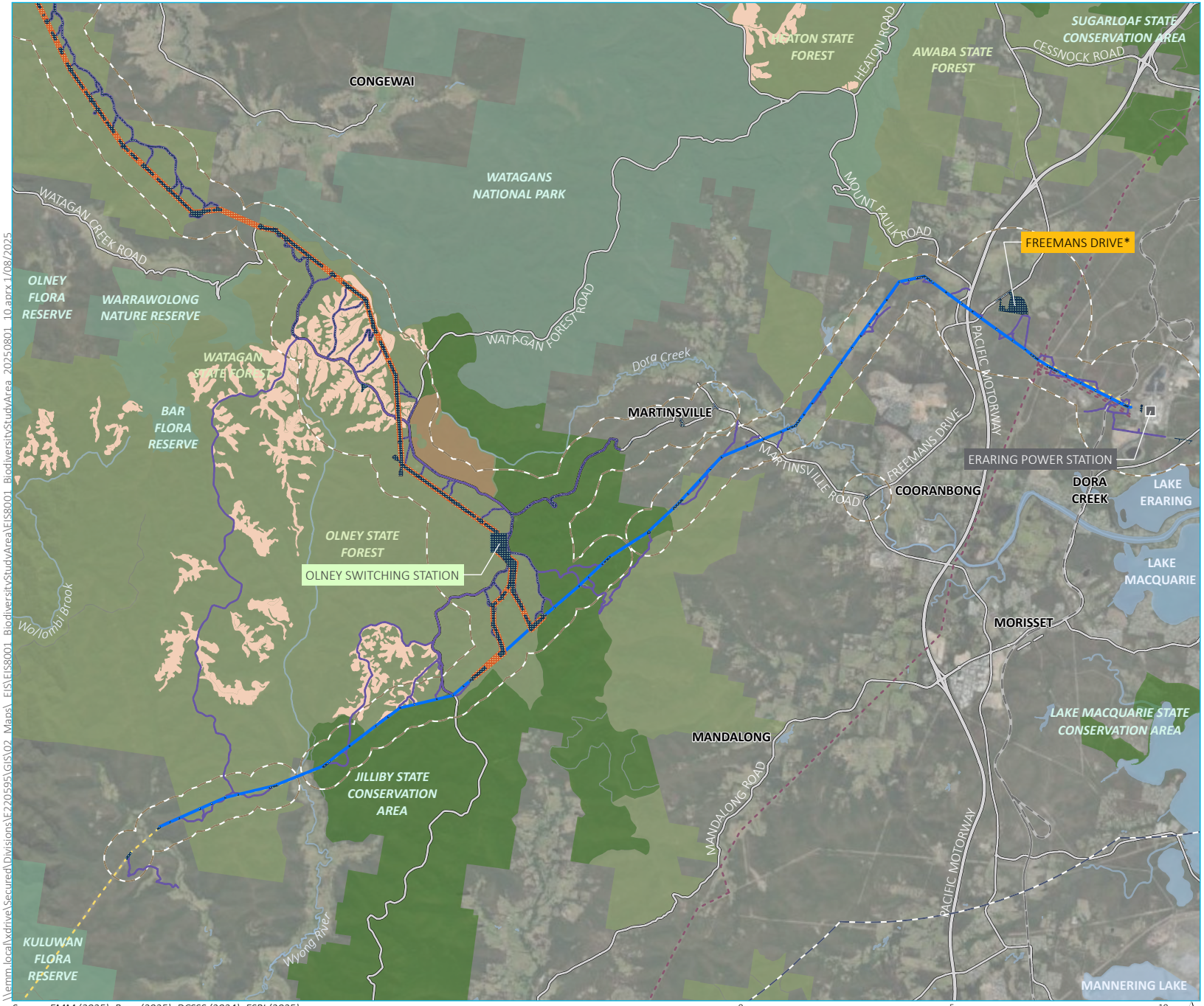
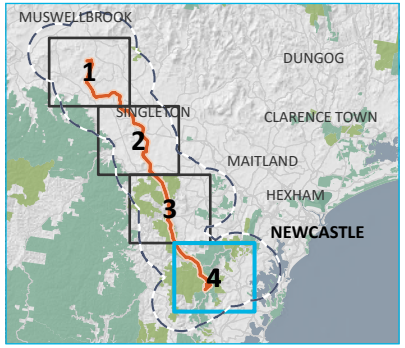
Biodiversity study area detailed
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.1

EMM
creating opportunities





KEY

- 10 km locality buffer
- Assessment area
- Biodiversity study area
- Disturbance area

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
- Harwood plantation
- Recreation area

Source: EMM (2025); Beca (2025); DCSSS (2024); ESRI (2025)

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GDA2020 MGA Zone 56

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Biodiversity study area detailed
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.1

EMM
creating opportunities

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8.1.3 Desktop assessment

A database review was undertaken to identify the extent and condition of landscape features within the disturbance area, assessment area and locality including the following:

- Interim Biogeographic Regionalisation for Australia (IBRA) bioregions and IBRA subregions
- rivers, streams, estuaries, and wetlands
- habitat connectivity
- karst, caves, crevices, cliffs, rocks, or other geological structures
- areas of outstanding biodiversity value
- NSW (Mitchell) landscape
- soil hazard features.

Information sources used in the desktop assessment to identify these landscape features included:

- *IBRA mapping. Version 7.0* (DAWE 2012)
- *Fisheries Spatial Data Portal mapping* (DPI 2022)
- *Atlas of Groundwater Dependent Ecosystems mapping* (GDE) (BoM 2022a)
- *Aerial photographs and satellite imagery of the project and buffer area using Nearmap* (11 August 2022)
- *NSW Biodiversity Values Mapping* (DPE 2022g)
- *NSW (Mitchell) Landscapes mapping and landscape descriptions* (DECC 2008a)
- *NSW Government eSPADE Online Tool* (DPHI 2024)
- *NSW BioNet Vegetation Classification PCT mapping* (DPE 2022h).

Additionally, information on local biodiversity was gathered from existing biodiversity development assessment reports (BDARs) and other relevant biodiversity reports, with particular emphasis on areas previously assessed in BDARs that overlap with the current project impact area. The following reports were reviewed:

- *Hunter Valley Operations Continuation Project, Biodiversity Development Assessment Report* (Umwelt 2022)
- *Mt Pleasant Optimisation Project – Appendix E – Biodiversity Development Assessment Report* (Hunter Eco 2021)
- *Mangoola Coal Continued Operations Project – Biodiversity Assessment Report* (Umwelt 2019)
- *Ecology Report for the Continuation of Rix's Creek Mine, Singleton LGA* (Bell 2015)
- *Warkworth Coal Mine Continuation Project – Biodiversity Assessment Report* (Cumberland Ecology 2014a)
- *Bengalla Mine Continuation – Biodiversity Assessment Report* (Cumberland Ecology 2014b)
- *Bulga Coal Mine Optimisation – Ecological Impact Assessment* (Umwelt 2013).

8.1.4 Field surveys

In accordance with the BAM, a variety of survey methods were used to identify native vegetation, plant community types (PCTs), threatened ecological communities (TECs) and threatened flora and fauna species in the disturbance area.

Between 2022 to 2025, seasonal surveys were undertaken during summer, autumn, winter and spring, and included the following survey methodologies:

- initial site stratification, preliminary investigation of biodiversity values, and vegetation mapping
- BAM plot surveys
- incidental threatened flora surveys
- fauna habitat assessment
- opportunistic fauna surveys
- targeted surveys for threatened flora
- targeted surveys for threatened fauna.

As the disturbance area had not been defined when field surveys commenced, a broader survey area was initially adopted and refined as the disturbance area evolved. Survey conditions were generally appropriate to support the survey techniques employed and species targeted. Bureau of Meteorology (BoM) records for the survey dates are provided in *Technical Report 1 – Biodiversity development assessment report.*

Figures detailing the survey effort for native vegetation and candidate threatened flora and fauna species are included in *Technical Report 1 – Biodiversity development assessment report.* Advice from the NSW Conservation Programs, Heritage and Regulation (CPHR) division informed the preparation of the BDAR, particularly in relation to survey methodology, and was applied and reflected in updates to *Technical Report 1 – Biodiversity development assessment report.*

Around 84% of the disturbance area was accessible and native vegetation extent was verified in the field. For the remaining 16% where access was limited (i.e. restricted access, seasonal constraints, or topographic limitations) or not granted, native vegetation extent was determined using aerial photograph interpretation, with reference to the *NSW State Vegetation Type Map* (SVTM), and supported by ground-truthed areas with similar vegetation, landscape setting, geology and soil types.

For areas with limited access (around 10%) that could not be surveyed within the required seasonal window for some candidate species, a number of candidate species have been conservatively assumed present (see *sections 8.4.3 and 8.4.4* for a list of species assumed present). In accordance with the BAM, there is the opportunity to verify these assumptions through additional field surveys once access becomes available during the required seasonal period.

For areas with no access (around 6%), the *Remote assessment of biodiversity values: BAM guide* (Remote Assessment Guide) (DCCEEW, 2025) was applied to support the assumed presence or exclusion of candidate threatened species. EnergyCo formally requested use of the guide on 8 May 2025, and approval was granted by CPHR on 14 May 2025. The guide was applied to 6 private landholdings and 6 discrete areas within State Forests, including 4.80 hectares across 3 areas in Watagan State Forest and 1.28 hectares in one area of Olney State Forest.

Sections 8.3.4 and *8.3.5* provide further detail about the application of the Remote Assessment Guide to flora and fauna species. Additional detail is provided in *Appendix Q (Remote assessment)* of *Technical Report 1 – Biodiversity development assessment report*, which outlines the methodology, justification for surrogate sites, and the candidate species assessed for assumed presence or exclusion based on targeted surveys in like-for-like vegetation.

8.1.5 Approach to vegetation removal assessment

The assessment of biodiversity impacts is based on a concept design (see *section 7.4* of *Chapter 7 (Approach to assessment))* that was used to define a disturbance area within the project impact area, which provides a more accurate estimation of the likely magnitude of vegetation clearance required, and any associated biodiversity.

As detailed in *section 4.3.1* and *section 4.5.1* of *Chapter 4 (Project description)*, the construction of different project elements would involve different levels of physical disturbance and vegetation clearing requirements during construction and operation of the project. Based on the varying levels of vegetation impact associated with project elements, disturbance area categories have been identified to assess the potential biodiversity impacts of the project (see Table 8.1 and Figure 8.2).

No clearing zones have also been identified within the transmission line easement where vegetation removal is not required (e.g. gullies that can be spanned) and where no access is required during both construction and operation (see Figure 8.3). No clearing zones do not form part of the disturbance area.

For further information on the application of the disturbance areas for the biodiversity assessment see to *Technical Report 1 – Biodiversity development assessment report*.

Table 8.1 Vegetation disturbance area categories

Disturbance area category	Definition
Disturbance area A	The area where vegetation would be completely removed. It includes areas at and around transmission towers (including tower pads and batters), stringing sites, laydown areas, switching stations, substation 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. This is a subset of Disturbance area A.
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.

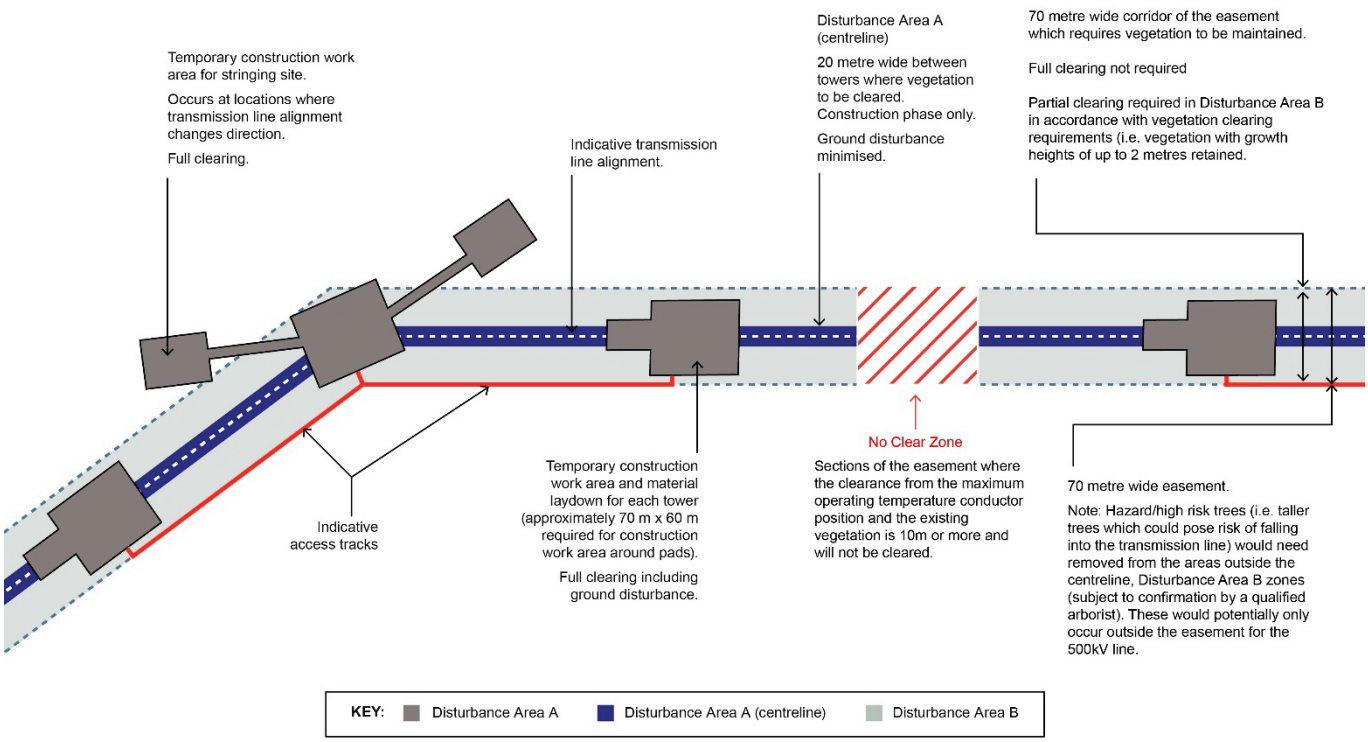


Figure 8-2 Approach to disturbance areas during construction

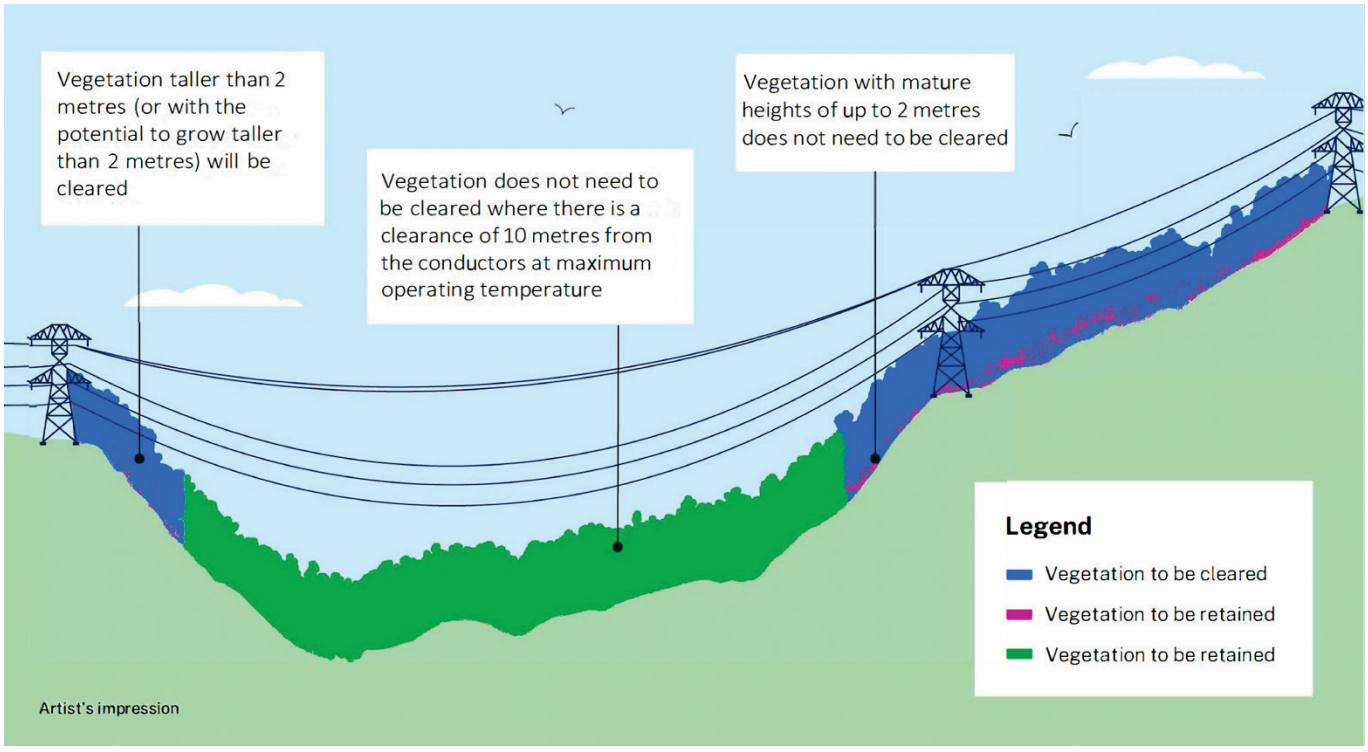


Figure 8-3 Approach to No Clearing Zones on forested plateaus

8.1.6 Biodiversity credit calculations

The *Biodiversity Assessment Method Calculator* (BAM-C) processes survey data to calculate the number and type of biodiversity credits that are required to offset the impacts of a project. Native vegetation is assessed as ecosystem credits and threatened species are assessed as either ecosystem credit species, species credit species or a combination of the 2 (referred to as 'dual credit species') in accordance with the BAM, as follows:

- ecosystem credit species (predicted): threatened species where the likelihood of occurrence and/or elements of its habitat can be confidently predicted by habitat types and landscape features
- species credit species (candidate): threatened species that cannot be reliably predicted by habitat types.

Under the BAM, vegetation integrity (VI) scores quantify the condition of existing native vegetation and habitat relative to a benchmark, based on structure and species composition. Future VI scores are used to determine post-clearing biodiversity values that inform offset requirements. The BAM allows for partial clearing scenarios, where residual vegetation will be retained and maintained (i.e. not subject to further degradation over time).

For the project, partial impacts were addressed in the BAM-C by adjusting the future values of relevant VI attributes for each disturbance area and associated vegetation zone, as follows:

- disturbance area A – future VI scores were calculated as 0 (assuming total loss of native vegetation).
- disturbance area B (including centreline) – future VI scores were calculated through changes to mean average scores in attributes associated with composition condition, structure condition and function condition.
- disturbance area HZ (hazard tree zone) – future VI scores have been calculated through changes to tree species composition and structure.

Technical Report 1 – Biodiversity development assessment report includes a detailed summary of the methodology used to determine the future VI score for partial clearing within disturbance areas A (including centreline) and HZ, supported by evidence from existing transmission line easements in the Hunter Valley and scientific literature.

The BAM and Supplementary SEARs issued for the project also require the consideration of TECs and threatened species listed under the EPBC Act within *Technical Report 1 – Biodiversity development assessment report*. A summary of potential impacts on TECs and species listed under the EPBC Act is also provided in *section 8.4*.

8.2 Avoidance and minimisation of impacts

During the selection of the HTP corridor, EnergyCo sought to avoid and minimise the project's impacts on biodiversity. Importantly, high conservation value areas such as Watagans National Park, Werakata National Park, Warrawolong Flora Reserve and existing biodiversity offset areas were avoided. Additionally, the better-quality remnants of the Central Hunter Valley Eucalypt Forest and Woodland and Warkworth Sands Woodland of the Hunter Valley TECs that provide habitat for threatened species and important habitat for the Regent Honeyeater and Swift Parrot were also avoided. *Chapter 3 (Alternatives and options)* provides further detail about the measures to avoid and minimise impacts on biodiversity and other key constraints during selection of the HTP corridor.

Following the corridor selection, an iterative design process based on field survey results was undertaken to further avoid and minimise the project's impacts on biodiversity.

With the refinement of the project design the following additional considerations were incorporated into the transmission line alignment and project assessment:

- co-location - placing sections of the transmission line alongside existing infrastructure or in disturbed areas, such as mining sites, forestry operations or cleared lands, where native vegetation and habitat quality are low
- relocation - adjusting the alignment to avoid impacts on threatened species and communities and known populations of serious and irreversible impact (SAII) species, including the Brush-tailed Rock Wallaby, microbats and threatened flora habitats
- partial clearing - implementing controlled vegetation clearing within and adjacent to the transmission line easement, focusing only on vegetation taller than 2 metres (see Figure 8.2)
- spanning and retention of forested gullies - reducing the extent of clearing within the State forests by spanning steep ravines and valleys where adequate conductor clearance can be achieved (see Figure 8.3)
- access - using existing access tracks where possible to minimise additional vegetation clearing and minimising construction of new access tracks
- micro-siting - mechanisms to adjust project features during the detailed design phase to avoid areas with high biodiversity value when on the ground works commence, including the minor relocation of project elements such as transmission towers to avoid high biodiversity values.

Cumulatively, the implemented measures to avoid and minimise impacts on biodiversity have resulted in a reduction in clearing of native vegetation by greater than 200 hectares. Significantly, this includes more than 100 hectares of impact to threatened ecological communities and a habitat for a range of potential SAII entity species.

8.3 Existing environment

8.3.1 Landscape features

The project is located within the Sydney Basin bioregion and spans 3 IBRA subregions: Hunter, Yengo and Wyong. It traverses 2 distinct landscape environments – the valley floor and the forested plateau – each supporting different biodiversity values and ecological characteristics (see Figure 8.4).

The valley floor environment, which includes the riverine floodplains of the Hunter River and its tributaries, dominates the northern extent of the study area from the Bayswater Power Station through to the township of Broke (see Figure 8.4). The primary land uses within this landscape are open cut coal mining, defence land (Singleton Military Area) and agriculture, which have generally resulted in highly disturbed environments. However, there are some isolated areas of remaining biodiversity value associated with TECs listed under the BC Act and EPBC Act. Of particular significance are the better-quality remnants of the Central Hunter Valley Eucalypt Forest and Woodland and Warkworth Sands Woodland of the Hunter Valley TECs that provide habitat for threatened species, as well as existing conservation reserves and mining offset areas.

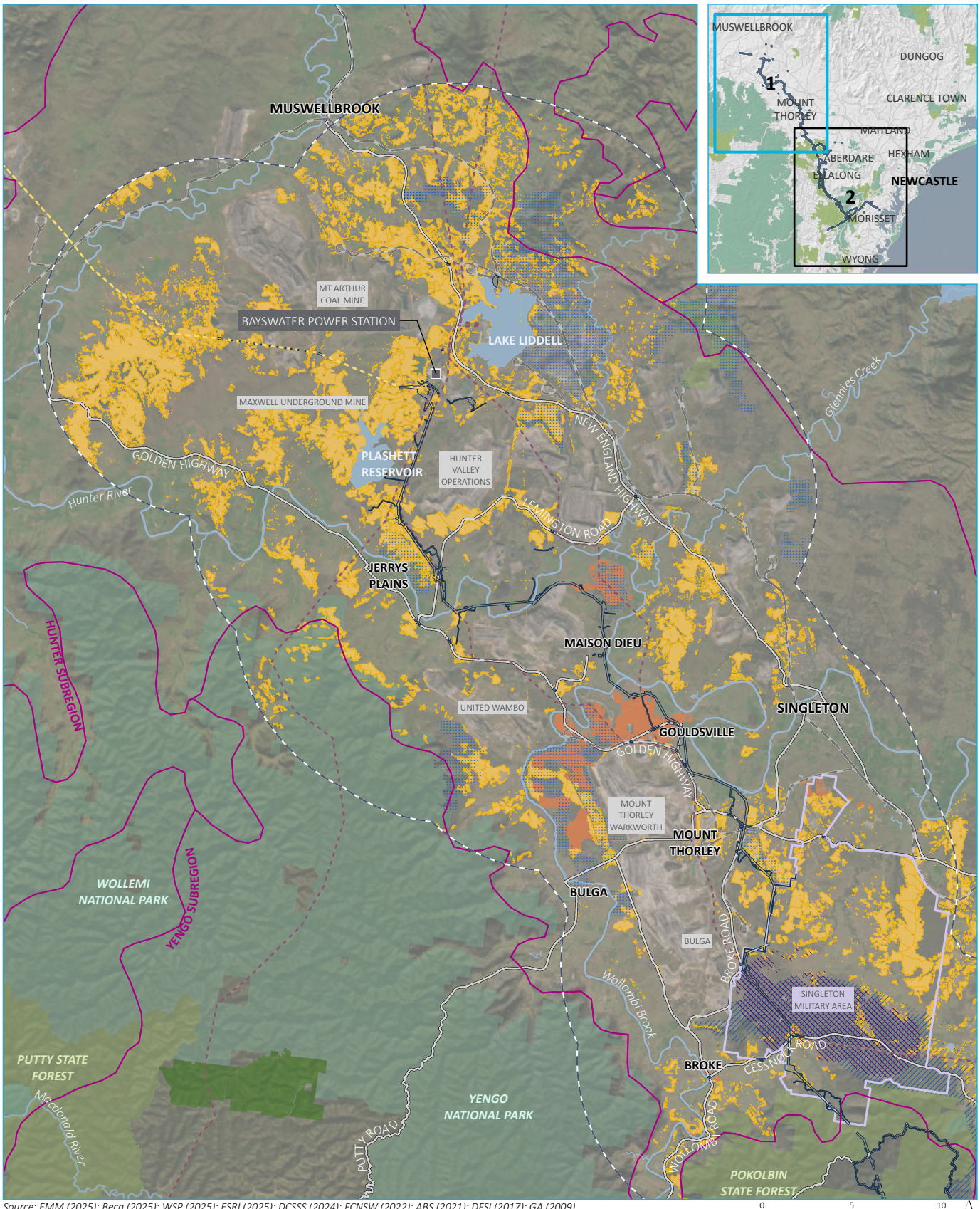
The forested plateau environment dominates the southern extent of the study area, from Broke to Olney State Forest. This landscape is dominated by a mixture of remnant moist sclerophyll vegetation within the sheltered valleys and dry sclerophyll forests along the ridgelines and upper slopes that are well represented within the National Park Estate. It also includes operational hardwood plantations that are impacted by ongoing logging activities within Olney State Forest, Watagan State Forest, Pokolbin State Forest and Corrabare State Forest.

By transecting the forested plateau environment, the project avoids impacting TECs and important habitat for the Regent Honeyeater and Swift Parrot located within the valley floor environment to the east of the project impact area (see Figure 8.4).

Landscape features of the study area and locality are summarised in Table 8.2 and Table 8.6 with further detail provided in *Technical Report 1 – Biodiversity development assessment report*.

Table 8.2 Landscape features of the study area and locality

Landscape features	Valley floor environment (Bayswater to Broke)	Forested plateau environment (Broke to Olney)
IBRA Bioregions and Subregions	Sydney Basin IBRA region. Hunter IBRA subregion	Sydney Basin IBRA region. Wyong and Yengo IBRA subregions
NSW (Mitchell) Landscape	Primarily Central Hunter Foothills, with smaller areas of Alluvial Plains, Hunter River Basalts, Upper Hunter Channels and Floodplain and Watagan Ranges landscapes	Primarily Watagan Ranges, with smaller areas of Bucketty Ridges, Central Hunter Alluvial Plains, Central Hunter Foothills, Gosford – Cooranbong, Coastal Slopes and Sydney – Newcastle Coastal Alluvial Plains landscapes
Hydrology (rivers, streams and wetlands)	Macquarie and Hunter River catchments. Three main watercourse crossings: Monkey Place Creek, Loder Creek and the Hunter River	Two main watercourse crossings: Congewai Creek and Watagan Creek
Soils	Primarily Jerry's Plains, Branxton, Hunter, Lidell and Bayswater soil landscapes characterised by low undulating hills and creek flats overtopping sandstone, mud/siltstone, shale, tuff, coal and conglomerate	Primarily the Watagan soil landscape group characterised by rolling to very steep hills and slopes, often containing sandstone boulders
Karsts, caves, crevices, cliffs, rocks and other significant geological features	Minor rocky areas. No significant karsts, caves, cliffs, rocky outcrops	Caves and cliffs primarily within Pokolbin, Corrabare, Watagan and Olney State forests
Habitat connectivity	Limited connectivity associated with roads and creek lines, paddocks and small patches of remnant woodland. The Singleton Military Area is more heavily forested but existing power easements transect this vegetation	Habitat connectivity corridors are associated with Pokolbin, Corrabare, Watagan and Olney State forests surrounding native vegetation
Areas of outstanding biodiversity value	None	None
Additional landscape features listed in the SEARs	None	Corrabare North Flora Reserve and Jilliby State Conservation Area



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

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KEY

- Disturbance area
- 10 km locality buffer
- Mining biodiversity offset area
- IBRA subregion

Threatened ecological community

- Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions
- Warkworth Sands Woodland in the Sydney Basin Bioregion

Current occurrence of important mapped habitat

- Regent honeyeater
- Swift parrot

Landscape feature

- Named watercourse
- Harwood plantation
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

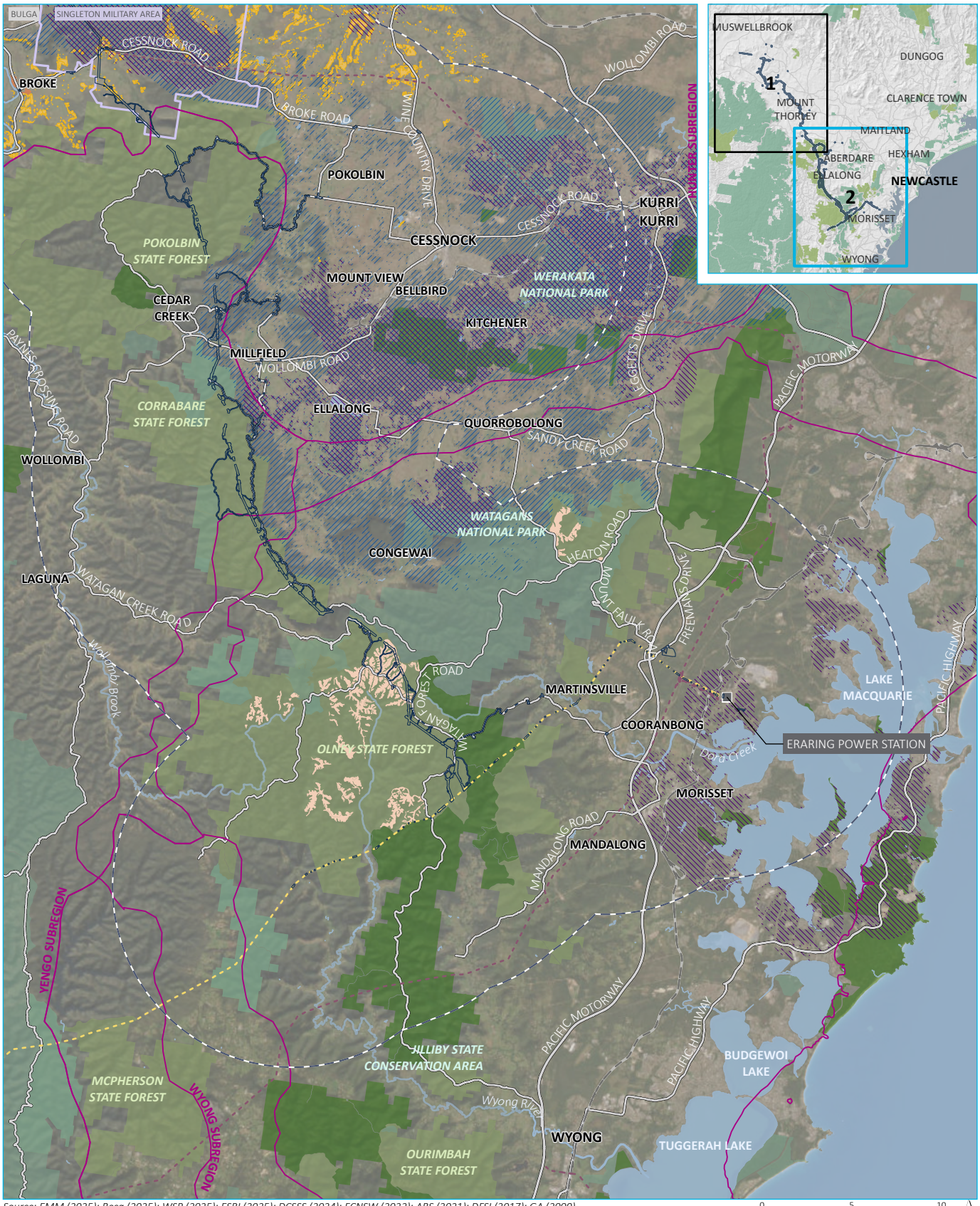
Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Railway
- Major road
- Defence

Landscape features of the locality
Map 1 of 2

Hunter Transmission Project
Environmental Impact Statement
Figure 8.4

EMM
creating opportunities



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

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KEY

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Current occurrence of important mapped habitat

- Regent honeyeater
- Swift parrot

Landscape feature

- Named watercourse
- Harwood plantation
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Railway
- Major road
- Defence

Landscape features of the locality
Map 2 of 2

Hunter Transmission Project
Environmental Impact Statement
Figure 8.4

EMM
creating opportunities

8.3.2 Native vegetation

Native vegetation covers around 60% (762 hectares) of the disturbance area (1266 hectares). The remaining areas (504 hectares), particularly within the Hunter Valley floor, are previously disturbed by historical and ongoing mining, agricultural, energy transmission and defence activities.

These disturbed areas are identified as Category 1 – Exempt land under the NSW *Local Land Services Act 2013* (LLS Act), excluded land, or non-native vegetation verified through field survey or aerial imagery. These areas are excluded from further assessment under the BAM.

Additional information regarding the approach to categorising excluded land is provided in *Technical Report 1 – Biodiversity development assessment report (section 4)*.

Most of the disturbance area occurs in the Hunter IBRA subregion (43%), with the remainder split between the Yengo (30%) and Wyong (27%) IBRA subregions. Native vegetation within the disturbance area has been assigned to 7 vegetation formations occur across these 3 IBRA subregions, including:

- Dry sclerophyll forests (shrub/grass sub-formation) – 178 hectares
- Dry sclerophyll forests (shrubby sub-formation) – 127 hectares
- Forested wetlands – 22 hectares
- Grassy Woodlands – 105 hectares
- Rainforests – 13 hectares
- Wet sclerophyll forests (grassy sub-formation) – 278 hectares
- Wet sclerophyll forests (shrubby sub-formation) – 39 hectares.

Native vegetation aligns with 34 plant community types (PCT) which occur in varying condition states within the disturbance area (see Table 8.3). Around 40% of the native vegetation is in varying degrees of disturbed conditions, including derived/disturbed grasslands (97 hectares) and thinned/poor/plantation woodlands (186 hectares) associated with previous clearing and mine rehabilitation and hardwood forestry plantations (31 hectares).

Figure 14.9 of *Technical Report 1 – Biodiversity development assessment report* identifies the distribution of native vegetation within the disturbance area based on PCT association, as well as the locations of disturbed land and non-native vegetation.

Table 8.3 Native vegetation condition PCTs identified within the disturbance area

IBRA subregion	Condition state	PCT	Area (ha)
Hunter	Mod-good	3086, 3087, 3239, 3241, 3438, 3444, 3446, 4039, 4072	60.13
	Poor/thinned	3314, 3315, 3431, 3636, 4015, 4089	154.68
	Derived/ disturbed grassland[1]	3314, 3315, 3431, 3444, 3636, 4015, 4089	96.52
	Plantation	3431	14.9
Total – Hunter subregion			326.23

IBRA subregion	Condition state	PCT	Area (ha)
Yengo	Mod-good	3086, 3087, 3151, 3152, 3230, 3237, 3238, 3239, 3241, 3242, 3244, 3328, 3438, 3439, 3444, 3446, 3489, 3599, 3605, 3617, 4039, 4072	224.19
	Poor/thinned	-	-
	Derived/ disturbed grassland[1]	3444	0.29
	Plantation	3239	2.83
Total – Yengo subregion			227.31
Wyong	Mod-good	3029, 3150, 3230, 3239, 3242, 3244, 3250, 3263, 3581, 3617, 3621	194.76
	Poor/thinned	-	-
	Derived/disturbed grassland	-	-
	Plantation	3150, 3230	13.68
Total – Wyong subregion			208.44
Total native vegetation			761.98

1: Derived/disturbed grassland PCTs have mature growth heights of less than 2 metres. The area of derived/disturbed grassland PCTs identified (96.81 ha) is limited to Disturbance area A (full clearing). An additional 53.78 ha of derived/disturbed grassland PCTs occurs within Disturbance area B and would not be cleared by the project and is therefore excluded from the total area of native vegetation identified in this table.

8.3.3 Threatened ecological communities

Based on PCT association, around 207 hectares of native vegetation within the disturbance area aligns with 7 TECs listed under the BC Act (all endangered) and 158 hectares of native vegetation aligns with 3 EPBC Act listed TECs (all critically endangered). These TECS and their associated PCT, condition state and extent within the disturbance area is identified in Table 8.4 (BC Act) and Table 8.5 (EPBC Act), and their distribution is shown in Figure 8.5.

While the classification of TECs under the BC Act and EPBC Act broadly overlaps, it varies according to PCT and condition state. In total, about 145 hectares of native vegetation is listed under both Acts, about 62 hectares is listed under the BC Act only (see Table 8.4), and about 12 hectares is listed under the EPBC Act only (Table 8.5).

The vast majority of TECs occur within the Hunter IBRA subregion, concentrated in valley floor environments along the HTP corridor. A small portion (around 3 hectares under the BC Act and 2 hectares under the EPBC Act) is located in the Yengo IBRA subregion, east of the alignment near the Wollombi construction support site.

By transecting the forested plateau environment, the project avoids further impacts to TECs in valley floor environments (to the east of the project impact area), including large areas of Central Hunter Grey Box-Ironbark Woodland Endangered Ecological Community (EEC).

Technical Report 1 – Biodiversity development assessment report provides detailed mapping of the extent of BC Act and EPBC Act TECs across the disturbance area.

Table 8.4 BC Act listed threatened ecological communities in the disturbance area

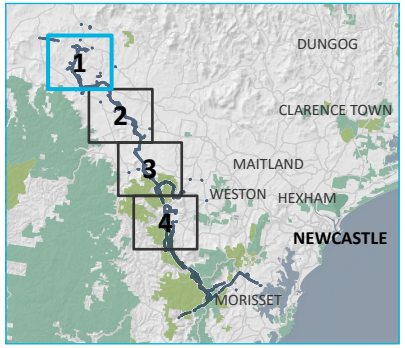
TEC	BC Act status	IBRA subregion	Associated PCT and condition state	Area (ha)
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	E	Hunter	3314_Thinned (38.46 ha) 3314_Poor (19.40 ha)[1] 3431_Thinned (63.42 ha) 3431_Poor (5.20 ha) 3431_Plantation (14.90 ha)	141.38
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	E	Hunter	3315_Thinned (8.86 ha)	8.86
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	E	Hunter	4089_Poor (4.22 ha)[1]	4.22
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	E	Hunter Yengo	3446_Mod-good (0.02 ha) 3446_Mod-good (1.35 ha)	1.37
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	E	Hunter Yengo	3444_Derived (0.02 ha)[1] 3444_Mod-good (36.64 ha)[1] 3444_Derived (0.29 ha)[1] 3444_Mod-good (0.92 ha)[1]	37.87
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	Hunter Yengo	4039_Mod-good (0.84 ha) 3328_Mod-good (0.45 ha) 4039_Mod-good (0.07 ha)	1.36
Warkworth Sands Woodland in the Sydney Basin Bioregion	E	Hunter	3636_Thinned (7.51 ha) 3636_Disturbed Grassland (4.86 ha)	12.37
Total				207.43

1: Identifies PCTs that are listed under the BC Act only. All other PCTs are listed under both Acts.

Table 8.5 EPBC Act listed threatened ecological communities in the disturbance area

TEC	EPBC Act status	IBRA subregion	Associated PCT and condition state	Area (ha)
Central Hunter Valley eucalypt forest and woodland	CE	Hunter	3314_Thinned (38.46 ha) 3315_Thinned (8.86 ha) 3431_Thinned (63.42 ha) 3431_Poor (5.20 ha) 3431_Plantation (14.90 ha) 3438_Mod-good (10.22 ha)[1] 3446_Mod-good (0.02 ha)	144.44
		Yengo	3438_Mod-good (1.97 ha)[1] 3446_Mod-good (1.35 ha)	
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	CE	Hunter Yengo	4039_Mod-good (0.84 ha) 3328_Mod-good (0.45 ha) 4039_Mod-good (0.07 ha)	1.36
Warkworth Sands Woodland of the Hunter Valley	CE	Hunter	3636_Thinned (7.51 ha) 3636_Disturbed grassland (4.86 ha)	12.37
Total				158.13

1: Identifies PCTs that are listed under the EPBC Act only. All other PCTs are listed under both Acts.



KEY

- Assessment area
- Project impact area
- Disturbance area
- IBRA subregion
- No clearing area

BC Act listed TEC

- Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions
- Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions
- Warkworth Sands Woodland in the Sydney Basin Bioregion

Impacted TEC

EPBC Act listed TEC

- Central Hunter Valley eucalypt forest and woodland
- Warkworth Sands Woodland of the Hunter Valley

Existing environment

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

Threatened ecological communities
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.5

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

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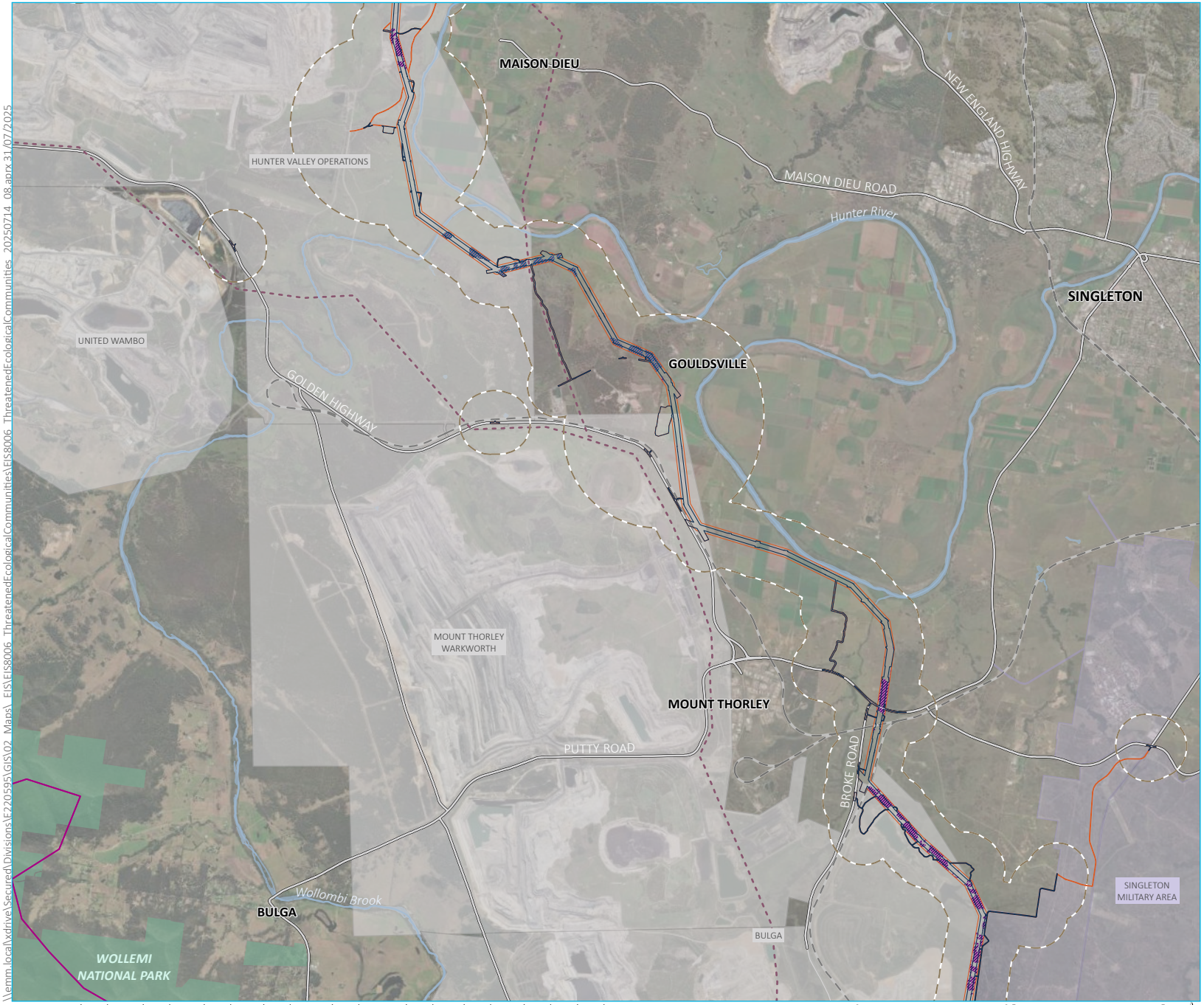

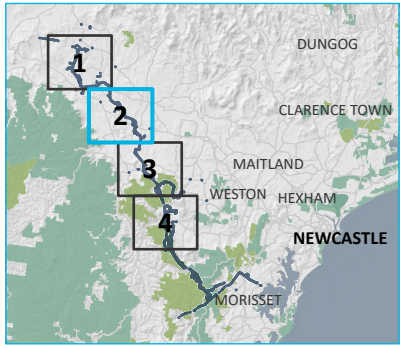

KEY

- 1 Assessment area
- Project impact area
- Disturbance area
- IBRA subregion
- No clearing area

BC Act listed TEC

- Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions
- Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions
- Warkworth Sands Woodland in the Sydney Basin Bioregion

Impacted TEC

EPBC Act listed TEC

- Central Hunter Valley eucalypt forest and woodland
- Warkworth Sands Woodland of the Hunter Valley

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Defence
- Mining

Threatened ecological communities
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.5

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

0 2.5 5 km

GDA2020 MGA Zone 56

N

EMM creating opportunities

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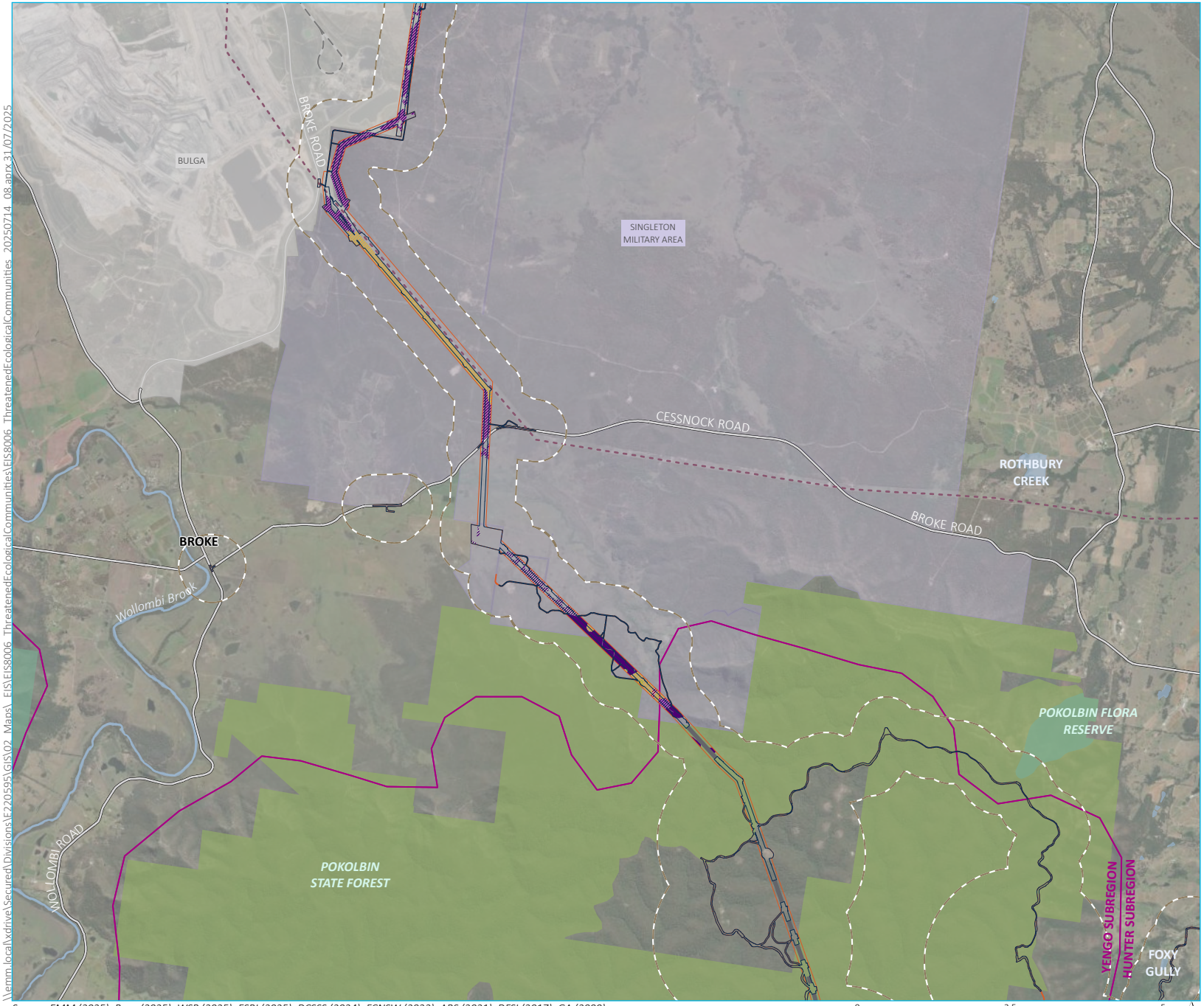

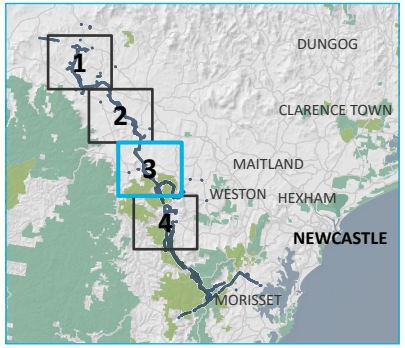

KEY

- Assessment area
- Project impact area
- Disturbance area
- IBRA subregion
- No clearing area

BC Act listed TEC

- Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions
- Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions
- Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions
- Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Impacted TEC

EPBC Act listed TEC

- Central Hunter Valley eucalypt forest and woodland
- River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

Threatened ecological communities
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.5

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

0 2.5 5 km

GDA2020 MGA Zone 56

N

creating opportunities

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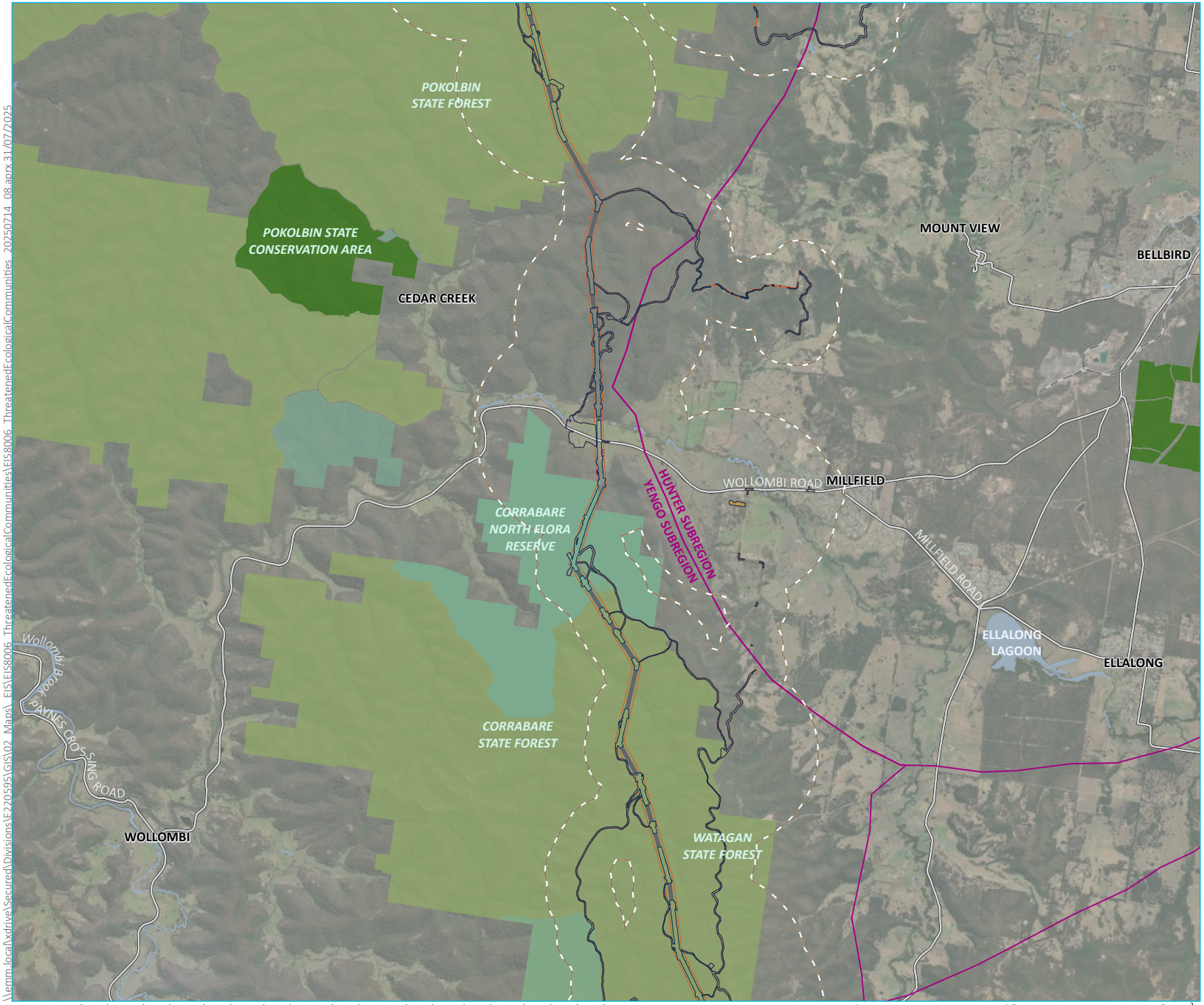

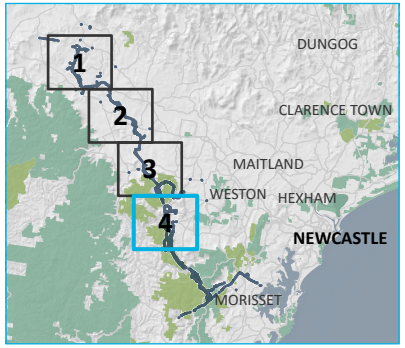

KEY

- 1 Assessment area
- Project impact area
- Disturbance area
- IBRA subregion
- No clearing area

BC Act listed TEC

- Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Impacted TEC

EPBC Act listed TEC

- River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria

Existing environment

- Railway
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

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

0 2.5 5 km

GDA2020 MGA Zone 56

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Threatened ecological communities
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 8.5

EMM
creating opportunities

8.3.4 Threatened flora

Seventy-seven candidate threatened flora species were identified as potentially occurring within the disturbance area and were assessed for habitat suitability (see Figure 8.6). Of these, 25 species were excluded from further assessment due to habitat absence, degradation or constraints. The remaining 52 candidate threatened flora species were the subject of targeted surveys and further assessment.

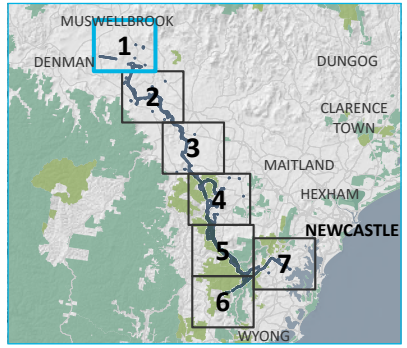
As detailed in section 8.1.4, the *Remote assessment of biodiversity values: BAM guide* (DCCEEW, 2025) was applied where access was not possible (see *Appendix Q (Remote assessment)* of Technical *Report 1 – Biodiversity development assessment report*). Targeted surveys in comparable vegetation were used to infer presence or absence. Seven species were assumed present based on previous records and habitat continuity. Twenty-three species were excluded using surrogate data, with representative habitat well covered by survey (>75% to >90%).

8.3.5 Threatened fauna

Fifty-two candidate threatened fauna species were identified as potentially occurring within the disturbance area and assessed for habitat suitability (see Figure 8.6). Of these, 10 species were excluded from further assessment due to habitat absence, degradation or constraints. The remaining candidate threatened fauna species were the subject of targeted surveys (see *section 8.4.3*).

No species were excluded using the *Remote assessment of biodiversity values: BAM guide* (DCCEEW, 2025). All threatened fauna with suitable habitat in restricted areas were assumed present.

No candidate threatened fauna species were excluded from the restricted access areas using the guide. Instead, all threatened fauna species with suitable habitat features — such as hollow-bearing trees, dead wood, rocky substrates, or native groundcover — were assumed present. This conservative approach was adopted due to the likely presence of suitable habitat within the restricted areas and/or the confirmed presence of the species in adjacent or contiguous habitat.



KEY

- Assessment area
- Project impact area
- Disturbance area
- No clearing area

Recorded threatened fauna species

- Brush-tailed Phascogale
- Common Planigale
- Dusky Woodswallow
- Grey-crowned Babbler (eastern)
- Hunter Valley Delma
- Speckled Warbler
- Squirrel Glider

Recorded threatened flora species

- Diuris tricolor
- Eucalyptus camaldulensis

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Cliff lines/escarpments
- Named waterbody
- State forest
- Mining

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

0 2.5 5 km

GDA2020 MGA Zone 56

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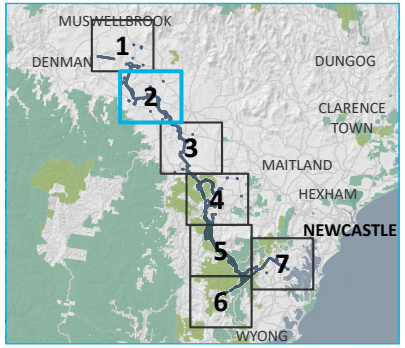
Threatened flora and fauna species
Map 1 of 7

Hunter Transmission Project
Environmental Impact Statement
Figure 8.6

EMM
creating opportunities



KEY

- Assessment area
- Project impact area
- Disturbance area
- No clearing area

Recorded threatened fauna species

- Grey-crowned Babbler (eastern)
- Hunter Valley Delma
- White-bellied Sea-Eagle

Recorded threatened flora species

- Cymbidium canaliculatum
- Eucalyptus camaldulensis

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining

Threatened flora and fauna species
Map 2 of 7

Hunter Transmission Project
Environmental Impact Statement
Figure 8.6

EMM
creating opportunities

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

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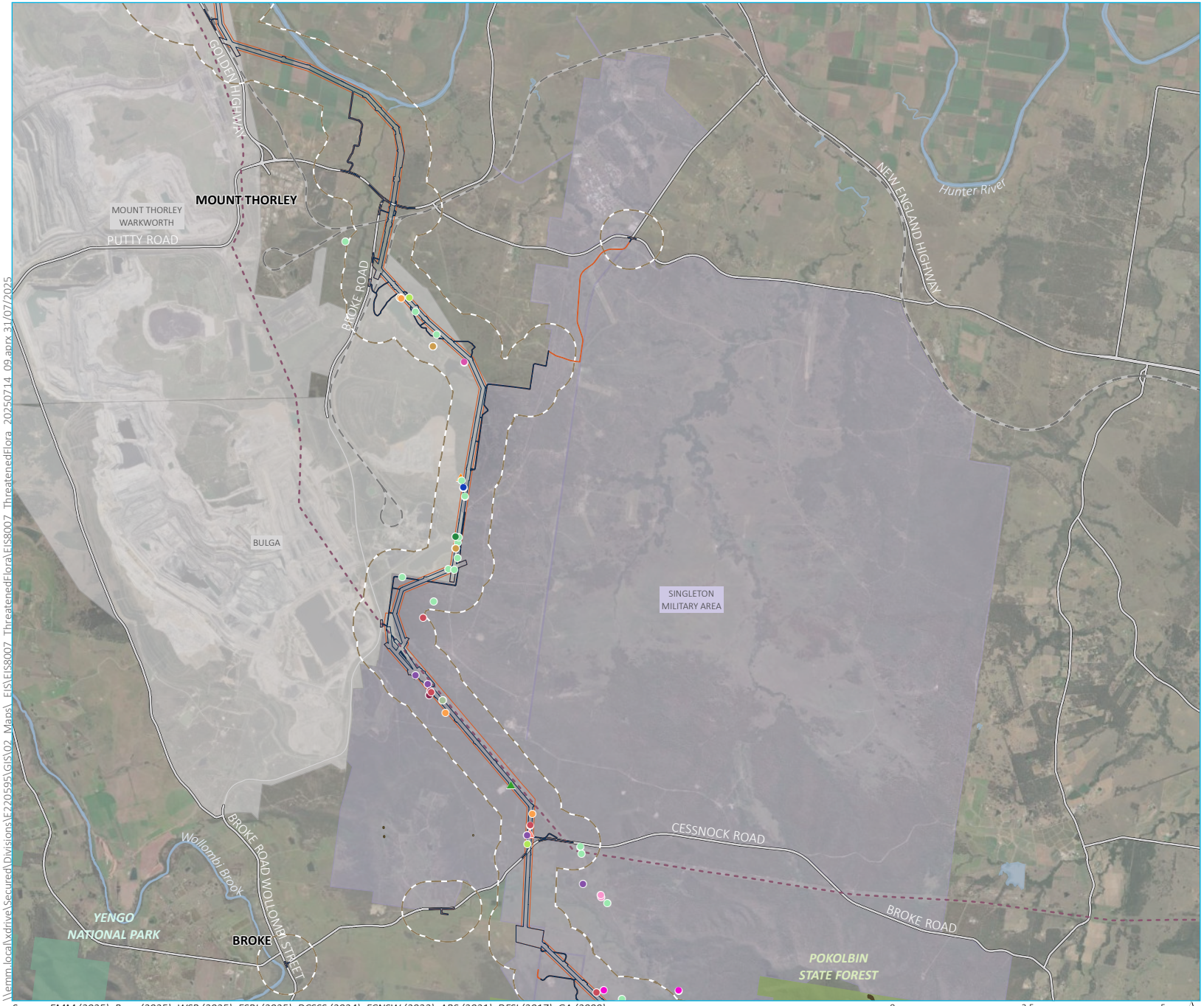

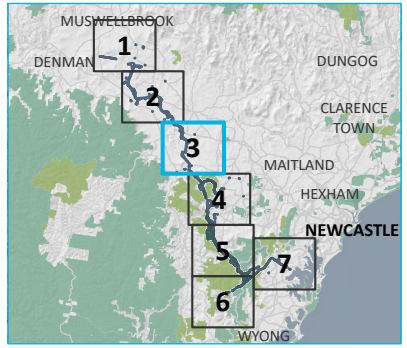

KEY

- Assessment area
- Project impact area
- Disturbance area
- No clearing area

Recorded threatened fauna species

- Brown Treecreeper (eastern)
- Eastern Coastal Free-tailed Bat
- Greater Broad-nosed Bat
- Grey-crowned Babbler (eastern)
- Grey-headed Flying-fox
- Hunter Valley Delma
- Large Bent-winged Bat
- Large-eared Pied Bat
- Latham's Snipe
- Little Bent-winged bat
- Little Lorikeet
- Powerful Owl
- Scarlet Robin
- South-eastern Glossy Black-Cockatoo
- Southern Myotis
- Speckled Warbler
- Squirrel Glider
- Varied Sitella

Recorded threatened flora species

- Cymbidium canaliculatum
- Eucalyptus glaucina
- Pterostylis gibbosa

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Cliff lines/escarpments
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

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

0 2.5 5 km

GDA2020 MGA Zone 56

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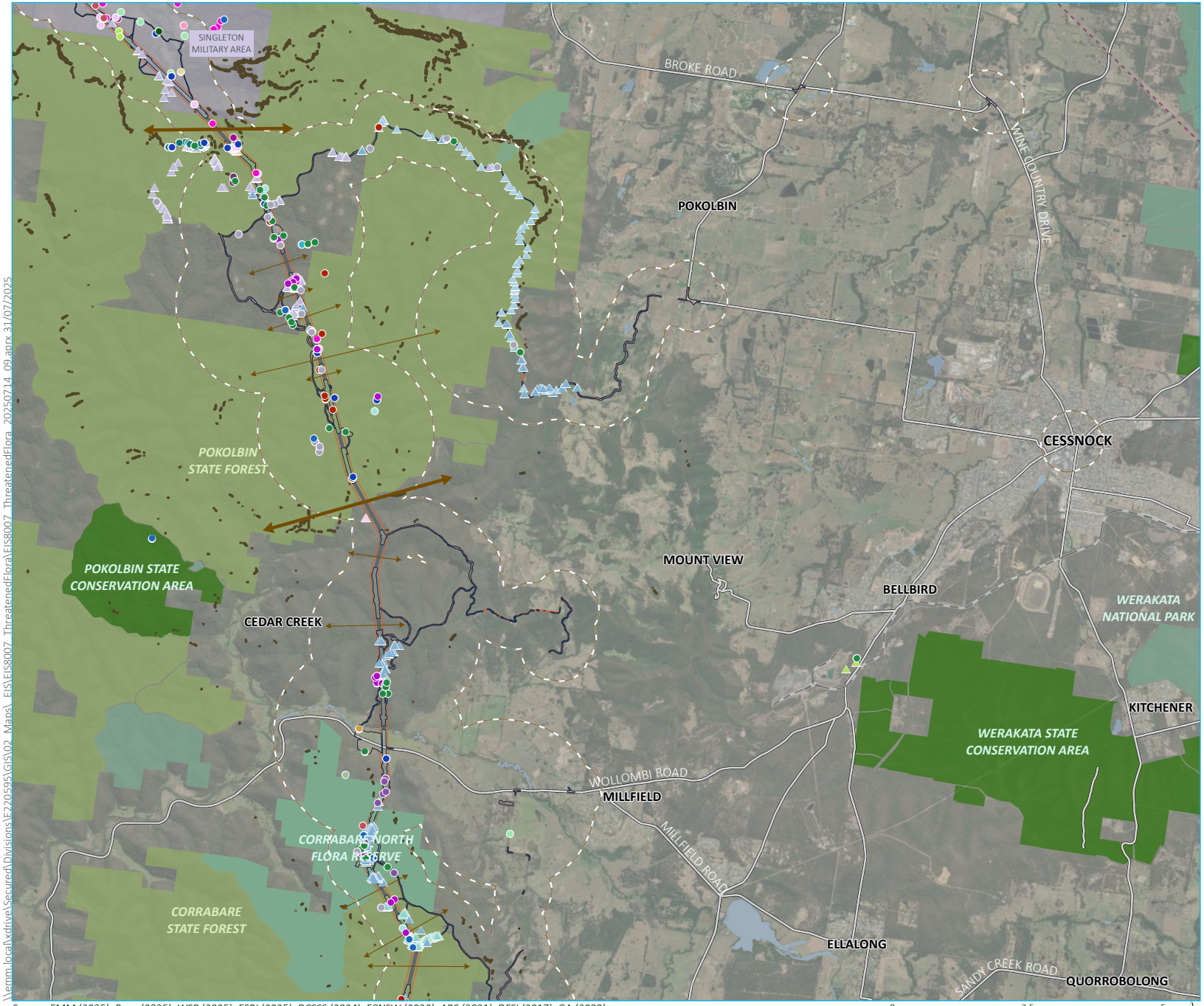
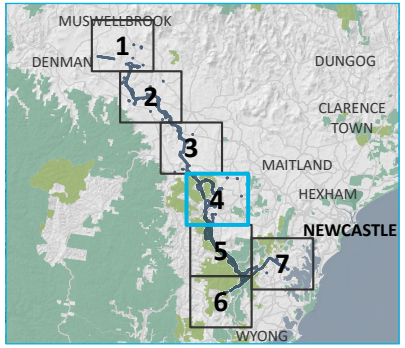
Threatened flora and fauna species
Map 3 of 7

Hunter Transmission Project
Environmental Impact Statement
Figure 8.6

EMM
creating opportunities





KEY

- Assessment area
- Project impact area
- Disturbance area
- No clearing area

Terrestrial connectivity

- Major
- Minor

Recorded threatened fauna species

- Brown Treecreeper (eastern)
- Brush-tailed Rock-wallaby
- Common Planigale
- Eastern Coastal Free-tailed Bat
- Eastern False Pipistrelle
- Gang-gang Cockatoo
- Greater Broad-nosed Bat
- Grey-crowned Babbler (eastern)
- Grey-headed Flying-fox
- Hunter Valley Delma
- Koala
- Large Bent-winged Bat
- Large-eared Pied Bat
- Little Bent-winged bat
- Little Lorikeet
- Masked Owl
- Powerful Owl
- Red-crowned Toadlet
- Rufous Fantail
- Sooty Owl
- South-eastern Glossy Black-Cockatoo
- Southern Greater Glider
- Southern Myotis
- Squirrel Glider
- Varied Sitella
- White-throated Needletail
- Yellow-bellied Glider

Recorded threatened flora species

- Brachyscome brownii
- Eucalyptus fracta
- Melaleuca groveana
- Prostanthera cineolifera
- Rhodamnia rubescens
- Rutidosis heterogama
- Senna acclinis

Existing environment

- 330 kV transmission line
- Railway
- Major road
- Minor road
- Cliff lines/escarpments
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence

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

0 2.5 5 km

GDA2020 MGA Zone 56

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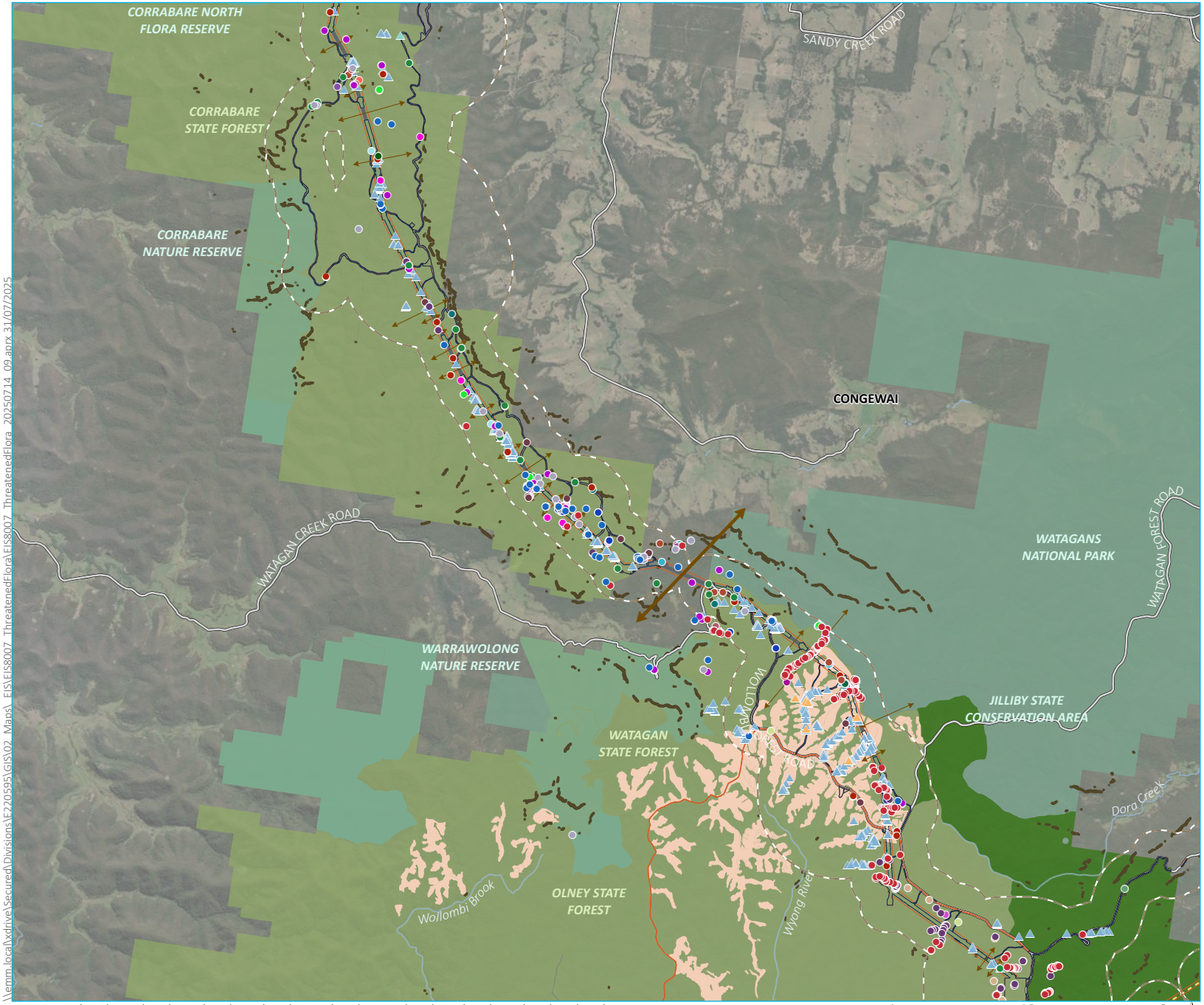
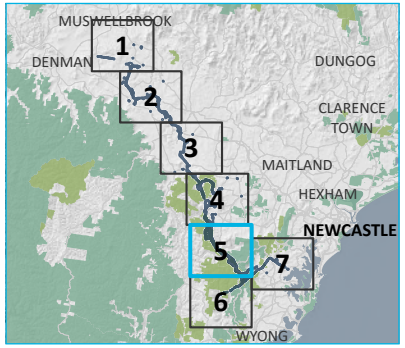
Threatened flora and fauna species
Map 4 of 7

Hunter Transmission Project
Environmental Impact Statement
Figure 8.6

EMM
creating opportunities





KEY

- Assessment area
- Project impact area
- Disturbance area
- No clearing area

Terrestrial connectivity

- Major
- Minor

Recorded threatened fauna species

- Barking Owl
- Brush-tailed Rock-wallaby
- Eastern Cave Bat
- Eastern Coastal Free-tailed Bat
- Eastern False Pipistrelle
- Eastern Pygmy Possum
- Gang-gang Cockatoo
- Giant Barred Frog
- Giant Burrowing Frog
- Greater Broad-nosed Bat
- Grey-headed Flying-fox
- Koala
- Large Bent-winged Bat
- Large-eared Pied Bat
- Little Bent-winged bat
- Little Lorikeet
- Littlejohn's Tree Frog
- Long-nosed Potaroo
- Masked Owl
- Parma Wallaby
- Powerful Owl
- Red-crowned Toadlet
- Rufous Fantail
- Sooty Owl
- South-eastern Glossy Black-Cockatoo
- Southern Greater Glider
- Spotted-tail Quoll
- Squirrel Glider
- Stephen's Banded Snake
- Stuttering Frog
- Yellow-bellied Glider

Recorded threatened flora species

- Cymbidium canaliculatum
- Melaleuca groveana
- Rhodamnia rubescens
- Rhodomyrtus psidioides

Existing environment

- 500 kV transmission line
- Major road
- Named watercourse
- Harwood plantation
- Cliff lines/escarpments
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

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

0 2.5 5 km

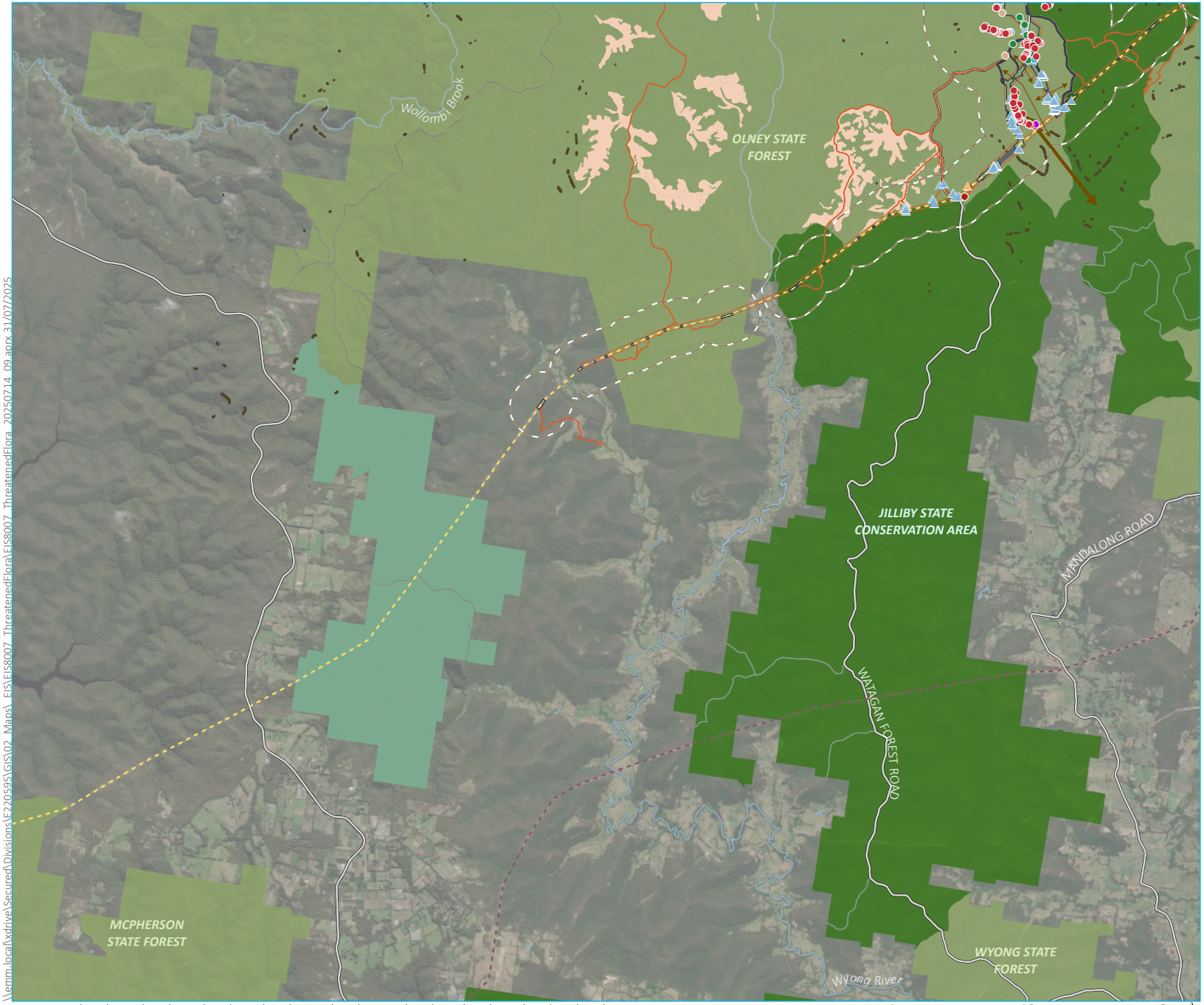
GDA2020 MGA Zone 56

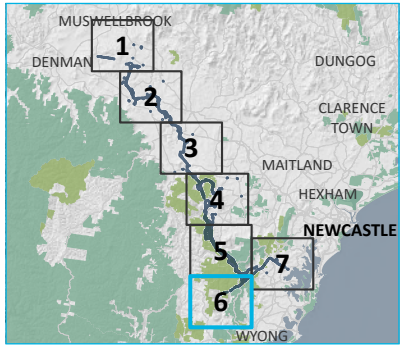
N

Threatened flora and fauna species
Map 5 of 7

Hunter Transmission Project
Environmental Impact Statement
Figure 8.6

EMM
creating opportunities





KEY

- Assessment area
- Project impact area
- Disturbance area
- No clearing area

Terrestrial connectivity

- Major
- Minor

Recorded threatened fauna species

- Eastern Coastal Free-tailed Bat
- Gang-gang Cockatoo
- Giant Barred Frog
- Giant Burrowing Frog
- Greater Broad-nosed Bat
- Large Bent-winged Bat
- Large-eared Pied Bat
- Little Bent-winged bat
- Littlejohn's Tree Frog
- Red-crowned Toadlet
- Sooty Owl
- South-eastern Glossy Black-Cockatoo
- Stuttering Frog

Recorded threatened flora species

- Rhodamnia rubescens
- Rhodomyrtus psidioides

Existing environment

- 330 kV transmission line
- 500 kV transmission line
- Major road
- Named watercourse
- Harwood plantation
- Cliff lines/escarpments
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

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

0 2.5 5 km

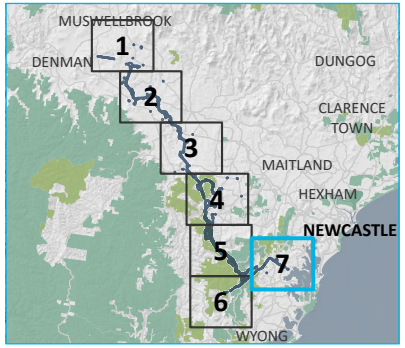
GDA2020 MGA Zone 56

N

Threatened flora and fauna species
Map 6 of 7

Hunter Transmission Project
Environmental Impact Statement
Figure 8.6

EMM
creating opportunities



KEY

- Assessment area
- Project impact area
- Disturbance area
- No clearing area

Recorded threatened fauna species

- Giant Barred Frog
- Koala
- Little Lorikeet
- Sooty Owl
- South-eastern Glossy Black-Cockatoo
- Squirrel Glider
- Yellow-bellied Glider

Recorded threatened flora species

- Genoplesium insigne
- Grevillea parviflora subsp. Parviflora
- Maundia triglochinoides
- Melaleuca biconvexa
- Tetratheca juncea

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Railway
- Major road
- Minor road
- Named watercourse
- Harwood plantation
- Cliff lines/escarpments
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

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

0 2.5 5 km

GDA2020 MGA Zone 56

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Threatened flora and fauna species
Map 7 of 7

Hunter Transmission Project
Environmental Impact Statement
Figure 8.6

EMM
creating opportunities

8.3.6 Aquatic ecology

The project impact area is partially within the Hunter River, Lake Macquarie and Tuggerah Lakes surface water catchments and intersects with numerous named and unnamed watercourses and vegetated riparian zones. *Chapter 17 (Surface water)* provides further detail on these catchments and watercourses, including their Strahler stream order.

Sixteen named watercourses and 48 unnamed watercourses and drainage lines that intersect with the project impact area contain mapped key fish habitat (KFH). Eleven of the named watercourses are perennial (Strahler stream order of 4 and higher) and would be crossed by the proposed transmission line and/or access tracks (new and upgraded), including:

- transmission line crossings from north to south: Hunter River, Wollombi Brook, Loader Creek, Monkey Place Creek, Deep Creek, Cedar Creek, Congewai Creek, Sweetmans Creek and Watagan Creek
- new and upgraded access tracks: Monkey Place Creek, Black Creek and Peach Tree Creek.

The project impact area contains mapped habitat for the Southern Purple Spotted Gudgeon (*Mogurnda adspersa*), listed as endangered under the *NSW Fisheries Management Act 1994* (FM Act). Field surveys confirmed the presence of the Southern Purple Spotted Gudgeon habitat where the disturbance area intersects with Wollombi Brook, Congewai Creek, Monkey Place Creek and Black Creek.

There is also mapped habitat for the Darling River Hardyhead (*Craterocephalus amniculus*), listed as endangered under the FM Act, located upstream of the project impact area (Hunter River). This species was considered further on a precautionary basis as potential habitat for this species was identified during the field surveys.

Likelihood of occurrence assessments were completed in accordance with the FM Act which determined that the Southern Purple Spotted Gudgeon has a high likelihood of occurrence, while Darling River hardyhead was assessed as having a moderate likelihood.

There are no FM Act listed ecological communities present in the study area.

8.3.7 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are communities of plants, animals, and other organisms whose extent and life processes are dependent on groundwater. Groundwater dependent ecosystems may rely on either the surface expression of groundwater (baseflow watercourses, wetlands) or the subsurface presence of groundwater, which can be accessed by plant roots via the capillary fringe (the non-saturated zone just above the water table).

The *Groundwater Dependent Ecosystems Atlas* (BoM 2024) indicates that several vegetation formations within the project impact area have a high or moderate potential to be terrestrial GDEs, including:

- high potential GDEs – forested wetlands (Coastal Floodplain Wetlands, Inland Riverine Forests) and some rainforest vegetation (Northern Warm Temperate Rainforest) that may rely

on surface or subsurface groundwater, which primarily occur along the Hunter River and Wollombi Brook floodplains

- **moderate potential GDEs** – include some Wet and Dry Sclerophyll Forests, particularly in low-lying areas (e.g. in Olney State Forest) where access to subsurface groundwater may occur intermittently, all remaining vegetation formations in the disturbance area are considered low potential GDEs, not obligately groundwater dependent.

Figure 14.20 of *Technical Report 1 - Biodiversity development assessment report* identifies the location of mapped GDEs across the locality.

Additionally, three watercourses are mapped aquatic GDEs including Wollombi Brook (high potential aquatic GDE) and Hunter River and Congewai Creek (moderate potential aquatic GDEs).

8.4 Potential impacts – construction

8.4.1 Native vegetation

Construction of the project would result in potential direct impacts to around 762 hectares of native vegetation that aligns with 34 PCTs. Around 546 hectares would be completely cleared (disturbance Area A, including the centreline) and 216 hectares would be partially cleared (disturbance areas B and HZ) (see Table 8.6). Table 8.6 also identifies the ecosystem credit liability generated under the BAM-C for each PCT, with further discussion provided in *section 8.6*.

Technical Report 1 – Biodiversity development assessment report includes a detailed summary of the methodology used to determine the Vegetation Integrity (VI) score for partial impacts based on existing transmission line easements in the Hunter Valley and scientific literature.

For derived grassland vegetation conditions, the impacts are limited to disturbance area A (including centreline) where there would be complete vegetation removal and potential sub-surface impacts through construction activities such as grading, excavation, and full tree removal. Where partial clearing occurs in disturbance area B, understory species would be retained and only vegetation with mature growth heights of more than 2 metres would be removed. This has resulted in the avoidance of impacts to around 54 hectares of derived grassland vegetation which has been exclude from the disturbance area (i.e. total impacts to native vegetation is 762 hectares because the 54 hectares of disturbed and derived grassland PCTs would not be impacted).

A total of 25 scattered trees, 20 of which are hollow bearing, were recorded within the disturbance area and would be impacted by the project, including 4 trees in the Yengo IBRA subregion and 21 (20 hollow bearing) in the Hunter IBRA subregion.

Table 8.6 Summary of potential direct impacts on native vegetation

Plant community type	Disturbance area (ha)				
	A	B	HZ	Total	Ecosystem credit liability
3029 – Lower North Wet Gully Palm Rainforest	1.61	3.2	0	4.81	118
3086 – Lower North Hinterland Riparian Dry Rainforest	4.84	1.12	0	5.96	193
3087 – Lower North Ranges Riparian Turpentine Forest	1.64	1.49	0	3.13	76
3150 – Hunter Coast Ranges Turpentine Wet Forest	17.48	17.99	0.56	36.03	723
3151 – Northwest Sydney Sandstone Grey Myrtle Dry Rainforest	0.87	0.98	0	1.85	34
3152 – Hunter Range Turpentine-Grey Myrtle Gully Forest	0.25	0.67	0	0.92	21
3230 – Central Coast Escarpment Moist Forest	52.6	17.77	0.09	70.46	1785
3237 – Hunter Range Blue Gum Gully Forest	2.43	3.03	0	5.46	116
3238 – Hunter Range Colluvial Apple-Gum Forest	0.01	0.04	0	0.05	1
3239 – Hunter Range Sheltered Grey Gum Forest	85.86	23.98	0.13	109.97	2732
3241 – Lower North White Mahogany-Spotted Gum Moist Forest	12.3	0	0	12.3	371
3242 – Lower North Ranges Turpentine Moist Forest	17.67	18.63	0.2	36.5	836
3244 – Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest	1.31	0.31	0	1.62	39
3250 – Northern Foothills Blackbutt Grassy Forest	2.02	0	0	2.02	47
3263 – Watagan Range Turpentine-Mahogany Grassy Forest	29.72	9.14	0.24	39.1	987
3314 – Central Hunter Slopes Grey Box Forest	64.01	13.87	0	77.88	1480
3315 – Central Hunter Ironbark-Spotted Gum Forest	22.2	4.1	0	26.3	399
3328 – Lower Hunter Red Gum-Paperbark Riverflat Forest	0.34	0.11	0	0.45	7
3431 – Central Hunter Ironbark Grassy Woodland	77.98	40.88	0	118.86	2286
3438 – Hunter Escarpment Footslopes Ironbark Forest	6.28	5.9	0.01	12.19	325
3439 – Hunter Escarpment Grey Gum Sheltered Forest	0.4	1.01	0.21	1.62	42
3444 – Lower Hunter Spotted Gum-Ironbark Forest	21.15	16.72	0	37.87	1139

Plant community type	Disturbance area (ha)				
	A	B	HZ	Total	Ecosystem credit liability
3446 – Lower North Foothills Ironbark-Box-Gum Grassy Forest	0.48	0.89	0	1.37	41
3489 – Hunter Escarpment Grey Box Forest	4.45	1.21	0.01	5.67	168
3581 – Hunter Coast Foothills Apple Forest	0.67	0	0	0.67	16
3599 – Blue Mountains Peppermint Shrub Forest	7.23	0.01	0	7.24	185
3605 – Hunter Range Ironbark Forest	43.47	13.45	0.18	57.1	1288
3617 – Sydney Hinterland Peppermint-Apple Forest	29.83	5.52	0.21	35.56	947
3621 – Sydney Hinterland Turpentine-Apple Gully Forest	2.02	2.84	0	4.86	104
3636 – Warkworth Sands Woodland	18.97	3.11	0	22.08	166
4015 – Central Hunter Riparian Forest	7.09	2.73	0	9.82	257
4039 – Hunter Range Creekflat Apple-Red Gum Forest	0.6	0.31	0	0.91	35
4072 – Hunter River Oak Mesic Forest	0.21	0	0	0.21	7
4089 – Namoi – Upper Hunter River Red Gum Forest	8.1	3.04	0	11.14	116
Total	546.09	214.05	1.84	761.98	**17,087**

8.4.2 Threatened ecological communities

The residual direct impacts to the 7 TECs listed as endangered under the BC Act and 3 TECs listed as critically under the EPBC Act are detailed in Table 8.7.

The overall direct impacts to TECs listed under the BC Act is around 207 hectares. The largest portion of direct impacts is to the Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC, with impacts to around 142 hectares of thinned, poor or planted native vegetation. Across all TECs, direct impacts are primarily associated with disturbance area A (including centreline), with around 120 hectares expected to be cleared to ground level.

Two TECs are also potential SAII entities, including:

- 4.22 hectares Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC
- 12.37 hectares Warkworth Sands Woodland in the Sydney Basin Bioregion.

Section 8.4.5 provides a detailed consideration of potential impacts on SAII entities.

Potential impacts on the 3 TECs listed under the EPBC Act (see Table 8.13) are discussed further in *section 8.4.11*.

Table 8.7 Summary of potential direct impacts on threatened ecological communities

TEC	Conservation status[1]		SAII entity	Disturbance area (ha)			
	BC Act	EPBC Act		A	B	HZ	Total
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	E	CE [2]	No	86.63	54.75	0	141.38
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	E	-	No	4.76	4.10	0	8.86
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	E	-	Yes	1.18	3.04	0	4.22
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	E	-	No	0.48	0.89	0	1.37
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	E	-	No	21.15	16.72	0	37.87
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	CE	No	0.94	0.42	0	1.36
Warkworth Sands Woodland in the Sydney Basin Bioregion	E	CE	Yes	9.26	3.11	0	12.37
Total impact				124.40	83.03	0.00	207.43

1: 'CE' denotes critically endangered under the EPBC Act and 'E' denotes endangered under the BC Act

2: Only part of the BC Act listed TEC is listed under the EPBC Act (see *section 8.4.11* for a detailed summary of direct impacts EPBC Act listed TECs)

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8.4.3 Threatened flora

There is the potential for residual direct impacts on 38 threatened flora species. Of these, 9 species were recorded during field surveys and 29 species were assumed present within the disturbance area, including:

- 22 species listed under the BC Act and EPBC Act (4 recorded during survey, 18 assumed present)
- 14 species listed under the BC Act only (4 recorded during survey, 10 assumed present)
- 2 species listed under the EPBC Act only (one recorded during survey, one assumed present).

Species were conservatively assumed present based on suitable habitat being present and where targeted surveys were not sufficient to exclude the species. However, many of the candidate flora species assumed present have a low likelihood of occurring within the disturbance area.

Table 8.8 summarises the direct impacts on threatened flora species listed under the BC Act and EPBC Act, including whether they were recorded within the disturbance area or assumed present. Table 8.8 also identifies the species credit liability generated under the BAM-C for each flora species, with further discussion provided in *section 8.6*.

Of the 38 threatened flora species, 8 are also potential SAII entities, 5 of which were recorded during field surveys and 3 were assumed present. These species are identified in Table 8.8 Summary of potential direct impacts on threatened flora species, and discussed further in *section 8.4.5*.

Potential impacts on the 24 threatened flora species listed under the EPBC Act (5 recorded, 19 assumed present) are discussed further in *section 8.4.11*.

Table 8.8 Summary of potential direct impacts on threatened flora species

Scientific name/common name	Conservation status		Potential SAII	Impact (ha or individual)			Species credit liability
	BC Act[1]	EPBC Act[2]		Known	Assumed	Total	
Acacia bynoeana/Bynoe's Wattle	E	V	–	0	9.77	9.77	104
Acacia pendula/ Acacia pendula population in the Hunter catchment	EP	CE	Yes	0	16.92	16.92	774
Angophora inopina/Charmhaven Apple	V	V	–	0	1.74	1.74	51

Scientific name/common name	Conservation status		Potential SAII	Impact (ha or individual)			Species credit liability
	BC Act[1]	EPBC Act[2]		Known	Assumed	Total	
Asperula asthenes/Trailing Woodruff	V	V	–	0	2.29	2.29	79
Brachyscome brownii	-	CE	-	25.42	0	25.42	TBD
Callistemon linearifolius/ Netted Bottle Brush	V	-	-	0	446 individuals	446 individuals	670
Corybas dowlingii/Red Helmet Orchid	E	–	–	0	11.37	11.37	327
Cymbidium canaliculatum	EP	–	–	1 individual	22 individuals	23 individuals	46
Cynanchum elegans/ White-flowered Wax Plant	E	E	–	0	9.75	9.75	403
Dillwynia tenuifolia	V	–	–	0	1.46	1.46	44
Diuris tricolor/Pine Donkey Orchid	V	–	–	0	26.56	26.56	416
Eucalyptus camaldulensis/ Eucalyptus camaldulensis population in the Hunter catchment	EP	–	–	1.5	1.8	3.3	14
Eucalyptus castrensis/ Singleton Mallee	E	-	Yes	0	0.21	0.21	16
Eucalyptus fracta/Broken Back Ironbark	E	–	Yes	4.53	16.15	20.68	1072
Eucalyptus glaucina/ Slaty Red Gum	V	V	-	0	1,176 individuals	1,176 individuals	2212
Eucalyptus pumila/Pokolbin Mallee	V	V	Yes	0	17.68	17.68	937

Scientific name/common name	Conservation status		Potential SAII	Impact (ha or individual)			Species credit liability
	BC Act[1]	EPBC Act[2]		Known	Assumed	Total	
Grammitis stenophylla/Narrow-leaf Finger Fern	E	–	–	0	5.76	5.76	176
Grevillea parviflora subsp. *Parviflora*/Small-flower Grevillea	V	V	–	0	3.55	3.55	104
Melaleuca biconvexa/Biconvex Paperbark	V	V	–	0	9.35	9.35	280
Melaleuca groveana/Grove's Paperbark	V	–	–	187 individuals	3,155 individuals	3,342 individuals	6684
Olearia cordata	V	V	–	0	4.03	4.03	129
Ozothamnus tesselatus	V	V	–	0	7.69	7.69	155
Persoonia hirsuta/ Hairy Geebung	E	E	Yes	0	1.46	1.46	66
Pomaderris queenslandica/Scant Pomaderris	E	–	–	0	6.85	6.85	182
Prasophyllum petilum/Tarengo Leek Orchid	E	E	–	0	30.99	30.99	688
Prasophyllum sp. Wybong	–	CE	–	0	30.99	30.99	1032
Prostanthera cineolifera/Singleton Mint Bush	V	V	–	30.01	27.71	57.72	1926
Pterostylis chaetophora	V	–	–	0	30.99	30.99	681
Pterostylis gibbosa/Illawarra Greenhood	E	E	–	1.97	0.21	2.18	67

Scientific name/common name	Conservation status		Potential SAII	Impact (ha or individual)			Species credit liability
	BC Act[1]	EPBC Act[2]		Known	Assumed	Total	
Rhizanthella slateri/Eastern Australian Underground Orchid	V	E	Yes	0	9.45	9.45	446
Rhodamnia rubescens/Scrub Turpentine	CE	CE	Yes	1,164 individuals	1,230 individuals	2,394 individuals	7182
Rhodomyrtus psidioides/Native Guava	CE	CE	Yes	1.69	18.3	19.99	936
Rutidosis heterogama/Heath Wrinklewort	V	V	–	0	15.68	15.68	221
Senna acclinis/Rainforest Cassia	E	–	–	0	5.95	5.95	177
Syzygium paniculatum/ Magenta Lilly Pilly	V	V	-	0	513 individuals	513 individuals	1026
Tetratheca juncea/Black-eyed Susan	V	V	–	0	2.85	2.85	91
Velleia perfoliata	V	V	–	0	4.02	4.02	128
Zieria involucrata	E	V	–	0	4.03	4.03	129

1: V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered under the BC Act.

2: V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act.

8.4.4 Threatened fauna

There is the potential for residual direct impacts on 28 threatened fauna species. Of these, 26 species were recorded during field surveys and 2 species were conservatively assumed to be present based on the presence of suitable habitat within the disturbance area. All recorded and assumed threatened fauna species are listed under the BC Act, with 15 species also listed under the EPBC Act.

Table 8.9 summarises the direct impacts on threatened fauna species listed under the BC Act and EPBC Act, including whether they were recorded within the disturbance area or assumed present. Table 8.9 also identifies the species credit liability generated under the BAM-C for each fauna species, with further discussion provided in *section 8.6*.

Of the 28 threatened fauna species, 6 are also potential SAII entities, all of which were recorded during field surveys. These species are identified in Table 8.9, and discussed further in *section 8.4.5*.

Potential impacts on the 15 threatened fauna species listed under the EPBC Act (14 recorded, one assumed present) are discussed further in *section 8.4.11*.

Table 8.9 Summary of potential direct impacts on threatened fauna species

Scientific name/common name	Conservation status[1]		Potential SAII	Habitat impact (ha)			Species credit liability
	BC Act	EPBC Act		Recorded	Assumed	Total	
Anthochaera phrygia/Regent Honeyeater	CE	CE	–	93.77	0	93.77	5313
Callocephalon fimbriatum/Gang-gang Cockatoo	E	E	–	2.96	90.27	93.23	3615
Calyptorhynchus lathami lathami/South-eastern Glossy Black-Cockatoo	V	V	–	0	69.5	69.5	2616
Cercartetus nanus/Eastern Pygmy-possum	V	–	–	155.55	0	155.55	5017
Chalinolobus dwyeri/Large-eared Pied Bat	E	E	Yes	506.36	0	506.36	24386
Delma vescolineata/Hunter Valley Delma	E	E	–	233.04	0	233.04	3340
Heleioporus australiacus/Giant Burrowing Frog	V	V	–	20.53	6.22	26.75	663
Hoplocephalus bitorquatus/ Pale-headed Snake	V	-	-	0	2.02	2.02	63
Hoplocephalus stephensii/Stephens' Banded Snake	V	–	–	141.86	3.85	145.71	4716
Lathamus discolor/Swift Parrot	E	CE	–	42.76	0	42.76	2369
Litoria littlejohni/Littlejohn's Tree Frog	E	E	–	63.53	0	63.53	2217

Scientific name/common name	Conservation status[1]		Potential SAII	Habitat impact (ha)			Species credit liability
	BC Act	EPBC Act		Recorded	Assumed	Total	
Mixophyes balbus/Stuttering Frog	E	V	Yes	180.09	0	180.09	8737
Mixophyes iteratus/Giant Barred Frog	V	V	–	2.34	1.47	3.81	93
Myotis macropus/Southern Myotis	V	–	–	120.25	0	120.25	2491
Ninox connivens/Barking Owl	V	–	–	29.3	7.34	36.64	1406
Ninox strenua/Powerful Owl	V	–	–	103.73	21.1	124.83	4807
Notamacropus parma/Parma Wallaby	V	V	–	304.98	0	304.98	9718
Petauroides volans/Southern Greater Glider	E	E	–	477.12	0	477.12	18222
Petaurus norfolcensis/Squirrel Glider	V	–	–	647.62	0	647.62	23507
Petrogale penicillata/Brush-tailed Rock- wallaby	E	V	Yes	145.64	10.38	156.02	7439
Phascogale tapoatafa/Brush-tailed Phascogale	V	–	–	90.41	0	90.41	2235
Phascolarctos cinereus/Koala	E	E	–	244.24	40.5	284.74	10693
Planigale maculata/Common Planigale	V	–	–	18.21	0	18.21	335
Potorous tridactylus/Long-nosed Potoroo	V	V	Yes	135.1	0	135.1	4370
Pseudophryne australis/ Red-crowned Toadlet	V	–	–	39.39	4.15	43.54	1073
Tyto novaehollandiae/Masked Owl	V	–	–	22.38	19.7	42.08	1598
Tyto tenebricosa/Sooty Owl	V	–	Yes	195.05	12.77	207.82	11797
Vespadelus troughtoni/Eastern Cave Bat	V	–	Yes	383.77	0	383.77	17489

1: V = Vulnerable, E = Endangered, CE = Critically Endangered under the BC Act and EPBC Act.

8.4.5 Serious and irreversible impacts

Under Clause 6.7 of the Biodiversity Conservation Regulation 2017, an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct, based on 4 guiding principles relating to:

- risk of extinction due to rapid decline
- very small population size
- limited geographic distribution
- lack of potential to recover due to irreplaceability.

Sixteen SAII entities are known to occur (2 TECs, 3 threatened flora species and 4 threatened fauna species) or assumed to occur (5 threatened flora species and 2 threatened fauna species) in the disturbance area based on the presence of suitable habitat (see Table 8.10). Except for the 2 TECs, the majority of the impacted SAII entities are associated with the forested plateau section of the project where extensive contiguous habitats exist.

Technical Report 1 - Biodiversity Development Assessment Report (see *section 9.1*) provides a detailed assessment for SAII on biodiversity values to assist the determining authority to evaluate the nature of an impact on a potential entity at risk of a SAII, including the relevant SAII principle/s that apply to each entity subject to assessment.

In response to advice from CPHR, the SAII assessment includes consideration of potential impacts on 2 additional SAII entities: the Variable Midge Orchid (*Genoplesium insigne*) and *Gyrostemon thesioides*. While the Variable Midge Orchid was recorded during targeted surveys within the project impact area, it is located outside of the disturbance area and would not be directly impacted. Assumed habitat for the other species (*Gyrostemon thesioides*) occurs within the disturbance area on land assessed in accordance with the Remote Assessment Guide which supported exclusion of this potential SAII entity.

For the SAII ecological communities, a high proportion of the impact would be in disturbance area B and will only be partially impacted, with the retained understorey and ecological attributes likely to still contribute to maintaining ecological functions between adjoining patches of ecological communities outside of the disturbance area.

Table 8.10 Summary of potential direct impacts to species and communities at risk of SAII

Species and communities at risk of SAII	Impact (ha or individual)		
	Known	Assumed	Total
Threatened ecological communities			
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC	4.22	0	4.22
Warkworth Sands Woodland in the Sydney Basin Bioregion EEC	12.37	0	12.37
Threatened flora species habitat			
Acacia pendula/ Acacia pendula population in the Hunter catchment	0	16.92	16.92
Eucalyptus castrensis/ *Singleton Mallee*	0	0.21	0.21
Eucalyptus fracta (Broken Back Ironbark)	4.53	16.15	20.68
Eucalyptus pumila (Pokolbin Mallee)	0	17.68	17.68
Persoonia hirsuta/ *Hairy Geebung*	0	1.46	1.46
Rhizanthella slateri (Eastern Australian Underground Orchid)	0	9.45	9.45
Rhodamnia rubescens (Scrub Turpentine)	1,164 individuals	1,230 individuals	2,394 individuals
Rhodomyrtus psidioides (Native Guava)	1.69	18.3	19.99
Threatened fauna habitat			
*Anthochaera Phrygia (*Regent Honeyeater)	93.77	0	93.77
Chalinolobus dwyeri (Large-eared Pied Bat)	506.36	0	506.36
Lathamus discolor (Swift Parrot)	42.76	0	42.76
Mixophyes balbus (Stuttering Frog)	180.09	0	180.09
Petrogale penicillata (Brush-tailed Rock- wallaby)	145.64	10.38	156.02
Tyto tenebricosa (Sooty Owl)	195.05	12.77	207.82

As detailed in *Chapter 3 (Alternatives and options)*, avoiding and minimising impacts on SAII entities was prioritised when considering potential corridor options.

Following the selection of the corridor, field surveys informed further measures to avoid and minimise potential impacts to SAII entities, including realigning the transmission line corridor within:

- the valley floor environment and riverine floodplains of the Hunter River to avoid and minimise impacts on remnant Warkworth Sands by prioritising low-quality vegetation areas

- Pokolbin, Corrabare, Watagan and Olney State forests to avoid Brush-tailed Rock-Wallaby, microbat and frog breeding habitats.

Avoidance and mitigation of impacts to potential SAII entities will be prioritised during detailed design. Mitigation measures include but are not limited to micro-siting of the transmission line infrastructure and associated work sites to avoid and minimise direct impacts, retention of habitat features, establishment of 'no go zones', and specific clearing controls in sensitive biodiversity areas (see *section 8.7*).

8.4.6 Aquatic ecology

The project has potential to impact on water quality, water bodies and hydrological processes that sustain threatened biodiversity.

Construction of the project has the potential to impact aquatic habitat through:

- removal or trimming of riparian vegetation
- erosion and sedimentation from soil disturbance
- mobilisation of contaminants
- temporary reduction in water quality
- disturbance from vehicle crossings and equipment
- temporary impacts on habitat for aquatic and semi-aquatic species.

Of the 16 named watercourses and 48 unnamed watercourses that contain mapped KFH, field surveys confirmed the presence of habitat for the Southern Purple Spotted Gudgeon where the project intersects with Wollombi Brook, Congewai Creek, Monkey Place Creek and Black Creek.

While potential habitat for the Darling River Hardyhead was also identified during field surveys, there is no mapped habitat for this species within the disturbance area and the most recent record was in 1976.

Tests of significance were completed for both species which concluded that construction of the project is unlikely to result in any significant impact. Transmission towers would typically be located 50 to 100 metres from watercourses and would direct impacts on Southern Purple Spotted Gudgeon habitat (and potential Darling River Hardyhead).

During construction of the transmission line, impacts would be limited to the removal or trimming of canopy vegetation on creek banks to enable line stringing, trunk bases and understorey would be retained, and any potential indirect impacts from erosion or sedimentation would be managed to avoid effects on riparian areas. Water quality impacts are expected to be temporary and negligible, and riparian areas would continue to function as they currently perform.

The many smaller gullies and creeks within the State forests and mountainous areas are within the designated no clearing zones and would be spanned by the new transmission line.

Most watercourse crossings would follow existing forestry or farm tracks, reducing the need for new disturbance. Where new watercourse crossings are required, these will be designed to minimise disturbance and harm within riparian corridors and aquatic habitat will be rehabilitated, where practicable, in accordance with the *Guidelines for controlled activities on waterfront land* (NRA 2018),

Why do fish need to cross the road? Fish passage requirements for waterway crossings (Fairfull and Witheridge 2003) and *Policy and guidelines for fish habitat conservation and management* (DPI 2013).

With the proposed mitigation and management measures, potential impacts to key fish habitat, aquatic habitat and threatened fish species are unlikely.

Potential direct and indirect impacts on threatened amphibian species recorded or assumed present within the disturbance area (including the Giant Barred Frog, Giant Burrowing Frog, Littlejohn's Tree Frog, Red-crowned Toadlet and Stuttering Frog) are addressed in *section 8.4.4* and *section 8.4.8.*

Appendix L (Aquatic biodiversity impact statement) of *Technical Report 1 – Biodiversity development assessment report* provides a detailed assessment of potential impacts on listed aquatic threatened species, populations or ecological communities.

8.4.7 Groundwater dependent ecosystems

During construction of the transmission line and towers, temporary and localised groundwater drawdown may occur during piling works in areas where the water table is shallow (near the Hunter River floodplain). While concrete pilings may intercept the water table, this is not expected to result in permanent groundwater take or drawdown that would alter groundwater flow, levels, direction or quality outside Disturbance Area A. As such, these activities would not result in any additional impacts to GDEs.

Excavation for construction support sites and switching stations is unlikely to intercept groundwater. If perched or shallow groundwater is encountered, any associated impacts would be short-term and confined to the immediate work area.

As there is no permanent groundwater take or change to groundwater conditions outside the disturbance area, the native vegetation assessment under the BAM is considered sufficient to address potential impacts on terrestrial GDEs. The project is unlikely to result in any indirect impacts on GDEs, and no additional mitigation measures or offset requirements would be required.

If construction water is sourced from existing licensed groundwater bores, it would be managed under existing entitlements and is not expected to affect GDEs.

Further details on the impacts of the project on groundwater is included in *Chapter 18 (Groundwater)*.

8.4.8 Indirect impacts

Indirect impacts are impacts that occur when the project affects native vegetation and threatened species habitat beyond the areas of direct impact (i.e. disturbance areas A (including the centreline), B and HZ). Indirect impacts associated with the project may include:

- inadvertent impacts on adjacent habitat or vegetation including:
  - impact to habitat surrounding caves that are known or potential breeding habitat for threatened microbat species and Sooty Owl
  - impact to habitat surrounding known locations of Brush-tailed Rock Wallaby populations
  - impact to habitat surrounding known aquatic or gully locations of threatened frog species
  - impact to habitat near known locations of Hunter Valley Delma

- reduced viability of adjacent habitat due to edge effects
- reduced viability of adjacent habitat due to noise, dust or light spill
- transport of weeds, pests and pathogens from the site to adjacent vegetation
- increased risk of starvation, exposure and loss of shade or shelter
- loss of breeding habitats
- trampling of threatened flora species
- increased risk of fire
- increased risk of collision with lines and EMF impacts with new infrastructure.

Most potential indirect impacts have the potential to occur during construction and may persist at reduced intensity during operation. Table 8.11 provides a consolidated summary of these indirect impacts across both phases. Indirect impacts that would predominantly occur during operation, such as the risk of fauna collision with transmission lines or EMF-related effects, are addressed separately in *section 8.5.2*.

Measures proposed to manage the residual risk of potential indirect impacts are provided in Table 8.17.

Importantly, partial clearing of the transmission line easement is designed to minimise impacts on biodiversity values, including indirect impacts. The retention of vegetation up to a height of 2 metres within disturbance area B will create a natural transition between the fully cleared areas (disturbance area A, including the centreline) and the surrounding forest or woodland, avoiding an abrupt, hard edge.

Significant efforts have also been made to establish 'no clearing zones' to support habitat connectivity by avoiding impacts on gullies within State forests and nature reserves by stringing the lines at substantial distances and avoiding any clearing where possible.

Table 8.11 Summary of potential indirect impacts

Indirect impact	Potentially impacted entities	Duration	Likelihood and consequence
Inadvertent impacts on adjacent vegetation and habitat	All PCTs and TECs Threatened species (Brush-tailed Rock Wallaby, Large-eared Pied Bat, Eastern Cave Bat, Large Bent-winged Bat, Sooty Owl) Aquatic habitat	Short-term during construction	**Moderate** The land is within a 100 m buffer of rocky areas containing caves, crevices, cliffs, and escarpments, which may serve as breeding habitats for threatened microbat species and the Sooty Owl. Construction during the breeding season may impact breeding success. Construction could lead to sedimentation, erosion, and the mobilisation of contaminants, affecting native vegetation and aquatic habitats, particularly near rivers, creeks, and key fish habitats, with the potential to reduce the viability of habitat for aquatic and semi aquatic species (including frogs) temporarily. Mitigation measures include amending construction methodology or cessing certain construction activities within 100 m of rocky during breeding periods if species are present; micro-siting project infrastructure; implementing 'no go zones'; specific clearing controls in sensitive biodiversity areas; and pre-clearing surveys.
Reduced viability of adjacent habitat due to edge effects	All PCTs and TECs	Long-term during construction and operation	**Negligible** New habitat edges may alter vegetation composition, increase wind exposure, and create changes in microclimates, such as temperature, light, and moisture. There is potential for weed invasion and changes in species interactions, such as increased insect populations attracting more predators. While some habitat edges may degrade, others may benefit from improved light conditions, leading to mixed impacts. The data from survey plots adjacent to existing easements suggests that the vegetation and habitat adjacent to existing easements remains in moderate to good condition.

Indirect impact	Potentially impacted entities	Duration	Likelihood and consequence
Reduced viability of adjacent habitat due to noise, dust or light spill	Native vegetation and TECs Fauna	Short-term during construction and operation	**Negligible** Noise and dust from construction may temporarily disturb fauna, including woodland birds and small mammals. Dust deposition may reduce plant function but is expected to be highly localised to Disturbance area A. Night-time lighting at switching stations may affect nocturnal species such as microbats but will be limited in extent and duration. Lighting will be designed in accordance with the *National Light Pollution Guidelines for Wildlife* (Commonwealth DCCEEW 2023a) and localised to infrastructure only.
Transport of weeds, pests, and pathogens from the site to adjacent vegetation	Native vegetation Threatened flora species Threatened ecological communities Habitats: Native vegetation adjacent to construction zones	Long-term during construction and operation	**Negligible** Soil movement, machinery and vehicle traffic may introduce weeds or pest species such as foxes, cats or rabbits into remnant vegetation patches, particularly in sensitive biodiversity areas for *Rhodamnia rubescens* which is extremely susceptible to infection by Myrtle Rust. Weed spread risks are highest during earthworks and early operational years. Mitigation measures will be implemented to control weed and pest spread, vehicle and machinery hygiene protocols, limiting soil movement and maintaining vegetation buffers, and implementing weed control during and after construction. An amphibian management plan would be prepared to control the spread of Chytrid Fungus within the disturbance area and adjoining threatened amphibian habitat. Procedures for the management of Myrtle Rust on threatened plants (including *Rhodamnia rubescens*) will be developed to ensure the project is consistent with the objectives of FCNSW and NPWS myrtle rust management,

Indirect impact	Potentially impacted entities	Duration	Likelihood and consequence
Increased risk of starvation, exposure, and loss of shade or shelter	All fauna species	Short/ medium-term during construction	**Negligible** Fauna may be displaced due to vegetation clearing, losing access to food, shade, or shelter. Displacement of resident fauna species during native vegetation clearing is considered relatively low due to the expansive similar forested and agricultural environments surrounding the project impact area. The linear nature of the project and highly mobile nature of most fauna species means the overall the risk of starvation, exposure and loss of shade or shelter due to the project is considered low. Mitigation and management measures will further reduce these risk, including vegetation management to retain habitat patches, clearing limits, pre-clearing surveys and fauna relocation procedures.
Loss of breeding habitats	All fauna species	Long-term during construction and operation	**Moderate** The loss of breeding habitat (i.e. hollow bearing trees, nests, dreys and burrows and fallen timber) has the potential to affect native animals such as: • hollow-dependent bats • hollow-nesting and canopy-nesting birds • arboreal mammals • reptiles and amphibian • terrestrial fauna (burrow and fallen timber users) The loss of breeding habitats is unlikely to extend beyond the disturbance area. Impacts beyond this area would be avoided through mitigation and management measures, including a supplementary hollow and nest strategy, and other measures that aim to reduce the impacts on trees, breeding habitat, threatened species and communities.

Indirect impact	Potentially impacted entities	Duration	Likelihood and consequence
Trampling of threatened flora species	Threatened flora species and habitats	Short-term during construction and long-term during operation	**Low** Reduction in population extent and available habitat of threatened flora species that occur in the ground stratum could occur due to trampling or unauthorised material, storage, vehicle and plant equipment. Mitigation measures include protection for these areas and inadvertent impacts such as trampling is considered unlikely. All known threatened flora will be mapped and uploaded to GIS systems accessible to construction personnel and marked as 'no-go zones'. Operational activities will follow environmental protocols, including restricted access and environmental inductions for maintenance crews.
Increased risk of fire	Native vegetation All flora and fauna species	Long-term during construction and operation	**Moderate** Altered fire regimes can disrupt fire-sensitive vegetation communities and alter species composition. Fire suppression could also affect species adapted to specific fire regimes. The bushfire risk assessment undertaken for the project concluded that the risk of ignition and spreading of a bushfire from construction and operation of the project would be very low (see *Technical Report 14 - Bushfire risk assessment*). Mitigation measures include design standards and vegetation clearing and maintenance controls (see *Chapter 21 (Hazards and Risks)*). Vegetation maintenance would occur in accordance with the Network Operator's standard operational procedures, which were considered in *Technical Report 1 – Biodiversity development assessment report* and included in Disturbance area B impact assessment calculations.

8.4.9 Prescribed impacts

Prescribed biodiversity impacts are those that may affect biodiversity values in addition to, or instead of, impacts from vegetation clearing and loss of habitat.

Most prescribed impacts have the potential to occur during construction and may persist at reduced intensity during operation. A summary of the relevant prescribed biodiversity impacts that may occur during construction of the project is provided below. Measures proposed to manage the residual risk are provided in Table 8.17.

Prescribed impacts that would predominantly occur during operation, such potential impacts on habitat connectivity, are addressed separately in *section 8.5.3*.

Karst, caves, crevices, cliffs and other geological features of significance, or rocks

Karst, caves, crevices, cliffs, rocks, and other geological features of significance are absent from a large proportion of the disturbance area. However, the mountainous areas of Pokolbin, Corrabare, Watagan and Olney State forests contain caves and clifflines with suitable habitat for Brush-tailed Rock Wallaby and microbats such as Eastern Cave Bat, Large Bentwing Bat and Large-eared Pied Bat. This rocky environment would be minimally impacted (restricted to the ridgetop and not the actual caves and clifflines), and these habitats would remain post construction of the HTP.

Known Sooty Owl cave roosting habitat was purposefully avoided as part of the design of the HTP.

Human-made structures

No substantial human-made structures (such as old farm buildings, mine infrastructure, etc.) are present in the disturbance area. Therefore, negligible impacts to human-made structures are expected during construction and operation of the project.

Non-native vegetation

Areas of non-native vegetation (agricultural land and improved pastures dominated by exotic species) are present in the disturbance area (see *section 8.3.2*). Areas of exotic-dominated vegetation would be impacted, however, these are of comparatively minimal value for the native species and communities present within the disturbance area. Negligible impacts to non-native vegetation are expected during construction and operation of the project given that this habitat would predominately remain post construction.

Waterbodies, water quality, and hydrological processes

The project crosses several waterbodies including Watagan Creek, Congewai Creek, Monkey Creek, Loder Creek and the Hunter River. These crossings have the potential to impact on water quality and hydrological processes that sustain threatened biodiversity. The extent of the impact is expected to be minor, however, given that the works would mostly be limited to aboveground construction, with appropriate ground disturbance and water management measures to be implemented (see *Chapter 17 (Surface water)*). In addition, permanent disturbance areas would be located outside of core riparian zones and the many smaller gullies and creeks located in mountainous areas would be spanned by the project.

Vehicle strike

During construction and operation, an increase in vehicle movements, and increase in road use means potential vehicle strike to native fauna is likely to occur.

The most vehicular movements would be generated during construction. Once construction is completed, vehicular movements are not expected to significantly increase compared to the existing situation and would be generally associated with ongoing inspection and maintenance

The consequence of the predicted level of impact is expected to be minor. Mitigation measures would be implemented to manage vehicle and animal interaction during construction and operation of the project (see Table 8.17).

8.4.10 Conservation areas and nature reserves

As detailed in *Section 8.7* of *Technical Report 1 - Biodiversity development assessment report*, significant effort was made to avoid and minimise potential impacts on conservation areas and nature reserves.

There would be unavoidable impacts on Jilliby State Conservation area (SCA) and Corrabare North Flora Reserve. The transmission line corridor has been refined to avoid Jilliby SCA and potential impacts would be limited to ancillary works associated with road upgrades along sections of Martinsville Hill Road and Watagan Road. While the transmission line corridor would traverse the Corrabare North Flora Reserve, significant efforts have been made to minimise vegetation clearing and potential impacts on habitat by designing the transmission line to maintain no clearing zones within gullies.

Native vegetation

The project would clear around 20.38 hectares of native vegetation aligning with 11 PCTs, including:

- Jilliby SCA – around 1.57 hectares of native vegetation (5 PCTs)
- Corrabare North Flora Reserve – around 18.81 hectares (6 PCTs).

Native vegetation within Jilliby SCA and Corrabare North Flora Reserve does not meet the criteria for listing as a TEC under the BC Act or EPBC Act.

Threatened species

Eighteen threatened flora species and 18 threatened fauna species were confirmed or assumed present, including:

- Jilliby SCA – direct impacts on 5 threatened flora (one recorded/4 assumed) and 14 threatened fauna species (13 confirmed habitat/one assumed)
- Corrabare North Flora Reserve – direct impacts on 16 threatened flora (one recorded/15 assumed) and habitat for 10 threatened fauna species (8 confirmed habitat/2 assumed).

8.4.11 Matters of national environmental significance

An EPBC Act referral for HTP was determined a controlled action on 5 February 2025, due to impacts on listed threatened species and ecological communities (sections 18 and 18A) and

Commonwealth land (sections 26 and 27A). The project will be assessed under a bilateral agreement between the Australian Government and the State of New South Wales (in accordance with section 45 of the EPBC Act).

EPBC Act listed threatened species and ecological communities

Appendix C (Matters of national environmental significance) of *Technical Report 1 – Biodiversity development assessment report* provides a detailed assessment of potential impacts to EPBC listed threatened species and ecological communities from the project in accordance with the *Significant Impact Guideline 1.1– Matters of National Environmental Significance* (Department of the Environment, 2013a). This assessment includes consideration of approved conservation advice, recovery plans and threat abetment plans, as well as a summary of potential impacts per Appendix 1 of the Guideline.

Ten EPBC Act listed TECs are known or predicted to occur within 10 kilometres of the project impact area. Of these, 3 TECs were recorded within the disturbance area and would be potentially impacted by the project (see Table 8.12). The remaining 7 TECs were confirmed not to be present and were excluded from further assessment.

Table 8.12 EPBC Act listed TECs likely to be significantly impacted

TEC	EPBC Act status	IBRA subregion	Associated PCTs and condition state	Area (ha)
Central Hunter Valley eucalypt forest and woodland	CE	Hunter	3314_Thinned (38.46 ha) 3315_Thinned (8.86 ha) 3431_Thinned (63.42 ha) 3431_Poor (5.20 ha) 3431_Plantation (14.90 ha) 3438_Mod-good (10.22 ha) 3446_Mod-good (0.02 ha)	144.44
		Yengo	3438_Mod-good (1.97 ha) 3446_Mod-good (1.35 ha)	
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	CE	Hunter Yengo	4039_Mod-good (0.84 ha) 3328_Mod-good (0.45 ha) 4039_Mod-good (0.07 ha)	1.36
Warkworth Sands Woodland of the Hunter Valley	CE	Hunter	3636_Thinned (7.51 ha) 3636_Disturbed grassland (4.86 ha)	12.37
Total				158.13

Fifty-eight threatened flora species, 42 threatened fauna species and 16 migratory species listed under the EPBC Act are known or likely to occur within the disturbance area or surrounding locality (10-kilometre buffer area). Of these, 6 flora species and 17 fauna and/or migratory species were

recorded within the disturbance area. An additional 17 flora species and 11 fauna and/or migratory species were determined to have a moderate to high likelihood of occurrence.

Under the EPBC Act where a project is likely to have a significant residual impact on a listed threatened species and/or community, the impacts must be compensated.

Based on the assessment of significance the project would result in residual impact to 3 threatened ecological communities, and 43 threatened species were determined to have a significant residual impact.

Table 8.13 identifies the EPBC Act listed threatened species likely to be significantly impacted by the project and the ecosystem or species credits required to offset the residual impact. Not all species requiring species credits were determined to have a significant residual impact under the EPBC Act. In addition, some species under the *NSW Biodiversity Offset Scheme* (BOS) will require ecosystem credits. Ecosystem credits will also account for those species that are only listed under the EPBC Act, as the ecosystem credits aims to offset the PCTs/habitat for the species.

Table 8.13 EPBC Act listed species likely to be significantly impacted

EPBC Act listed species and communities	EPBC Act status	Impact area (hectares) or individuals	Ecosystem or species credit
Threatened species - ecosystem credit species			
Botaurus poiciloptilus (Australasian Bittern)	E	22.08	415
Brachyscome brownii	CE	25.42	3103
Climacteris picumnus victoriae (Brown Treecreeper (eastern subspecies))	V	751.21	8149
Dasyurus maculatus (Spotted-tail Quoll)	E	754.03	16,759
Grantiella picta (Painted Honeyeater)	V	248.82	5726
Hirundapus Caudacutus (White-throated Needletail)	V, M	761.98	12,341
Melanodryas cucullata cucullata (South-eastern Hooded Robin)	E	248.82	5736
Nyctophilus corbeni (Corben's Long-eared Bat)	V	39.4	759
Yellow-Bellied Glider (Petaurus australis)	V	480.38	11,956
Pseudomys novaehollandiae (New Holland Mouse)	V	31.98	542
Pteropus poliocephalus (Grey-headed Flying fox)	V	727.25	5406
Pycnoptilus floccosus (Pilotbird)	V	217.72	5325
Rostratula australis (Australian Painted Snipe)	E	22.08	415
Stagonopleura guttata (Diamond Firetail)	V	453.97	9689

EPBC Act listed species and communities	EPBC Act status	Impact area (hectares) or individuals	Ecosystem or species credit
Threatened flora – species credit species			
Angophora inopina/Charmhaven Apple	V	1.74	51
Asperula asthenes/Trailing Woodruff	V	2.29	79
Cynanchum elegans/White-flowered Wax Plant	E	1.75	62
Eucalyptus glaucina /Slaty Red Gum	V	1176 individuals	2212
Eucalyptus pumila/Pokolbin Mallee	V	17.68	937
Melaleuca biconvexa/Biconvex Paperbark	V	9.35	280
Olearia cordata	V	4.03	316
Ozothamnus tesselatus	V	7.69	155
Prasophyllum petilum/Tarengo Leek Orchid	E	30.99	688
Prasophyllum sp. Wybong	CE	30.99	1032
Prostanthera cineolifera/Singleton Mint Bush	V	57.72	1926
Pterostylis gibbosa/Illawarra Greenhood	E	2.18	67
Rhizanthella slateri/Eastern Australian Underground Orchid	E	9.45	446
Rhodamnia rubescens/Scrub Turpentine	CE	2,394 individuals	7182
Rhodomyrtus psidioides/Native Guava	CE	19.99	936
Syzygium paniculatum /Magenta Lilly Pilly	V	513 individuals	1026
Velleia perfoliata	V	4.02	128
Zieria involucrata	V	4.03	129
Threatened fauna - species credit species			
Anthochaera phrygia/Regent Honeyeater	CE	93.77	5297
Callocephalon fimbriatum/Gang-gang Cockatoo	E	93.23	2622
Calyptorhynchus lathami lathami/South-eastern Glossy Black-Cockatoo	V	69.5	1689
Chalinolobus dwyeri/Large-eared Pied Bat	E	506.63	307
Delma vescolineata/Hunter Valley Delma	E	233.04	3122
Heleioporus australiacus/Giant Burrowing Frog	V	26.75	1690

EPBC Act listed species and communities	EPBC Act status	Impact area (hectares) or individuals	Ecosystem or species credit
Lathamus discolor/Swift Parrot	CE	42.76	2369
Litoria littlejohni/Littlejohn's Tree Frog	E	63.53	2353
Mixophyes balbus/Stuttering Frog	V	180.99	9243
Mixophyes iteratus/Giant Barred Frog	V	3.81	59
Notamacropus parma/Parma Wallaby	V	304.98	4620
Petauroides volans/Southern Greater Glider	E	477.12	11,258
Petrogale penicillata/Brush-tailed Rock- wallaby	V	156.02	6892
Phascolarctos cinereus/Koala	E	284.74	10,260
Potorous tridactylus/Long-nosed Potoroo	V	135.1	4279

Commonwealth land

The project would cross the Singleton Military Area, which is Commonwealth land under the EPBC Act. Under the EPBC Act the assessment on Commonwealth land must consider the environment on Commonwealth Land. The EPBC Act defines environment to include:

a. ecosystems and their constituent parts, including people and communities
b. natural and physical resources
c. the qualities and characteristics of locations, places and areas
d. heritage values of places
e. the social, economic and cultural aspects of a thing mentioned in (a), (b), or (c).

Appendix C (Matters of national environmental significance) of *Technical Report 1 – Biodiversity development assessment report* provides a detailed assessment of potential impacts to common plants and animals, threatened species and ecological communities listed under the BC Act and the EPBC Act on Commonwealth land (Singleton Military Area) in accordance with the *Significant Impact Guidelines 1.2: Actions on, or impacting upon, Commonwealth Land and actions by Commonwealth agencies* (Department of the Environment, 2013b). The potential impacts of the project include:

- BC Act communities
  - Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions
  - Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions
  - Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions
  - Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions

    - River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
- EPBC Act communities
    - Central Hunter Valley eucalypt forest and woodland
    - River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria
- Threatened flora
    - Two threatened plant species were recorded within the Singleton Military Area and one endangered population listed under the BC Act. Based on the database searches and ecological surveys, a further 6 species were assumed present based on associated PCTs
- Threatened fauna
    - Eighteen threatened fauna species were recorded within the Singleton Military Area during the ecological surveys, including 9 mammal species, 8 bird species and one reptile species. An additional 123 species were predicted as likely to occur based on database records and observations from fieldwork (i.e. presences of habitat features, habitat condition and connectivity).

The Singleton Military Area has been mapped as important habitat area for the critically endangered Regent Honeyeater and Swift Parrot. Neither species were recorded during the ecological surveys (see Figure 8.4).

8.5 Potential impacts – operation

8.5.1 Direct impacts

Potential direct impacts on native vegetation and threatened species habitat during operation would occur through ongoing vegetation management to ensure vegetation clearance requirements and APZs are maintained (see *section 8.1.5* for further detail). Potential direct impacts on native vegetation, TECs and threatened species habitat during operation are included in the clearing estimates in *section 8.4.*

8.5.2 Indirect impacts

Some indirect impacts associated with construction of the project may also occur during operation, including:

- reduced viability of adjacent habitat due to edge effects, as the presence of new habitat edges is maintained during operation
- reduced viability of adjacent habitat due to noise, dust or light spill, due to light spill from substations and occasional noise or dust from maintenance activities
- transport of weeds, pests, and pathogens can continue during operation as a result of ongoing access and maintenance activities
- loss of breeding habitats due to ongoing vegetation maintenance may result in impacts nests, dreys or burrows

- trampling of threatened flora species during periodic maintenance activities
- increased risk of fire linked to vegetation maintenance and infrastructure faults.

Table 8.11 provides a consolidated summary of these potential indirect impacts and the measures proposed to manage the residual risk of potential indirect impacts are provided in Table 8.17.

In addition to these, the operation of the project may increase the risk of fauna collision with power lines and potential effects from electromagnetic fields (EMF). Species most at risk include large, high-flying birds such as raptors, cockatoos and waterbirds, as well as microbat species such as the Large-eared Pied Bat and Eastern Cave Bat.

Although EMF-related impacts on bird physiology are not well understood and vary by species, the potential for localised effects is acknowledged. Mitigation measures include tower designs that discourage nesting, installation of bird diverters in high-risk areas, and careful consideration of EMF exposure in tower siting.

An additional species offset is proposed to account for indirect impacts to 4 threatened bird species assessed as being at a higher risk of line strike and EMF impacts on birds nesting in transmission line towers.
Table 8.14 identifies these species and the additional proposed species offsets.

Section 8.2 of *Technical report 1 - Biodiversity development assessment report* provides a detailed assessment and explanation of the approach to determine the additional offset, which involves an extra 10% of credits within the appropriate subregions to address these indirect impacts.

Table 8.14 Indirect impacts to threatened bird species at risk of line strike and EMF

Scientific name/common name	Conservation status[1]		Potential SAII	Indirect impact area (hectares)[2]	Species credit liability
	BC Act	EPBC Act			
Callocephalon fimbriatum/Gang-gang Cockatoo	E	E	–	9.32	373
Calyptorhynchus lathami lathami/South-eastern Glossy Black-Cockatoo	V	V	–	6.95	278
Ninox strenua/Powerful Owl	V	–	–	12.48	499
Tyto tenebricosa/Sooty Owl	V	–	Yes	20.78	1247
Total proposed additional species credits					2397

1: 'E' denotes endangered and 'V' denotes vulnerable under the BC Act and EPBC Act

2.:10% of direct impact area

8.5.3 Prescribed impacts

Prescribed impacts that primarily occur during construction of the project, but my persist to a lesser extent during operation of the project, are discussed in *section 8.4.9*.

Operation of the project has potential to impact regional habitat connectivity, especially in State forests, where the transmission line corridor intersects native vegetation and habitat used by threatened species (see Figure 8.1).

Partial clearing of the transmission line easement is designed to minimise impacts on biodiversity values, including habitat connectivity. A gradual transition would be used between the cleared easement and the surrounding forest or woodland, rather than an abrupt, hard edge. Significant efforts have been made to establish 'no clearing zones' by avoiding impacts on gullies within State forests and nature reserves by stringing the lines at substantial distances and avoiding any clearing, where possible.

Potential prescribed impacts during operation would be minimised through the implementation of mitigation measures detailed in *section 8.7,* including development of connectivity strategy.

A range of measures are proposed to mitigate potential habitat connectivity impacts for at- risk arboreal mammals, woodland birds, and semi-mobile terrestrial species. These measures include co-location with existing infrastructure routes to minimise additional habitat fragmentation, particularly within the Singleton Military Area which includes areas of contiguous native vegetation. Additionally, no clearing zones within State Forests and retention of understorey habitat (up to 2 metres) within the transmission line easement (disturbance area B).

Additional targeted measures are also proposed for threatened species recorded in areas that coincide with terrestrial habitat corridors, including the Eastern Pygmy Possum, Long-nosed Potoroo, Brush-tailed Rock-wallaby, Southern Greater Glider, Squirrel Glider, Koala and Parma Wallaby. Targeted measures proposed for these species include glider poles and rope bridges in identified Squirrel Glider, Southern Greater Glider, Eastern Pygmy Possum, and Brush-tailed Phascogale habitat.

The exact location and design of under-transmission line glider poles and/or rope bridges will be nominated as part of a Connectivity Strategy guided by the locations of habitat connectivity (see Figure 14.14 and Figure 14.15 of *Technical Report 1 – Biodiversity development assessment report*).

In addition to targeted measures for threatened species recorded in terrestrial habitat corridors, additional species credits are proposed (see Table 8.15). *Section 8.3* of *Technical report 1 – Biodiversity development assessment report* provides a detailed assessment and explanation of the approach to determine the additional offset, which involves an extra 10% of credits within the appropriate subregions to address these indirect impacts.

Table 8.15 Impacts to species at higher risk of prescribed impact – habitat connectivity

Scientific name/common name	Conservation status[1]		Potential SAII	Indirect impact area (ha)[2]	Species credit liability
	BC Act	EPBC Act			
Cercartetus nanus/Eastern Pygmy-Possum	V	–	No	15.56	513
Petauroides volans/Southern Greater Glider	E	E	–	47.71	1908
Petaurus norfolcensis/Squirrel Glider	V	–	–	64.76	2590
Phascogale tapoatafa/Brush-tailed Phascogale	V	–	Yes	9.04	262

Scientific name/common name	Conservation status[1]		Potential SAII	Indirect impact area (ha)[2]	Species credit liability
	BC Act	EPBC Act			
Total proposed additional species credits					5273

1: 'E' denotes endangered and 'V' denotes vulnerable under the BC Act and EPBC Act

2.:10% of direct impact area

8.6 Biodiversity offsets

The potential direct impacts of the project on native vegetation, threatened ecological communities and threatened species would generate a total of credits, including: 17,109 ecosystem credits and 209,996 species credits. An additional credit obligation for indirect and prescribed impacts to threatened fauna would generate 7670 species credits.

Table 8.16 summarises the estimated biodiversity credit liability requirements for the project under the NSW BOS.

Table 8.16 Native vegetation and threatened species biodiversity offset liability

Impact	Credit liability
Native vegetation impacts	17,087
Scattered trees	22
Total ecosystem credits	**17,109**
Threatened flora direct impacts	29,671
Threatened fauna direct impacts	180,325
Total species credits	**209,996**
Threatened fauna indirect impacts (bird strike and EMF)	2397
Threatened fauna prescribed impacts (habitat connectivity)	5273
Total additional species credits (indirect and prescribed impacts)	**7670**
Total credit requirements	**234,725**

EnergyCo intends to enter into a Strategic Offset Delivery Agreement (SODA) with the Secretary of the NSW Department of Climate Change, Energy, Environment and Water (NSW DCCEEW) for the project. Under this agreement, responsibility for delivering biodiversity offsets will be transferred to the Department with commensurate funding.

Offset selection will be guided by a conservation investment strategy for the region. The strategy will outline priority areas and actions to protect and restore biodiversity values, improve habitat connectivity, support species resilience to climate change and provide permanent conservation outcomes while also benefitting landholders. The Department is preparing a strategy which will be published on the NSW DCCEEW website prior to entry into the SODA.

Biodiversity offsets secured under the SODA will constitute either the retirement of like-for-like credits or conservation actions that are targeted at impacted entities. The Department will engage with credit owners, landholders and other potential partners in offset delivery through a range of programs including Credit Supply Fund auction processes, sponsored biodiversity stewardship agreements under the Stewardship Support Program, acquisition of new public land to create credits and tailored Savings our Species projects.

8.7 Mitigation and management

8.7.1 Environmental management

Environmental management for the project will be carried out in accordance with the approach detailed in *Chapter 24 (Environmental Management).* Residual impacts to biodiversity values will be minimised through the application of mitigation and management measures and the implementation of a Biodiversity management plan (BMP) for the project.

The BMP will be prepared by a suitably qualified and experienced biodiversity expert and will be implemented prior to the commencement of clearing works and for the duration of construction. The plan will include (as a minimum):

- the location and extent of areas of vegetation clearance and habitat disturbance, and how these will be suitably demarcated on-site
- the location and extent of areas to be protected (e.g. retained vegetation, hollow-bearing trees, nests, burrows and other habitat features, including applicable buffers to habitat features) located inside the construction impact area or in close proximity to clearing areas.
- pre-clearing survey procedures
- two-phase clearing process to allow fauna to move into adjoining habitat
- a threatened species unexpected finds protocol
- fauna handling and rescue procedure
- measures to be implemented on-site to clearly demarcate areas to be retained as 'no go areas'
- procedures for monitoring of partial clearance
- salvage of resources
- revegetation/rehabilitation plan (including seed collection where appropriate)
- controlling erosion
- bushfire management
- education of construction teams
- adaptive management procedures (including triggers)
- monitoring, evaluation reporting and compliance.

'No go area' demarcation devices must be established prior to the commencement of clearing works in each construction area and be maintained throughout the construction.

Sensitive biodiversity areas have also been identified in *Technical Report 1 – Biodiversity development assessment report.* These are areas of high ecological value that require specific clearing controls to avoid and minimise impacts on potential SAII entities, as well threatened species and communities, including:

- Warkworth Sands Woodland threatened ecological community
- Breeding habitat for threatened fauna (Amphibians, Microbats)
- Important habitat for Gang-gang Cockatoo and Sooty Owl

- All recorded threatened flora species, including *Rhodamnia rubescens*
- Riparian zones (5 m buffer from top of bank).

The clearing controls applied in these areas include (but are not limited to):

- hand clearing within to avoid and minimise impacts (relevant to Disturbance area B)
- no tracked machinery in riparian buffers and threatened flora zones
- erosion and sediment controls to avoid impacts on downstream amphibian habitat
- protocols to minimise the spread of Chytrid Fungus Disease (for amphibians) and Myrtle Rust (for *Rhodamnia rubescens*)
- timing restrictions during breeding periods (microbat, Gang-gang Cockatoo, Sooty Owl breeding period).

A biodiversity management plan (BMP) and connectivity strategy will also be developed and implemented to guide the management and evaluation of mitigation measures (see *section 8.7*).

Suitably qualified and experienced biodiversity experts will prepare the BMP, in consultation with relevant government agencies, including CPHR, NPWS, FCNSW and the Australian Government DCCEEW.

The BMP will be prepared in accordance with *Technical Report 1 – Biodiversity development assessment report* and will act as the overarching document guiding the implementation of biodiversity mitigation and management measures. It will be supported by the specific sub-plans identified Table 8.17.

8.7.2 Mitigation measures

The mitigation measures that will be implemented to avoid or minimise residual biodiversity impacts are listed in Table 8.17. These should be read in conjunction with:

- *Technical Report 1 – Biodiversity development assessment report*, which provides:
  - further details on the specific mitigation measures targeting threatened species and communities listed under the BC Act and EPBC Act, as well as specific SAII entities
  - figures identifying the locations to target avoidance and minimisation of impacts TECs and habitat for threatened species and SAII entities and 'sensitive biodiversity areas' (see Figure 14.21 of *Technical Report 1 – Biodiversity development assessment report*)
  - details about the clearing procedures, control measures and post-construction restoration measures to ensure biodiversity values are retained as assessed in the BDAR (see Table 1.3 of *Technical Report 1 – Biodiversity development assessment report*),
- the mitigation measures in other chapters that are relevant to the management of biodiversity, including:
  - *Chapter 9 (Aboriginal heritage)* – Aboriginal cultural heritage sites identified for avoidance
  - *Chapter 10 (Landscape and visual)* – mitigation of light spill
  - *Chapter 13 (Agriculture)* – biosecurity management
  - *Chapter 16 (Noise and vibration)* – noise management
  - *Chapter 17 (Soils and surface water)* – erosion and sediment control and water quality

- *Chapter 18 (Groundwater)* – groundwater management
- *Chapter 21 (Hazards and risks)* – asset protection zones and vegetation management within the easement for operational and safety requirements, including bushfire risk management.

It should be noted that some environmental impacts assessed in this EIS are relevant to multiple technical aspects and therefore will share common mitigation measures. Where this occurs, the mitigation measure has not been duplicated but rather one ID number has been provided for the particular measure and a cross reference to that ID number has been included in other related environmental aspects.

Table 8.17 Proposed mitigation and management measures - residual biodiversity impacts (direct, indirect and prescribed)

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B1	Biodiversity impacts	A biodiversity management plan will be prepared and implemented for the duration of construction (see *section 8.7.1)*.	Detailed design Construction	All locations
B2	Impacts on native vegetation, TECs, threatened species and potential SAII entities	The locations of TECs, habitat for threatened species and SAII entities will be considered, and potential impacts avoided or minimised to the greatest extent practicable during finalisation of the detailed design and construction methodology. This will include: • micro-siting of transmission line infrastructure within the HTP corridor • prioritising disturbance in areas with a Vegetation Integrity score <17 as per *section 9* of the BAM • sensitive biodiversity areas to be avoided, (including species polygons, buffered threatened species locations, areas of TECs, SAII entities and MNES) will inform the detailed design of the project As part of this measure a hierarchy of biodiversity constraints will be developed and mapped to provide an overarching avoidance prioritisation framework to inform detailed design and the BMP.	Detailed design Construction	Sensitive biodiversity areas Avoidance micro-siting areas Regent honeyeater and Swift parrot important areas Applicable locations identified in Figure 14.21 of *Technical Report 1 – Biodiversity development assessment report*

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B3	Impacts on threatened species breeding habitat	Prior to construction activities taking place within 100 metres of rocky areas containing caves, overhangs or crevices, cliffs or escarpments and during the breeding season for the Large-eared Pied Bat, Eastern Cave Bat (November to February), Large Bent-winged Bat, Little Bent-winged Bat (December to February), an ecologist will be engaged to determine if the species are present. If present, an assessment of the proposed activities will be completed to determine what, if any, activities can take place within the relevant 100 m, and what mitigation measures need to be implemented. Measures may include cessation of certain activities, amending the construction methodology including selecting alternative plant or equipment. Any requirements for a management plan will also be determined at that time.	Detailed design Construction	Within 100 m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments Applicable locations identified in Figure 3 of *Technical Report 1 – Biodiversity development assessment report*
B4	Impacts on native vegetation, TECs, threatened species and potential SAII entities	Micro-siting of temporary construction infrastructure, including construction support sites, laydowns areas and access tracks (new and upgraded), will be undertaken to minimise vegetation clearing and disturbance of watercourses. This will include: • prioritising areas of low biodiversity value • utilising existing access tracks, where feasible • locating watercourse crossings at narrow width locations • minimising the quantity of cut and fill activities. Applicable to all TECs and habitat for threatened species and SAII entities.	Detailed design Construction	Construction support sites, laydown areas and access tracks

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B5	Impacts on fauna habitat connectivity	A connectivity strategy will be developed and implemented to avoid and minimise impacts to connectivity for threatened species. Connectivity corridors, in the form of installation of under-transmission line glider poles, rope bridges and/or retained tall tree stumps, will be investigated and installed in appropriate locations, and in accordance with clearance requirements for transmission lines and infrastructure, where habitat connectivity for fauna species will be impacted. The exact location and design of under-transmission line glider poles, rope bridges and/or retained tall tree stumps will be nominated as part of the connectivity strategy and will be guided by the locations of habitat connectivity identified in Figure 14.14 and 14.15 of *Technical Report 1 – Biodiversity development assessment report*. The strategy will be developed for all relevant threatened species, including (but not limited to) the Squirrel Glider, Yellow-bellied Glider, and Greater Glider, Southern Greater Glider, Gang-gang Cockatoo, Glossy Black-Cockatoo and Swift Parrot. This strategy will require ongoing management of connectivity corridors.	Detailed design Construction Operation	Relevant habitat connectivity locations
B6	Loss of nesting hollows for hollow dependant fauna	A supplementary hollow and nest strategy will be developed and implemented for the installation of nest boxes, or other hollow creation methods, to provide alternative roosting and/or nesting habitat for threatened fauna displaced during clearing. Nest box/hollows will be installed prior to commencement of clearing works in relevant construction locations. Where supplementary hollows are proposed to be established on land adjacent to the easement, these will be subject to landowner agreement and captured in any property management plan.	Detailed design Construction	Relevant locations
B7	Inadvertent impacts on trees	Tree protection measures are to be installed and maintained for trees to be retained within the hazard zone, in accordance with *AS 4970-2009 – Protection of Trees in Development Sites* throughout construction	Detailed design Construction	Applicable trees within the hazard tree zone (Disturbance area HZ)

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B8	Impacts on native vegetation, TECs, threatened species and potential SAII entities	Pre-clearing surveys will be guided by the BMP and completed prior to clearing at each location by a suitability qualified ecologist. The proposed clearing extents will be marked out on-site prior to the pre-clearing surveys. Pre-clearing surveys will be carried out prior to the commencement of clearing works. During the surveys, the ecologist will: • survey the proposed clearing extent (including confirmed clearing extents within the assumed habitat of SAII entities) • identify any fauna that will require relocation prior to clearing, including inspection of any built structures and wooden fence posts to be demolished • confirm if occupied habitats need to remain until fledging/movement of young can occur • confirm that 'no-go zones' are demarcated • confirm that hollow-bearing trees within and adjacent to the clearing extents are prominently marked/tagged • confirm that nest boxes are in place (where required) in suitable locations adjacent to areas to be cleared, or suitable locations for installation have been identified.	Detailed design Construction	All locations
B9	Unintentional harm to biodiversity values	All relevant project personnel, including relevant sub-contractors will be trained on biodiversity management protocols and requirements for the project, through inductions, toolbox talks and targeted training, and provided with sensitive biodiversity area maps (showing clearing boundaries and exclusion zones) and updates as required. Inductions and training will be completed prior to commencement of work for all relevant personnel.	Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B10	Impacts on understorey vegetation in riparian areas	Understorey vegetation will be protected within vegetated riparian zones where reasonable and feasible (within the definition of the NSW *Water Management Act 2000*). Vegetation clearing will be limited to the tree stratum and shrubs above 2 m in height only, with root systems and trunk bases being retained in-situ.	Construction Operation	Riparian environments
B11	Impacts on riparian vegetation and aquatic habitats	A riparian vegetation management plan (RVMP) will be developed and implemented for the project to manage activities within vegetated riparian zones to minimise impacts to aquatic environments. The plan will be prepared prior to and implemented during any disturbance to a riparian area. The plan will identify the measures to be implemented to minimise impacts from construction activities (such as temporary and permanent watercourse crossings) within riparian and aquatic environments. A schedule of works will be stipulated within the approved RVMP. Riparian areas subject to disturbance will be progressively stabilised and rehabilitated. The RVMP will form a sub-plan to the BMP.	Detailed design Construction	Riparian environments disturbed during construction of the project
B12	Impacts on threatened bird species at risk of line strike and EMF	Bird diverters will be installed on transmission lines at appropriate locations to reduce impacts on aerial fauna species from collision with transmission lines and infrastructure. The exact position and diverter model will be finalised during detailed design by a qualified ecologist in consultation with CPHR. Installation of the bird diverters will occur within 2 weeks of transmission line installation or as soon as practical and will remain in place and/or replaced as required.	Construction Operation	Relevant locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B13	Clearing of native vegetation (biodiversity offset requirements)	The predicted clearing of native vegetation and habitat by the project identified in *Technical Report 1 – Biodiversity development assessment report* will be monitored against the recorded clearing. A revised Biodiversity Assessment Method (BAM-C) calculation based on the project's final disturbance to biodiversity post construction will be completed. Any additional (or reduced) credit liability identified will be met as part of the biodiversity offset scheme requirements and secured under the SODA.	Construction	Disturbance area
B14	Unexpected impacts on threatened species and ecological communities	An unexpected finds protocol will be implemented if threatened ecological communities or flora and fauna species, not assessed in *Technical Report 1 – Biodiversity development assessment report,* are identified in the disturbance area.	Construction	Disturbance area
B15	Impacts on riparian corridors and aquatic habitat	Watercourse crossings (especially but not only to key fish habitat) will be designed to minimise disturbance and harm within riparian corridors and aquatic habitat will be rehabilitated where practicable, in accordance with the following guidelines: • *Guidelines for controlled activities on waterfront land* (NRA 2018) • *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge 2003) • *Policy and guidelines for fish habitat conservation and management* (DPI 2013).	Detailed design Construction	All relevant watercourse crossing locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B16	Operational guidelines and procedures	Develop and implement guidelines and procedures for maintenance of the project during operation as part of the operational EMS or equivalent. These guidelines and procedures will cover the following: • vegetation clearing and maintenance commitments in the biodiversity development assessment report and environmental impact statement • avoiding access and disturbance in areas of high biodiversity conservation significance; outside of the areas required for construction • avoiding maintenance of vegetation that does not need to be maintained during operation.	Operation	Operation impact area
B17	Indirect impacts from light spill	Lighting designs to be in accordance with the *National Light Pollution Guidelines for Wildlife (DCCEEW 2023).*	Detailed design Operation	Operation impact area

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
B18	Impacts on threatened amphibian habitat	An amphibian management plan will be prepared and implemented for the duration of construction. The plan is to include (as a minimum): • the location and extent of areas of threatened amphibians breeding habitats, and how these will be suitably demarcated on-site • the location and extent of areas to be protected (e.g. retained vegetation and other habitat features, including applicable buffers to habitat features) located inside the construction area or in close proximity to the clearing areas • measures to control the spread of Chytrid Fungus within the disturbance area and adjoining threatened amphibian habitat • monitoring requirements to ensure effective control • measures to be implemented on-site to clearly demarcate areas to be retained as 'no go areas' 'No go area' demarcation devices must be established prior to the commencement of clearing works in the location and extent of areas of threatened amphibians breeding habitats. This plan will form a sub-plan to the BMP.	Detailed design Construction	Threatened Amphibians breeding habitats within or near the disturbance area
B19	Spread of Myrtle Rust into sensitive vegetation communities	A Myrtle Rust procedure will be developed to ensure the project is consistent with the objectives of FCNSW and NPWS Myrtle Rust management.	Detailed design Construction	Disturbance area
B20	Vegetation clearing	Implement the clearing procedures, control measures and post- construction restoration measures identified to ensure, to the greatest extent practicable, biodiversity values are retained as assessed in *Technical Report 1 – Biodiversity development assessment report*.	Detailed design Construction Operation	Disturbance area A (including centreline) Disturbance area B Disturbance area HZ

8.8 Summary and conclusion

EnergyCo sought to avoid and minimise the project's impacts on significant biodiversity values during selection of the preferred route option and transmission line alignment. This included prioritising avoidance of national parks, nature reserves, offset sites, wetlands, key fish habitat, and areas of high-quality native vegetation, TECs, threatened species and SAII entities.

Following selection of the preferred project alignment, further refinements were informed by biodiversity surveys and assessment. These included co-location with existing infrastructure, realignment to avoid mapped threatened species habitat and SAII entities, partial clearing, and spanning of forested gullies and steep terrain. Importantly, more than 200 hectares of native vegetation clearing was avoided through design refinements, including around 100 hectares of impact to TECs and habitat for a range of SAII entity species, and a 20% reduction of clearing in State forests.

The total disturbance area for the project is around 1266 hectares, of which 762 hectares is native vegetation. The project would result in direct impacts to 546 hectares and partial impacts to 216 hectares of native vegetation associated with 34 PCTs. Around 40% of this native vegetation is in a disturbed condition, including derived grasslands and thinned, poor or plantation woodlands associated with previous clearing, mine rehabilitation and hardwood forestry plantations.

The remaining portion of the disturbance area, particularly within the Hunter Valley floor, is dominated by agricultural and mining land uses associated with significant existing and historical disturbance. These areas are identified as Category 1 - Exempt land under the LLS Act or verified as non-native land and do not require further assessment under the BAM.

Of the 762 hectares of native vegetation impacted by the project, around 207 hectares is listed under the BC Act (7 TECs) and 158 hectares is listed under the EPBC Act (3 TECs). The largest proportion of direct impacts is to the Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC, impacting around 142 hectares of thinned, poor or planted native vegetation.

Two of the directly impacted TECs are potential SAII entities, including 4.22 hectares Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions and 12.37 hectares Warkworth Sands Woodland in the Sydney Basin Bioregion.

Thirty-eight threatened flora species would be potentially impacted by the project (9 recorded and 29 conservatively assumed present). These include 22 species listed under the BC Act and EPBC Act, 14 species listed under the BC Act only and 2 species listed under the EPBC Act only. Three potential flora SAII entities were recorded during surveys and 5 were conservatively assumed present.

Twenty-eight threatened candidate fauna species listed under the BC Act would be potentially impacted by the project (26 recorded and 2 assumed present). Fifteen of these species are also listed under the EPBC Act and 6 are potential SAII entities (all of which were recorded during field surveys).

Significant effort has been made to avoid and minimise impacts on SAII entities and further measures will be prioritised during detailed design and construction. In total, 16 potential SAII entities were recorded or conservatively assumed present based on suitable habitat (11 known and 5 assumed).

Construction and operation of the project also has the potential for indirect and prescribed impacts on native vegetation and threatened species habitat beyond the disturbance area. These includes the potential line strike for 4 threatened bird species, as well potential impacts on habitat connectivity for 4 threatened fauna species.

The potential direct impacts of the project on native vegetation, TECs and species would generate 17,109 ecosystem credits and 209,996 species credits. An additional credit obligation for indirect (bird strike and EMF) and prescribed (habitat connectivity) impacts to threatened fauna would generate 7670 species credits.

The estimated biodiversity credit liability requirements for the project have been determined in accordance with the under the NSW BOS for the project. EnergyCo intends to enter into a SODA with the Secretary of NSW DCCEEW for the project. Under this agreement, responsibility for delivering biodiversity offsets will be transferred to the Department with commensurate funding.

Specific mitigation and management measures have been proposed for residual biodiversity impacts. These include measures that would be undertaken during the construction and operation of the project. These include, but are not limited to, micro-siting of the transmission line infrastructure and associated work sites to avoid and minimise impacts during detail design where possible, pre-clearing surveys, retention and enhancement of habitat features, no clearing zones and sensitive biodiversity areas.

Residual impacts to biodiversity values will be minimised through mitigation and management measures and the implementation of a Biodiversity management plan (BMP) for the project. The BMP will be prepared by suitably qualified and experienced biodiversity experts, in consultation with relevant government agencies, including CPHR, NPWS, FCNSW and the Australian Government DCCEEW.

Aboriginal heritage

9

9 Aboriginal heritage

This chapter provides a summary of the potential impacts of the construction and operation of the Hunter Transmission Project (HTP, the project) on Aboriginal cultural heritage and identifies appropriate mitigation and management measures. A detailed assessment is provided in *Technical Report 2 - Aboriginal cultural heritage assessment*. The relevant Planning Secretary's environmental assessment requirements (SEARs) as they relate to Aboriginal cultural heritage, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance)*.

9.1 Assessment approach

9.1.1 Legislation, policies, plans and guidelines

The Aboriginal cultural heritage assessment (ACHA) was carried out in accordance with the requirements of legislation, policies and assessment guidelines, including:

- *Commonwealth Native Title Act 1993*
- *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Commonwealth Engage Early: Guidance for proponents on best practice Indigenous engagement for environmental assessments* (Department of the Environment, 2016)
- *NSW National Parks and Wildlife Act 1974*
- *NSW Aboriginal Land Rights Act 1983*
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (Department of Environment, Climate Change and Water (DECCW), 2010a)
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010b)
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (Office of Environment and Heritage (OEH), 2011)
- *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (International Council on Monuments and Sites* (ICOMOS), 2013).

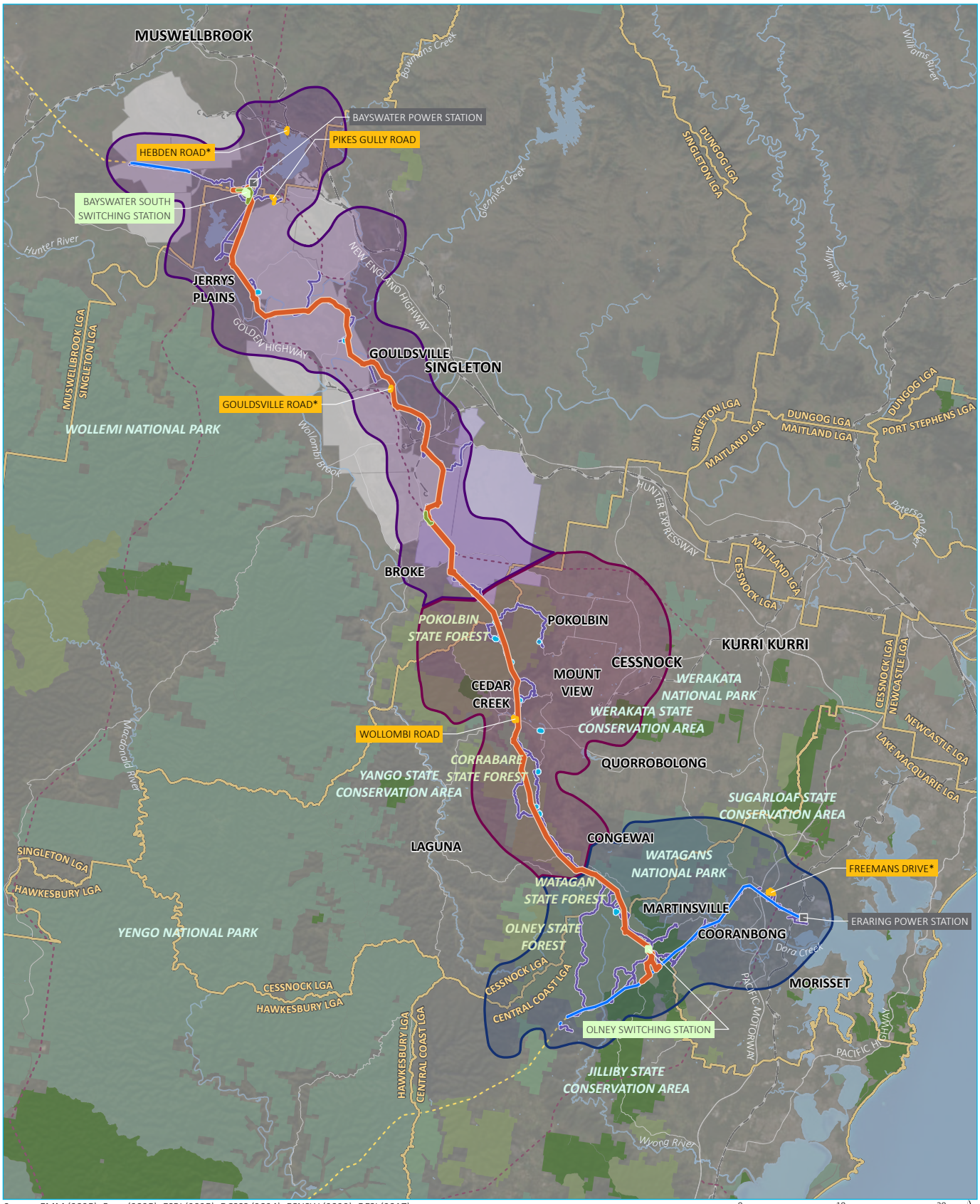
9.1.2 Study area

The study area for the ACHA (ACHA study area) includes around 174,880 hectares centred on the project impact area and where relevant incorporates the broader areas of the Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie local government areas (LGAs)[1] to capture the regional cultural and historical context. The ACHA study area is outlined in Figure 9.1.

The ACHA study area has been divided into 3 zones:

- HTP North – Bayswater to Broke includes Lake Liddell, the Bayswater Power Station, major coal mining complexes in the Upper Hunter Valley, Mount Thorley Industrial Estate, Singleton Military Area, and several rural properties generally on the alluvial floodplains of the Hunter River
- HTP Central – Pokolbin to Corrabare includes the Pokolbin and Corrabare State forests and the rural residential areas between these forests at Cedar Creek, Millfield and Laguna
- HTP South – Olney to Eraring includes the Watagan and Olney State forests, Watagans National Park, the residential areas in Martinsville and Cooranbong, and Eraring Power Station.

[1] The ACHA study area also encompasses earlier project design elements including earlier proposed access routes which no longer form part of the project. The ACHA study area broadly aligns with the extent of Aboriginal Heritage Information Management System (AHIMS) searches carried out to inform the ACHA.



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

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GDA2020 MGA Zone 56

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KEY

ACHA study area
- HTP North
- HTP Central
- HTP South

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
- Local government area

Study area- Aboriginal heritage

Hunter Transmission Project
Environmental Impact Statement
Figure 9.1

EMM
creating opportunities

9.1.3 Assessment methodology

Overview

The methodology for the ACHA involved:

- a desktop assessment involving review of relevant databases and literature to identify Aboriginal objects, sites and places within and surrounding the project impact area, including reviews of:
  - Heritage NSW's Aboriginal Heritage Information Management System (AHIMS)
  - a wide range of environmental documents and reports to inform the geology, soil, vegetation and hydrology within and surrounding the project impact area
  - publicly available Aboriginal cultural heritage investigations, assessments and management plans extending across the ACHA study area
- consultation with Aboriginal individuals and communities in proximity to and/or with cultural knowledge of, the project impact area to identify objects, sites and values of cultural significance. This included application of the Heritage NSW consultation guideline processes, as well as a number of additional communication strategies. The latter includes early engagement, and co-designed workshops to explore tangible and intangible values to inform the project design, targeted inspections of key places within the study area with Traditional Owners, and regular face-to-face meetings to discuss the project
- a cultural values mapping study, which involved consultation with Elders and key knowledge-holders to identify and investigate cultural and/or intangible values associated with the project impact area. This included extensive consideration of major viewlines and viewscapes, where relevant
- the preparation of a predictive model to identify known or potential cultural materials across the project impact area based on consultation outcomes, cultural values mapping and the archaeological context of the region
- field surveys, which involved non-invasive investigations of the project impact area and its surrounds by archaeologists and Aboriginal representatives to confirm the presence of Aboriginal sites and places identified through desktop assessments and the predictive model, and to document the locations of previously unrecorded sites
- test excavations following non-invasive field surveys to confirm the presence of Aboriginal artefacts in areas identified to potentially contain sub-surface stone artefactual material
- assessment of the significance of the recorded Aboriginal sites and places
- assessment of the potential direct and indirect impacts to these sites and places during the construction and operation of the project
- identification of mitigation measures to avoid, manage and minimise impacts to Aboriginal cultural heritage.

Further detail on the methodology for the assessment of Aboriginal cultural heritage is provided in *Technical Report 2 – Aboriginal cultural heritage assessment*.

Cultural values mapping

Cultural values mapping is also described as cultural resource mapping or cultural landscape mapping and refers to a range of research techniques and tools employed to 'map' the tangible and intangible cultural assets of people within the local landscape. It involves the application of a wide variety of techniques and activities, from community-based data collection and management to the use of mapping software based on geographic information systems (GIS), to accurately map cultural resources for communities and places.

From the inception of the project, it was understood that tangible and intangible cultural places and values may be present within or near the project impact area. As such, from early project development, activities have been undertaken to ensure cultural places and values have been robustly investigated, assessed and discussed with the Aboriginal community.

Activities initially included early consultation with key locally-based Wonnarua, Darkinjung and Awabakal Traditional Owners (identified within the project-specific consultation strategy). These discussions included cultural values and how to understand, capture and assess them for the project, which resulted in a range of co-designed activities developed with those participants to provide early advice and information into the ongoing project design and refinement process, including one-on-one interviews, community workshops and targeted site inspection of key locales with Traditional Owners.

Following these initial engagements, a more detailed cultural values mapping investigation was undertaken by an anthropologist. This included the broader identification of Elders and knowledge-holders through consultation with the Aboriginal community. These individuals were then consulted extensively over a 6 month period using a range of agreed techniques to receive their information and knowledge; and their permission to use the information appropriately. This included on-Country activities such as workshops, an oral history interview, visits to viewlines and places of importance, and general field inspections.

A summary of activities carried out to understand the cultural values associated with the project impact area, including the cultural values mapping study, is provided in *Chapter 7 (Cultural values mapping)* of *Technical Report 2 - Aboriginal cultural heritage assessment* while the cultural values mapping study is contained in *Appendix D (Supplementary cultural values information)* of *Technical Report 2 - Aboriginal cultural heritage assessment*.

Field investigations and test excavations

The archaeological field survey and test excavation methodology were developed and carried out in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b).

Field surveys were carried out over a period of over 38 weeks between March 2024 and March 2025 and involved the participation of 23 Registered Aboriginal Parties (RAPs). Field surveys aim to identify Aboriginal archaeological sites and places with the assistance of Aboriginal participants, including sites that would require further investigation and sites to be avoided, and to characterise the landscape to aid predictions of archaeological potential and sensitivity. Survey efforts involved around 643 kilometres of linear pedestrian survey (or about 2259 hectares) throughout the project impact area and included 7702 individual points of observation. Due to a process of ongoing

refinement of the project design, these investigations extended beyond the project impact area into the surrounding ACHA study area in several locales, with more than 1000 kilometres of field survey ultimately undertaken.

A targeted program of test excavations was carried out in areas determined to potentially contain sub-surface artefactual material. These occurred after the main field survey program. Test excavations were largely focused on potential Warkworth sand system deposits as well as localised landforms identified during the field survey, usually near major watercourses. Test excavations were carried out over 4 weeks between October to November 2024. It is highlighted that the test excavation program was incomplete prior to the finalisation of the ACHA due to landowner and access constraints at the time of the assessment. The findings of further test excavations underway at the time of finalising the ACHA will be provided in the Submissions Report. Remaining test excavations are planned along the HTP corridor in HTP North, specifically:

- adjacent to the Hunter River and Loder Creek
- intersecting Warkworth Sands.

Following the field survey and test excavation program, an exercise in ratifying the findings of these activities (alongside finding of the desktop assessment) was carried out to develop an overall archaeological assemblage or resource for the project impact area. This process assisted in the completion of a nuanced assessment of potential impacts to different sites and objects because of the various project elements, and in the development of management and mitigation measures.

Significance assessment

An important element of cultural heritage management is determining the significance of cultural heritage places to understand potential loss and suitable mitigation measures to be employed.

Cultural significance is outlined in Article 1.2 of the *Burra Charter* as 'aesthetic, historic, scientific, social or spiritual value for past, present or future generations' (Australia ICOMOS 2013), and these values are reiterated in the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011). In assessing the scientific significance of sites, aspects such as rarity, representativeness and integrity must be considered. Typically, a site or object that is rare will have a heightened significance, although a site that is suitable for conservation due to being 'representative' of its type will also be significant. Conversely, an extremely rare site may no longer be significant if its integrity has been sufficiently compromised.

The criteria (and corresponding definitions) for assessing cultural significance adopted as part of the ACHA is provided in Table 9.1.

Table 9.1 Summary of criteria used to assess cultural significance

Criterion	Definition
Cultural/social value - Does the place have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons?	Social (or cultural) value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them. Social or cultural value can only be identified through consultation with Aboriginal people.

Criterion	Definition
Historic value - Is the place important to the cultural or natural history of the local area and/or region and/or State?	Historic value refers to the association of a place with a historically important person, event, phase or activity. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have 'shared' historic values with other (non-Aboriginal) communities.
Scientific (archaeological) value - Does the place have potential to yield information that will contribute to an understanding of the cultural or natural history of the local area and/or region and/or State?	Scientific (archaeological) value refers to the importance of a landscape, area, place or object because of its rarity, representativeness and the extent to which it may contribute to further understanding and information. Information about scientific values is gathered through archaeological investigation undertaken in this report.
Aesthetic value - Is the place important in demonstrating aesthetic characteristics in the local, regional, and/or State environment?	Aesthetic value refers to the sensory, scenic, architectural and creative aspects of the place. It is often linked with social value, and can consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use. This value is only relevant to archaeological sites on only rare occasions, such as rock shelters that contain art, or culturally modified trees in prominent positions.

9.1.4 Consultation

Aboriginal consultation has been undertaken in accordance with the processes and methods outlined in *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a), as well as additional project specific communication strategies to promote transparent and frequent 2-way dialogue between the Aboriginal community and the project. Aboriginal consultation has included over 1100 interactions with RAPs, including over 600 person days of on-site activities. These interactions and on-site activities have included face-to-face meetings during key phases of the project, RAP participation in field surveys, RAP participation in test excavations, interviews with an anthropologist to discuss cultural values within and surrounding the project impact area, and provision of the ACHA to the RAPs for review and input into the overall findings, significance and management of cultural heritage for the project. Further detail regarding the consultation activities carried out as part of the ACHA is provided in *Chapter 4 (Aboriginal Consultation)* of *Technical Report 2 – Aboriginal cultural heritage assessment.*

In total, 48 RAPs were consulted with from November 2023 to July 2025, providing valuable input into the development and refinement of the project. The RAPs for the project include predominantly locally-based Wonnarua, Awabakal and Darkinjung Traditional Owners and organisations. RAPs also include numerous Gomeroi and Wiradjuri individuals and organisations (being in the general vicinity of elements of the project), as well as several broader Aboriginal community organisations interested in cultural heritage management. As such, discussions have been wide-ranging, initially focusing on who speaks for Country, the potential impacts to important Dreaming places and stories in the region, the methods and approach to field investigation, and the potential impacts to and management of identified cultural sites and values.

Key matters raised by RAPs in meetings held during the ACHA review period included:

- concern about the level of involvement of some participants and the specific division of the project, especially between Wonnarua and Awabakal traditional boundaries
- an acknowledgement by many RAPs of the level of avoidance and refinement undertaken and achieved to avoid cultural materials, and general support for the findings of the ACHA, its conclusions and proposed recommendations
- concern for Aboriginal sites and places situated outside, but close to, the project impact area
- concerns regarding the legacy and future management of cultural materials following the construction and operation of the project.

9.2 Existing environment

9.2.1 Ethnographic context

Traditionally, the Country on which the project is located was occupied by people known as the Wonnarua, Awabakal and Darkinjung (north to south). All spoke related languages and shared many cultural attributes, and their descendants are still based in the region today. Neighbouring groups include the Gomeroi, Darug and Worimi, although the documented boundaries of those groups are all some distance away from the project impact area.

The traditional Country of the Wonnarua people covered 5200 square kilometres from Maitland through the Upper Hunter to the Great Dividing Range in the west. The traditional Country of the Awabakal people covered 1800 square kilometres on the south side of the Hunter River in the vicinity of Lake Macquarie. The traditional Country of the Darkinjung people covered 4700 square kilometres from south of Jerry's Plains, east towards Cessnock and south to Wisemans Ferry, with the western boundary in the vicinity of Rylstone. It is likely that Wollombi Brook was a meeting place for the Darkinjung and surrounding Aboriginal people.

The archaeological record indicates that the ACHA study area was subject to Aboriginal occupation for at least 20,000 years prior to colonial settlement, which imposed dramatic impacts upon Aboriginal people, societies and their ways of life. The history of occupation was marked by varying levels of hostility and cooperation, while frontier violence, massacres and more gradual, systemic structures of elimination and control feature prominently in the literature and Aboriginal oral histories.

9.2.2 Archaeological context

Significant parts of the ACHA study area have been extensively investigated for over 30 years, including for several major coal mines, as part of the Singleton Military Area, and more recently for renewable energy projects. While data remains spatially constrained, these studies provide a robust model of cultural materials that may be expected across the ACHA study area.

The following conclusions can be made about the archaeological context of the ACHA study area based on previous studies:

- HTP North features a significant amount of cultural materials dominated by isolated or low-density stone artefacts, typically near watercourses such as the Hunter River, Wollombi Brook, Bayswater Creek, Parnells Creek, Moorlands Creek and Loder Creek
- HTP Central and HTP South both include rock shelters, grinding grooves and culturally modified trees. However, information within State forests and reserves is limited and is mostly constrained to opportunistic documentation of Aboriginal objects and sites.

A search of the AHIMS database in March 2025 revealed 3956 previously documented sites within the ACHA study area. The most common site types registered included stone artefact sites (83%), followed by rock shelters (8%), grinding grooves (4%), and culturally modified trees (1%). Of the 3956 documented sites, some 439 are outside, but within 200 metres of the project impact area. Within the project impact area there are 132 previously documented sites (including 18 previously destroyed), resulting in 114 extant sites within the project impact area. These are dominated by low-density artefact scatters and isolated objects.

AHIMS search results within the project impact area are mostly in HTP North where extensive cultural heritage management has occurred in recent decades. The search results are consistent with the conclusions made by previous studies in the ACHA study area, with HTP North being dominated by surface and shallowly buried stone artefact scatters. More extensive sites were documented along Parnells Creek, Wollombi Brook and Hobden Gully. Stone artefact sites were also prevalent in HTP Central and HTP South however these areas also feature rock shelters, grinding grooves and a culturally modified tree.

9.2.3 Cultural values mapping

Early co-design workshops undertaken prior to the ACHA process identified a number of Dreaming places and stories within the ACHA study area. While diverse, these areas were often elevated promontories and/or distinct geological features. They included Lizard Rock (also known as Yellow Rock), Mount Yengo, Mount Warrawolong and Mount Sugarloaf, and views to and from these features. The early identification of these sites and places was integrated into avoidance and project refinement activities throughout 2024.

Detailed cultural mapping subsequently undertaken with Elders and key knowledge-holders identified 32 places of archaeological, traditional, historical or contemporary value to the Aboriginal community in the ACHA study area. The identification of these places reiterated the importance of landscape elevations and several water sources in the region, as well as focusing on a number of archaeological sites either known or identified through the field survey program.

Eight of these places are within or intersect the project impact area, primarily through the broader cultural landscapes or viewlines associated with these places. They include sensitive landscapes where cultural materials may be expected, ecological and water resources, and key lookouts and/or associated viewlines and viewscapes.

Further findings from cultural values mapping activities are outlined in *Technical Report 2 - Aboriginal cultural heritage assessment*.

9.2.4 Predictive model

It is possible to predict the types and topographic contexts of sites which may occur within the project impact area based on the results of previous surveys and analysis of archaeological records in similar landscape contexts. Aboriginal occupation of the ACHA study area has been well-documented, in large part due to the extensive archaeological assessments undertaken in association with environmental assessments for the region. A predictive model was developed for the ACHA study area to predict the potential presence and location of Aboriginal sites within the project impact area. A summary of the outcomes of the predictive model for the project is included in Table 9.2.

Table 9.2 Summary of predictive model outcomes for the project

ACHA study area zone(s)	Predictive model summary
Entire ACHA study area	Grinding grooves and, to a lesser extent, quarry sites are prevalent in the ACHA study area. These are frequently constrained to exposed sandstone in small and moderate watercourses but are also found in other landforms where suitable geology is present. Burials can occur anywhere in the landscape but are more likely within rock shelters, under rock ledges or buried in sandy soil profiles. Their identification in the landscape is rare, and few have been documented in the vicinity of the project impact area.
HTP North	Significant artefact scatters and deposits are predicted to be present in HTP North, reflecting extensive past occupation. These scatters and deposits would typically be found on elevated locations such as levees and lower slopes adjacent to larger watercourses. Cultural materials in HTP North are more likely to be encountered close to the Hunter River, Wollombi Brook, Loder Creek, Doctors Creek, Parnells Creek, and their tributaries. The presence of deep soil profiles, especially Warkworth sand system units, are also often correlated with the presence of substantive and significant cultural deposits. Culturally modified trees, including scarred and carved trees, may occur where native vegetation has been preserved. Such vegetation is extremely sparse in HTP North and likely constrained to isolated trees or small areas of remnant vegetation.

ACHA study area zone(s)	Predictive model summary
HTP Central and HTP South	Rock shelters and associated features (including art and cultural deposits) are predicted to be found in the steeper sandstone relief and escarpments throughout this part of the project impact area. While more broadly such sites are closely constrained to environmental resources (e.g. permanent water), the project impact area is within an extensive ceremonial landscape between Mount Sugarloaf and Mount Yengo. Rock shelters in this region were, therefore, not just for practical use, but may also have had spiritual and/or religious connections, and as such may occur in other environmental contexts. Culturally modified trees, including scarred and carved trees, may occur where native vegetation has been preserved. HTP Central and HTP South have been subject to historical and contemporary logging. However, the potential for such sites is probable given the extensive human and ceremonial activities known to have occurred in this region.

9.2.5 Archaeological assemblage of the project impact area

Previous investigations across the region and the multiple engagement and survey activities for the project have identified a large number of Aboriginal and cultural sites and places within or near the project. This indicates that the project is within a rich cultural landscape with evidence of extensive but disparate past human activity within the project impact area.

The field survey and test excavation program identified 195 Aboriginal sites and places within the project impact area, including 156 newly identified sites and 39 previously documented sites that were validated by the field survey. The types of sites identified during the field survey aligned with the archaeological context of the project impact area and with the predictive model outlined in *section 9.2.4*. In HTP North, sites were dominated by various densities of stone artefacts often near major watercourses or lesser tributaries. Within HTP Central and HTP South, sites were dominated by rock shelters, a culturally modified tree and grinding grooves sites. It should also be noted that a further 123 Aboriginal sites were recorded outside but within 200 metres of the project impact area during field surveys.

Following the field survey and test excavation program, the ratification process[2] was carried out to refine and consolidate Aboriginal objects and sites across the project impact area to provide an overall archaeological resource for the project to manage and where necessary, mitigate. This ratification process refined the number of objects and sites to 32 within the project impact area. Table 9.3 provides the archaeological assemblage of the project impact area.

[2] The ratification process applied administrative (e.g. removal of destroyed recordings, removal of duplicate recordings, etc.) and analytical (e.g. aggregation of closely located site recordings, further consideration of field activity findings, and amalgamation of isolated stone artefacts and low-density artefact scatters into a broader background scatter) methods

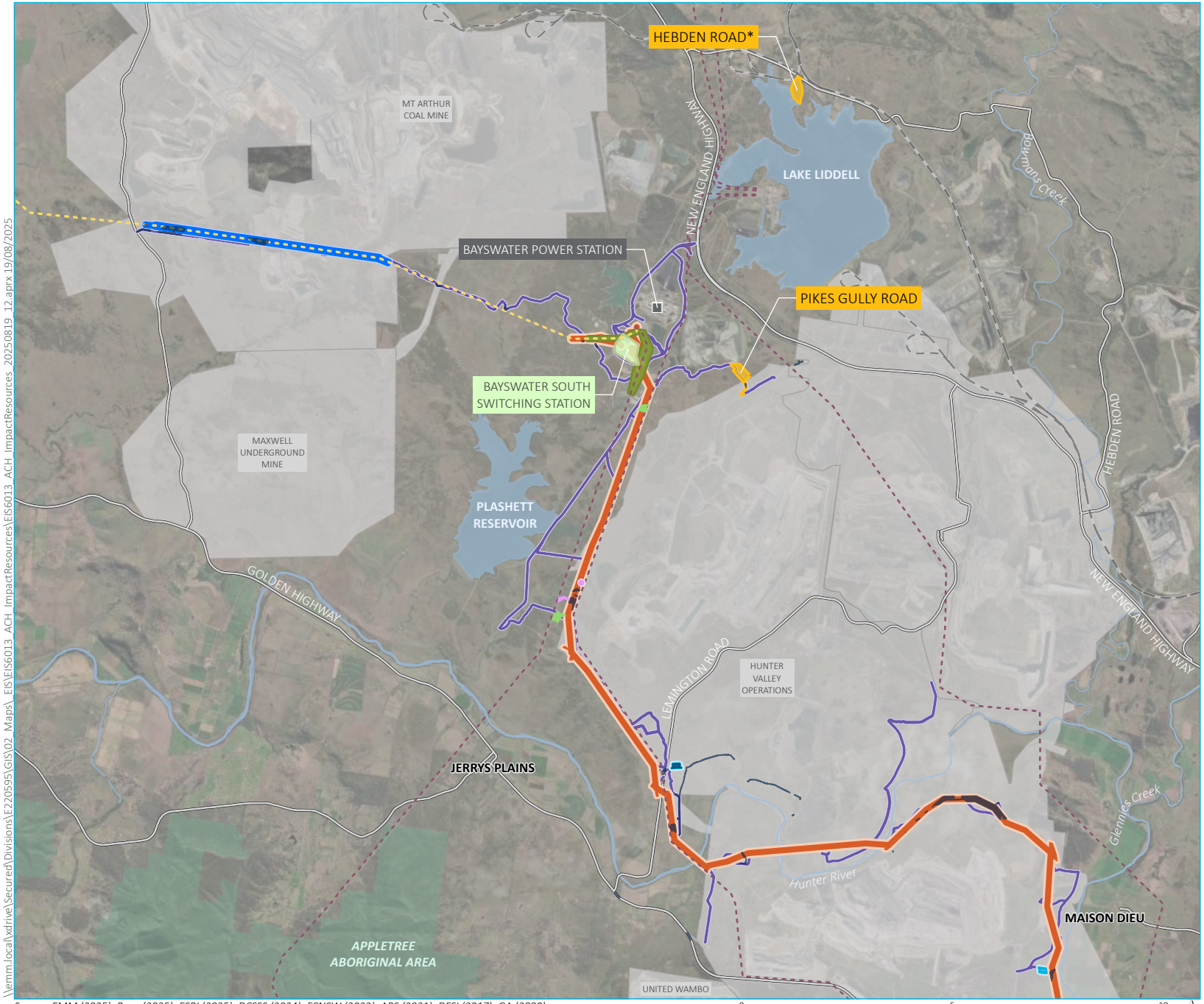
Table 9.3 Archaeological assemblage within project impact area

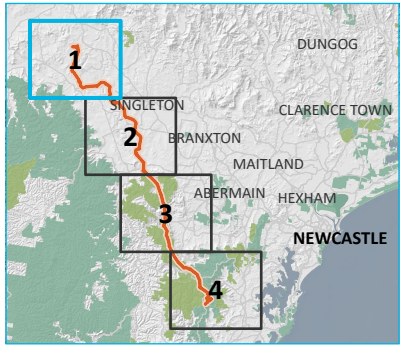
Project area reference	Archaeological assemblage
Project impact area	• Background scatter of isolated Aboriginal objects, and low-density artefact scatters found across the entire project impact area, presented as 3 discrete listings (i.e. background scatter in HTP North, HTP Central and HTP South) that incorporate 191 previously documented or newly identified site recordings
HTP North	• 10 moderate or high-density surface artefact scatters • One cultural place and/or resource and gathering site
HTP Central	• 3 sub-surface stone artefact deposits associated with Congewai Creek • 2 grinding groove sites • One culturally modified tree • One stone arrangement • 2 rock shelters • 4 cultural places and/or resource and gathering sites
HTP South	• One grinding groove site • 3 rock shelters • One cultural place and/or resource and gathering site

In addition to discrete cultural sites and places, a number of broader landscape values were identified within the project impact area. These include:

- Warkworth sand system – a geological deposit known to contain significant cultural materials found in the general vicinity of Wollombi Brook
- cultural viewlines and viewscapes – a number of viewlines and viewscapes between major regional promontories, most notably between Mount Yengo and Mount Sugarloaf and in the vicinity of Flat Rock, are bisected by the project impact area
- Dora Pinnacles, Dora Creek, Flat Rock and Trig Road cultural landscapes – locations where numerous significant archaeological sites were identified, typically in the form of rock shelters with art motifs and stone arrangements, likely related to ceremonial activity.

The locations of these sites are shown in Figure 9.2.





KEY

Potential Warkworth sand system deposit

Archaeological resource within project impact area*
- Moderate density artefact scatter (21-50)
- High density artefact scatter
- Moderate density artefact scatter

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

*Background scatter extends across the entire project impact area and is not displayed

The archaeological resource of the project impact area
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 9.2

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

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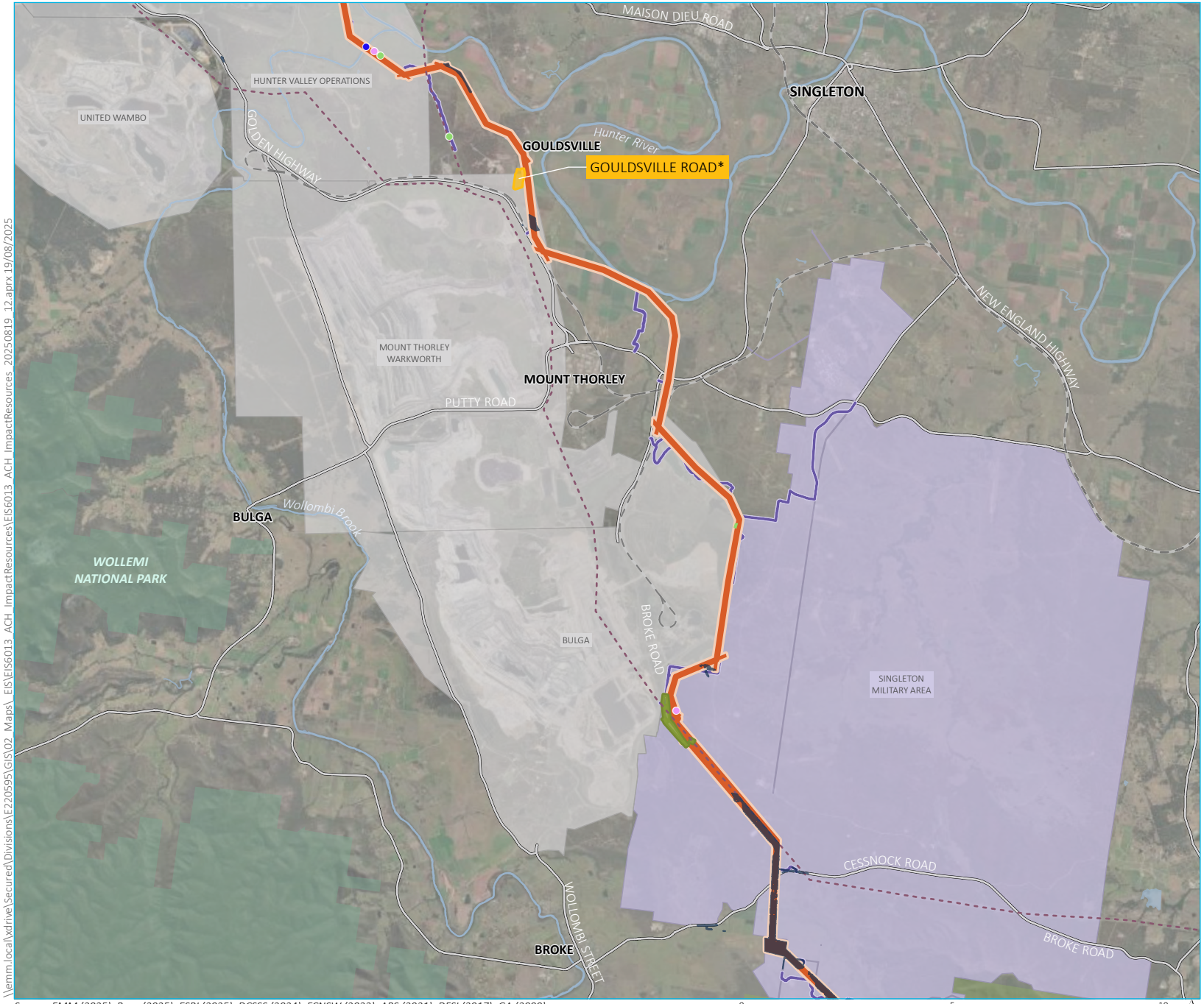

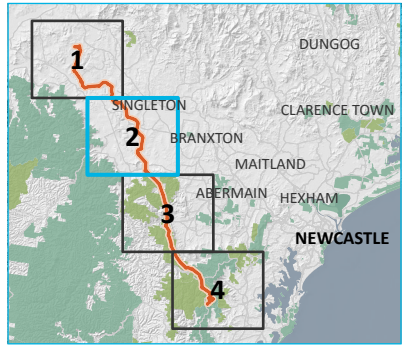

KEY

Potential Warkworth sand system deposit

Archaeological resource within project impact area*
- Cultural place
- High density artefact scatter (>50)
- Moderate density artefact scatter (21-50)
- High density artefact scatter

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
- State forest
- NPWS reserve
- Defence
- Mining

*Background scatter extends across the entire project impact area and is not displayed

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

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The archaeological resource of the project impact area
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 9.2

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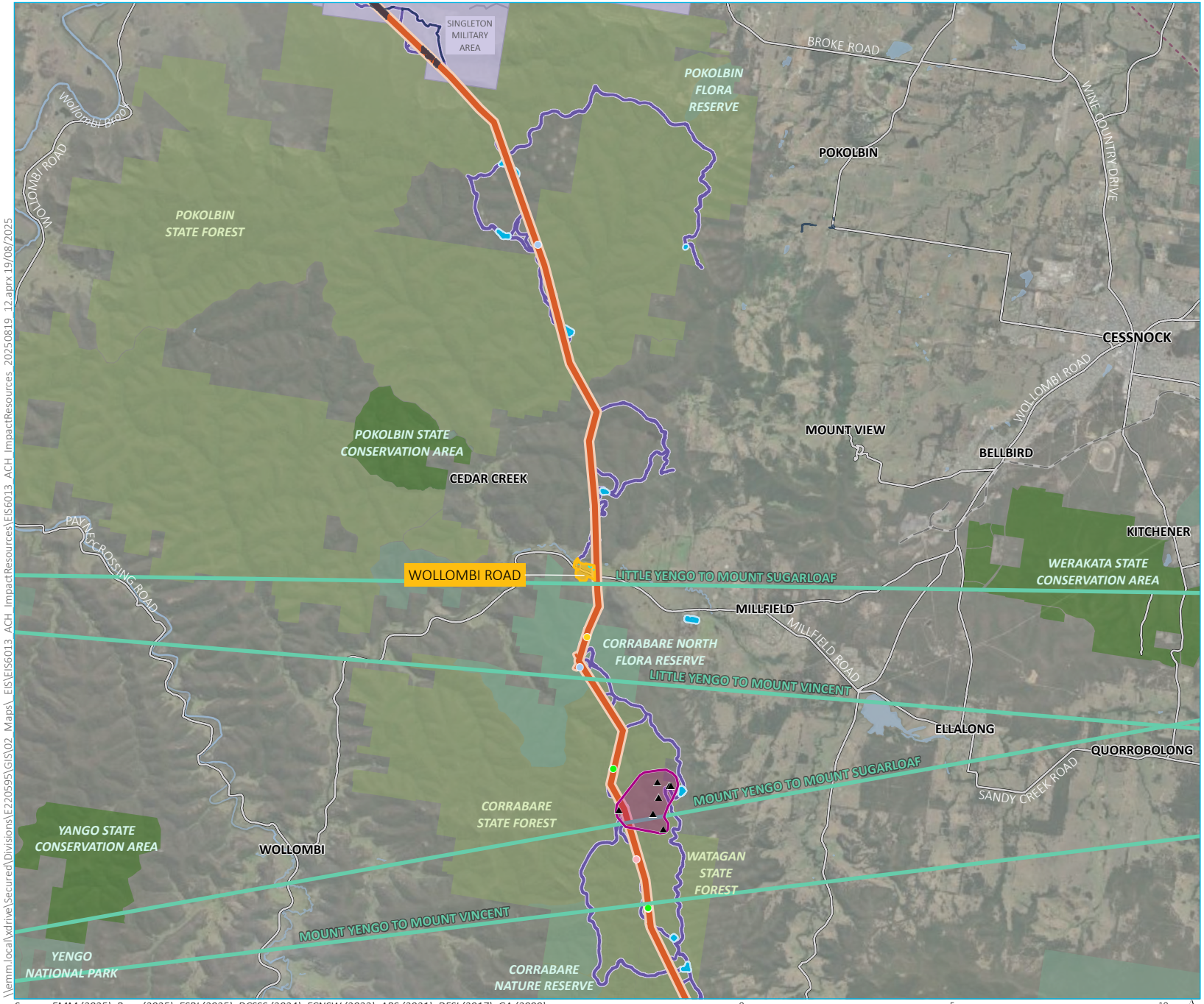

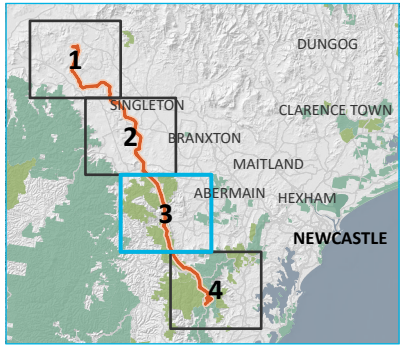

KEY

- Potential Warkworth sand system deposit
- Viewline

Archaeological resource within project impact area*

- Aboriginal resource and gathering
- Culturally modified tree (carved or scarred)
- Grinding groove
- Rockshelter
- Site comprising the cultural landscape
- Focus area
- Cultural landscape

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
- State forest
- NPWS reserve
- State conservation area
- Defence

*Background scatter extends across the entire project impact area and is not displayed

The archaeological resource of the project impact area
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 9.2

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

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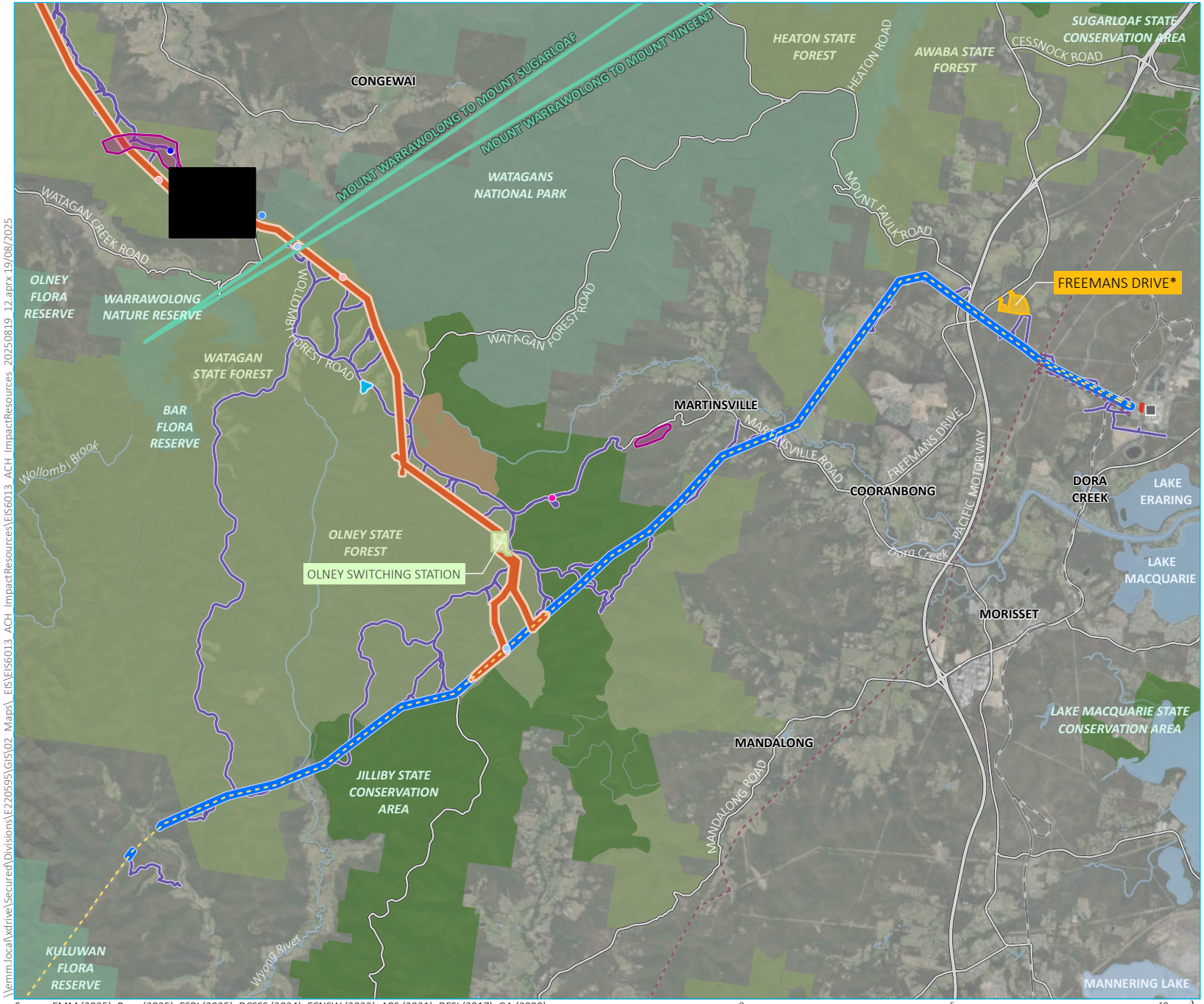

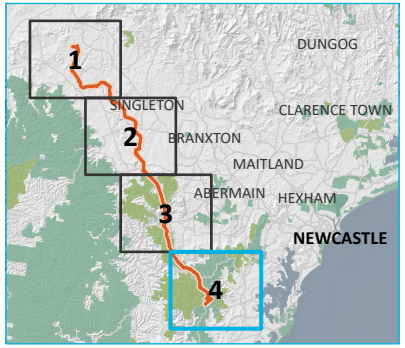

KEY

Viewline

Archaeological resource within project impact area*
- Aboriginal ceremony and dreaming
- Contemporary site (wishing well)
- Cultural place
- Grinding groove
- Rockshelter
- Stone arrangement
- Cultural landscape

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
- State forest
- NPWS reserve
- State conservation area
- Recreation area

*Background scatter extends across the entire project impact area and is not displayed

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

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The archaeological resource of the project impact area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 9.2

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9.2.6 Significance assessment

Assessing cultural significance of Aboriginal heritage sites and places potentially impacted by a project is required under the NSW Guidelines (OEH 2011). At a general level, when considering scientific significance, a number of the sites have moderate or high significance due to their ability to provide information on the past activities of the area. With specific reference to the cultural assemblage of the project impact area, rarity and aesthetic values are also prevalent in determining a site's significance. The Aboriginal sites and places within the project impact area can primarily be divided into the following main categories:

- rock shelters that would have been used for habitation in the past. These sites form the foundational information for past Aboriginal populations, behaviour and activity across Australia, and are therefore of high scientific significance. Commonly, they include art and other cultural deposits that make them extremely important to the local Aboriginal community
- grinding grooves that reflect the maintenance and curation of stone tools, primarily spears and hand axes, used by the local Aboriginal people. These sites have significant research value that can contribute to our understanding of the past use and visitation of a region. They commonly have some form of aesthetic values, being prevalent on sandstone platforms and near running water or natural billabongs and lakes. They are also frequently highlighted as important to the local Aboriginal community, being one of the few enduring site types that visually demonstrate the longevity of Aboriginal people's use and visitation to a place
- stone arrangements that relate to either hunting or ceremonial activities often associated with Dreaming places and stories. These sites have strong cultural importance to the local Aboriginal community, being one of the few structures that can be connected back to pre-contact Aboriginal societies and their ceremonial activity. Such sites also have various research potential, either directly where cultural deposits are present and can be explored for activities and timing, or indirectly through their spatial location, viewlines and connection to or from other places
- culturally modified trees that indicate the use and manipulation of the cultural landscape by Aboriginal people in the past. While typically of limited scientific significance, they are increasingly rare in the region due to land clearance, especially in HTP North. Following further specialist investigations, only a single culturally modified tree remains within the project impact area that is indicative of traditional scarring. These site types are typically important to the local Aboriginal community and have a moderate level of cultural value
- cultural places which are highly variable across the project impact area. They include archaeological, traditional, historical and contemporary places and values, some of which have a physical place, some reflect an analogy of a broader landscape feature, and others have limited spatial definition. Many have some level of research value in understanding the behaviours, concerns and views of contemporary Aboriginal people
- high and moderate density artefact scatters that indicate the occupation or repeat visitation of a locale by people in the past. For the project impact area, most of these sites are assigned a moderate research value due to the prevalence of these site types (especially in HTP North) with none having rare or representative qualities because of general disturbance throughout the project impact area.

The remaining identified sites, including the broader background artefact scatter, have limited, if any, research potential. While important in demonstrating the longevity and continued use of the region by Aboriginal people in the past, it is considered that little further information can be obtained from additional investigation of these sites, places and objects.

In addition, the cultural landscapes, viewlines and viewscapes identified as part of the cultural assemblage of the project impact area cannot be easily assigned significance due to being spatially poorly defined and their values and meaning being variable within the Aboriginal community. Generally, these sites and values have been assessed as having both aesthetic and cultural significance to the broader Aboriginal community, being associated with landforms, views and dense bushland.

A summary of the overall significance of each of the 32 Aboriginal objects and sites identified within the project impact area is provided in Table 9.4 in *section 9.3*. Details of the cultural, historical, scientific and aesthetic significance of each object and site within the project impact area is provided in *Technical Report 2 - Aboriginal cultural heritage assessment*.

9.3 Potential impacts – construction

Construction of project infrastructure and supporting construction activities would occur within the construction impact area. As such, the ACHA conservatively assessed the complete impact to any cultural materials within the construction impact area, with the project committing to avoid discrete, high value sites (see Figure 9.3). Efforts to date to avoid or minimise impacts to Aboriginal heritage sites and objects are detailed in *Chapter 3 (Alternatives and options)*.

A range of construction activities are proposed within the construction impact area, with some activities having a lower likelihood of harming cultural materials. This is most relevant between proposed transmission towers, where construction activities would largely be limited to vegetation clearing and vehicle movements for stringing purposes, and where large-scale earthworks or ground disturbance activities are unlikely to be required. Cultural materials within these areas would largely be unaffected by the construction of the project. Several Aboriginal sites are documented within deeper gorges and ravines within state forests in HTP Central and HTP South. It is likely that these sites would be unaffected by construction activities, as the conductors can be spanned across these areas where required safety and operational clearances can be met. Ground disturbance activities would be negligible or localised along public roads and already-established access tracks, meaning cultural materials can, in most cases, be avoided in these areas. Disturbance activities would be more substantial where existing tracks require widening or new tracks are constructed. In addition, the project has committed to avoiding discrete, high value sites.

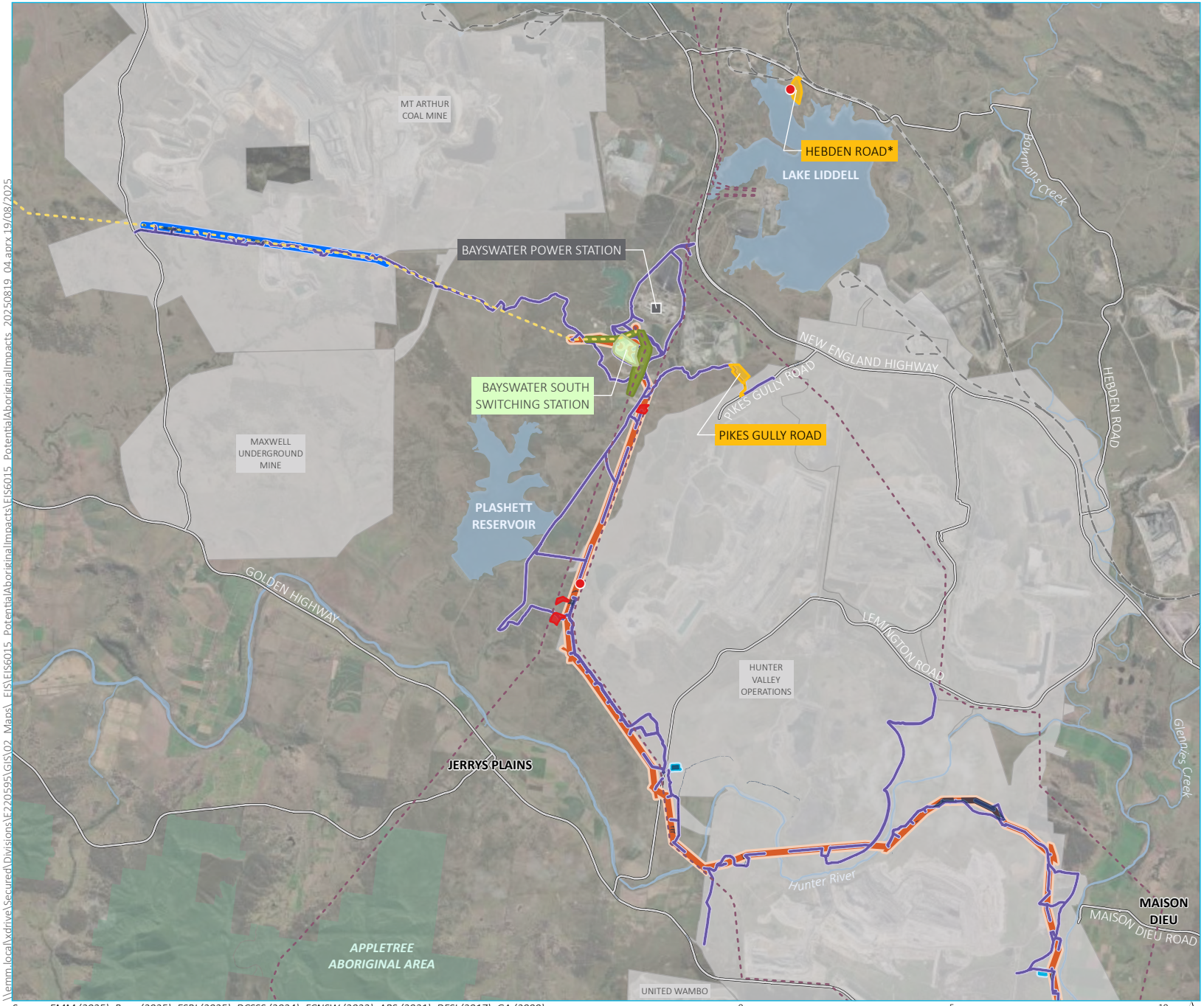
In contrast, more substantive ground disturbance would be required for establishment of construction support sites, laydown areas, civil works at switching stations, the foundations of proposed towers and the construction of new or upgrades to existing access tracks. This would require the removal of the upper soil profile on or within which some cultural materials were documented. These more substantial activities, where ground disturbance is likely, have the potential to directly harm Aboriginal objects, sites and places where present.

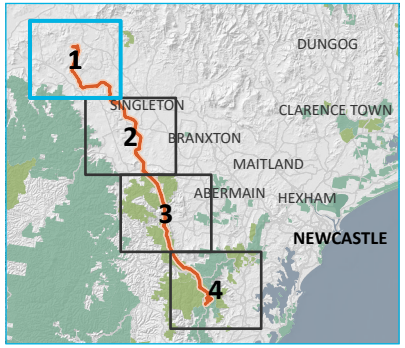
Construction of the project is also likely to produce indirect impacts to Aboriginal cultural heritage, particularly in the significant cultural landscape of HTP Central and HTP South. These include:

- vibration impacts that may result in destabilisation of cultural materials outside of the construction impact area. Applying the *German Standard DIN 4150-2016 Vibration in Buildings – Part 3: Effects on Structures* criteria for sensitive heritage structures (the closest comparison available for the identified cultural materials) indicates that heritage values within 55 metres of the project impact area may be subject to vibration impacts
- obstruction of important viewlines and viewscapes as a result of the establishment of transmission towers to heights of up to 85 metres during construction
- impacts to the broader cultural landscape as a result of vegetation clearance and construction of project infrastructure.

A summary of potential impacts to Aboriginal heritage values is provided in Table 9.4. There are 32 discrete Aboriginal sites and places identified throughout the construction impact area. Of these 32 sites and places, 5 would be avoided due to their high scientific and/or cultural significance (DEEP CK MOTHER SWA, Flat Rock lookout (HTP-C-CP01), HTP-C-CVM08, HTP-C-GG03, HTP-C-GG05) (see Figure 9.3). In addition, around 12 sites and places may only be partially impacted or unaffected by the project as they are in areas where ground disturbance would be minimal or unlikely (i.e. between transmission towers and/or outside of vegetation clearance areas). One further site is mostly located outside the project impact area and would be minimally impacted.

Around 88 hectares of the Warkworth sand system are also predicted within the project impact area, however extensive tracts of these deposits are located between proposed transmission towers and avoidance of substantive parts of the soil profile are probable where limited ground disturbance activities are proposed in these locales.





KEY

Aboriginal heritage impact*

- Directly impacted Aboriginal heritage site
- Potential Warkworth sand system deposit

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

*Background scatter extends across the entire project impact area and is not displayed

Potential Aboriginal heritage impacts within the project impact area

Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 9.3

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

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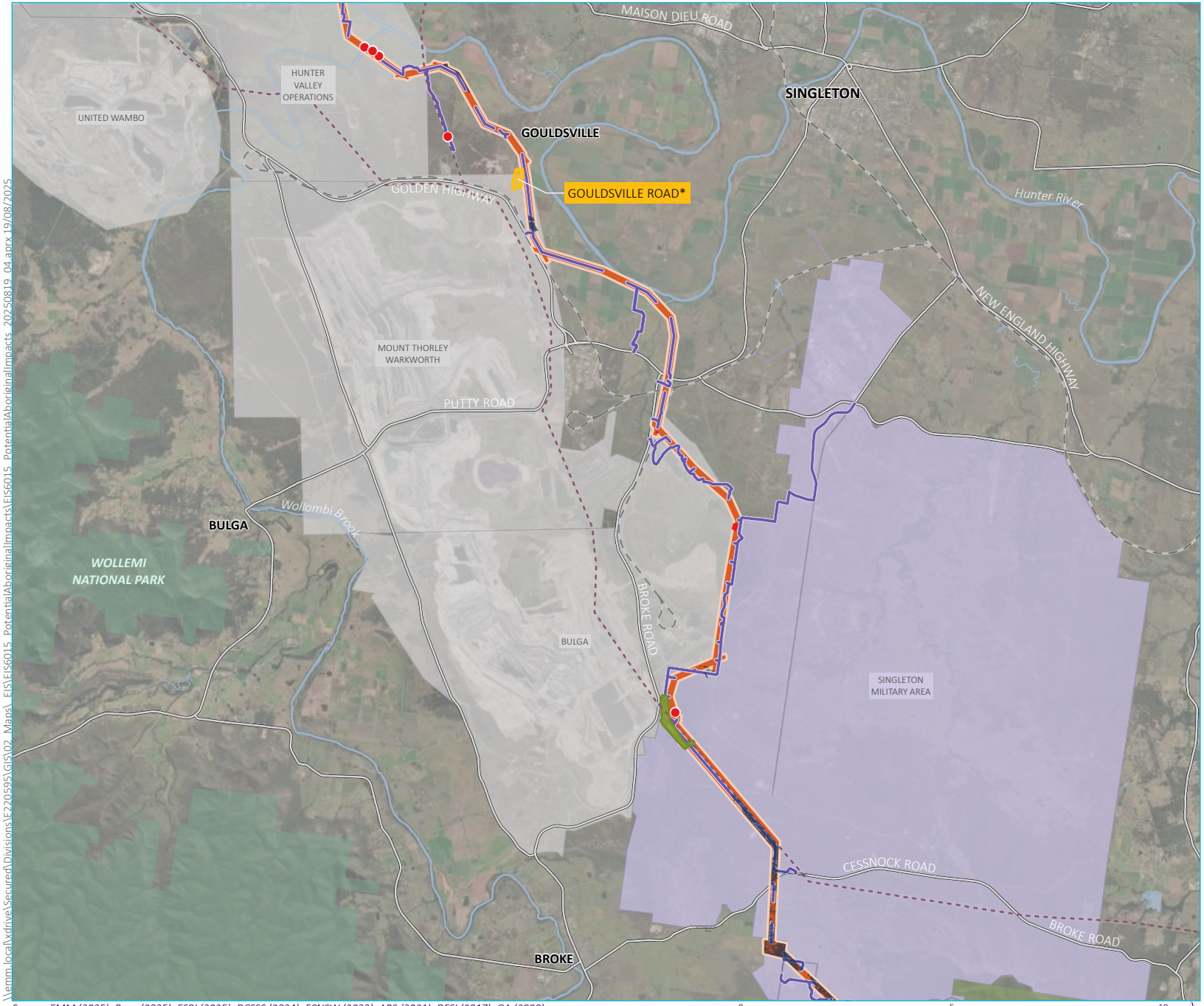

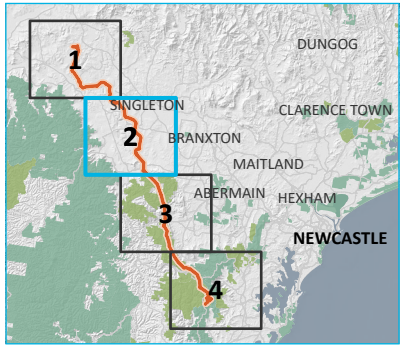

KEY

Aboriginal heritage impact*

- Directly impacted Aboriginal heritage site
- Potential Warkworth sand system deposit

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

*Background scatter extends across the entire project impact area and is not displayed

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

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Potential Aboriginal heritage impacts within the project impact area

Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 9.3

EMM
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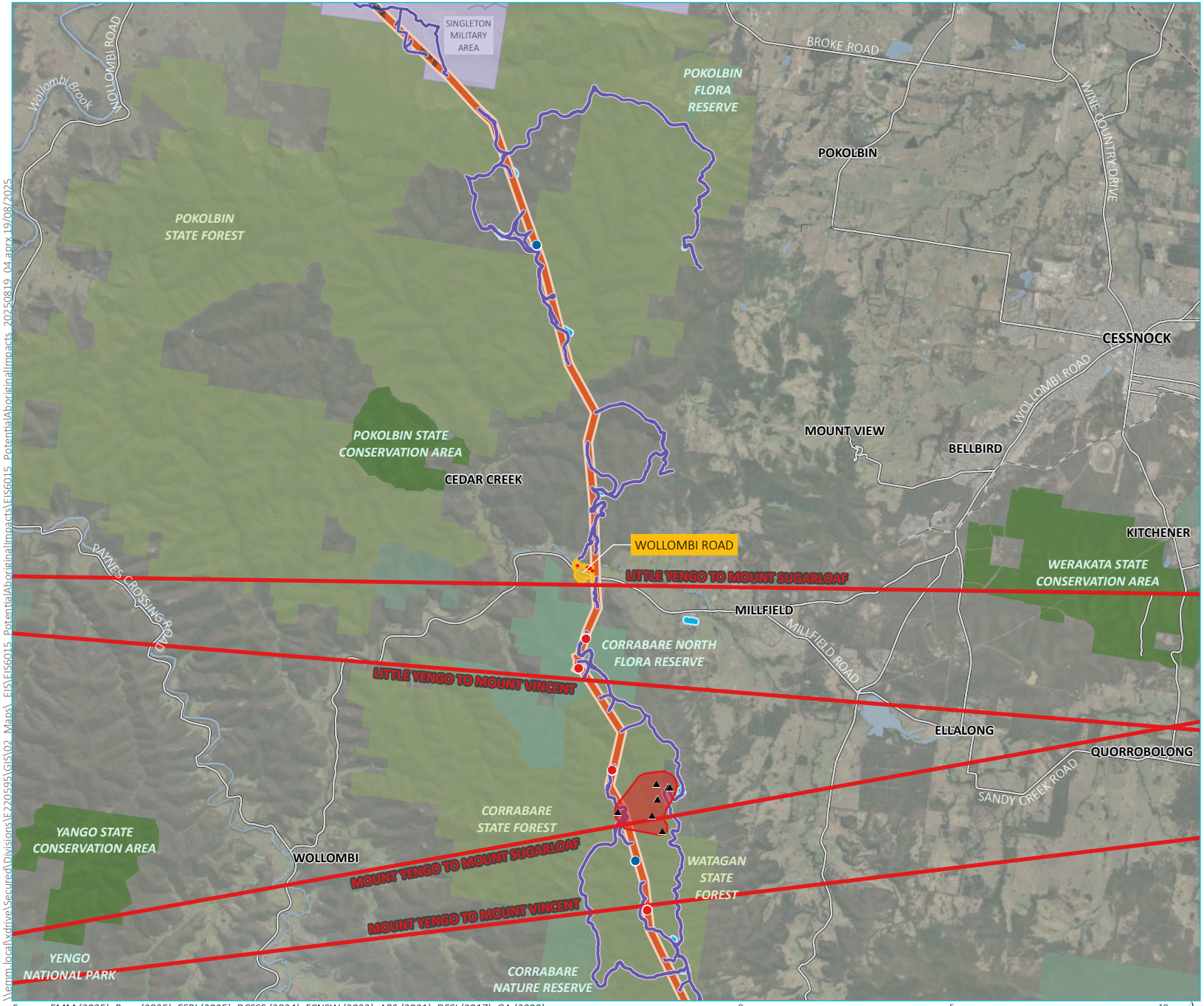

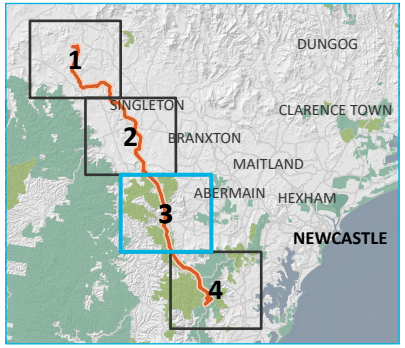

KEY

Aboriginal heritage impact*

- Directly impacted Aboriginal heritage site
- Committed for avoidance by the project
- Site comprising the cultural landscape
- Directly impacted viewline
- Directly impacted cultural landscape
- Potential Warkworth sand system deposit

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

*Background scatter extends across the entire project impact area and is not displayed

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

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Potential Aboriginal heritage impacts within the project impact area

Map 3 of 4

Hunter Transmission Project

Environmental Impact Statement

Figure 9.3

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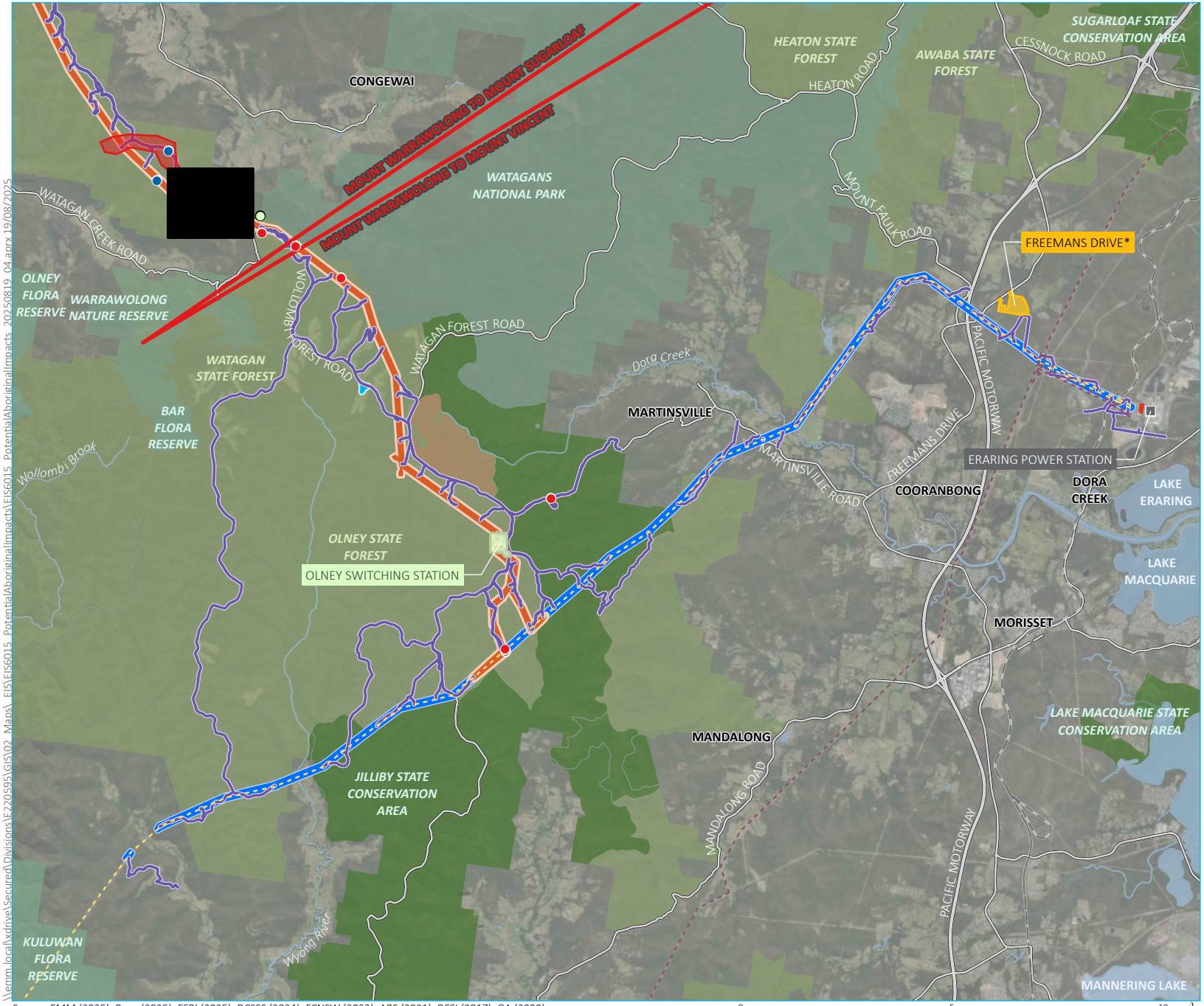

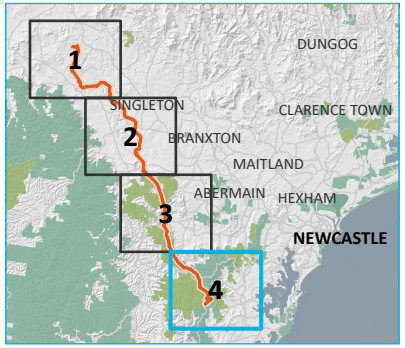

KEY

Aboriginal heritage impact*

- Directly impacted Aboriginal heritage site
- Indirectly impacted Aboriginal heritage site
- Committed for avoidance by the project
- Directly impacted viewline
- Directly impacted cultural landscape

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

*Background scatter extends across the entire project impact area and is not displayed

Potential Aboriginal heritage impacts within the project impact area

Map 4 of 4

Hunter Transmission Project

Environmental Impact Statement

Figure 9.3

creating opportunities

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

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Table 9.4 Summary of potential impacts to Aboriginal objects and/or sites from construction of the project

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
HVOCP TR47-AS3	37-2-6514	High density artefact scatter (>50)	Moderate	Stringing activities between potential transmission towers	Direct	Partial loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site would be minimally affected by the project.
BOP-OS8	37-6-2842	Moderate density artefact scatter (21-50)	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site would be minimally affected by the project.
HVO-1258	37-6-3376	High density artefact scatter (>50)	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site would be minimally affected by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
HVO-1267	37-6-3384	Moderate density artefact scatter (21-50)	Moderate	Stringing activities between potential transmission towers	Direct	Partial loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site would be minimally affected by the project.
2010-HVOSE-15	37-6-4023	High density artefact scatter (>50)	Moderate	Within a proposed access track upgrade	Direct	Complete loss of value	Due to the potential ground disturbance activities associated with access track upgrades within the construction impact area, this site is expected to be wholly impacted by the project.
HTP-N-AS01	37-2-6667	High density artefact scatter (>50)	Moderate	Potential transmission tower construction and surrounding activities	Direct	Complete loss of value	Due to the ground disturbance for the tower pad and excavations for tower footings, this site is expected to be impacted by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
HTP-N-AS15	37-2-6666	High density artefact scatter (>50)	Moderate	Ancillary activities associated with potential transmission tower construction	Direct	Partial loss of value	This site extends into, and beyond the project impact area, with most of the cultural deposit remaining outside the construction impact area. As such, it is anticipated that this site would be partially impacted by the project.
HTP-N-AS30	37-6-4488	High density artefact scatter (>50)	Moderate	Stringing sites associated with potential transmission tower construction	Direct	Complete loss of value	Due to the potential ground disturbance activities associated with stringing sites within the construction impact area, this site is expected to be impacted by the project.
HTP-N-AS32	37-6-4487	High density artefact scatter (>50), potential archaeological deposit	Moderate	Stringing activities between potential transmission towers	Direct	Partial loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site would be minimally affected by the project.
HTP-N-AS71	37-2-6665	High density artefact scatter (>50)	Moderate	Within the curtilage of a proposed construction support site	Direct	Complete loss of value	Due to the potential ground disturbance activities associated with construction support sites within the construction impact area, this site is expected to be wholly impacted by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
Hunter crossings (HTP-N-CVM01)	37-6-4493	Cultural place	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. In addition, this site is located along the banks of the Hunter River, where ground disturbance is not anticipated. Therefore, it is anticipated that this site would be minimally affected by the project.
HTP-N-BS1	N/A	Background scatter	Low	Entire project impact area – all activities	Direct	Negligible loss of value	This site represents part of a broader scatter of cultural materials extending across the region, and a loss of a portion of the cultural deposit is considered to have limited impact to its value.
DEEP CK MOTHER SWA	37-6-3714	Rock shelter, art (pigment or engraved)	High	EnergyCo has committed to avoiding direct impacts on this site of high significance	None	No loss of value	Project will avoid this site and its surrounding environment.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
HTP-C-AR01	37-6-4486	Aboriginal resource and gathering	Moderate	Stringing activities and vegetation clearance between potential transmission towers; and nearby ancillary activities at Becketts Road	Direct	Complete loss of value	This site is wholly within the construction impact area, in areas associated with spanning activities and vegetation clearance activities between towers. The values of this site relate to specific tree species (as a resource used by Aboriginal people), due to vegetation clearance activities, this site is expected to be impacted by the project.
HTP-C-AR02	37-6-4485	Aboriginal resource and gathering	Moderate	Stringing activities and vegetation clearance between potential transmission towers	Direct	Complete loss of value	This site is wholly within the construction impact area, in an area associated with spanning activities and vegetation clearance activities between towers. The values of this site relate to specific shrub species (as a resource used by Aboriginal people), due to ground disturbance activities associated with vegetation clearance activities, this site may be wholly impacted by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
HTP-C-CMT05	37-6-4483	Culturally modified tree	Moderate	Stringing activities and vegetation clearance between potential transmission towers	Direct	Complete loss of value	This site is wholly within the construction impact area, in an area associated with spanning activities and vegetation clearance activities between towers. Due to ground disturbance activities associated with vegetation clearance, this site is likely to be wholly impacted by the project.
Flat Rock lookout (HTP-C-CP01)	45-3-5003	Cultural place	High	EnergyCo has committed to avoiding direct impacts on this site of high significance	None	No loss of value	This site and its surrounding environment are committed for avoidance by the project.
HTP-C-CVM08	45-3-5010	Cultural place	High	EnergyCo has committed to avoiding direct impacts on this site of high significance	None	No loss of value	This site and its surrounding environment are committed for avoidance by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
HTP-C-GG03	37-6-4484	Grinding groove	High	EnergyCo has committed to avoiding direct impacts on this site of high significance	None	No loss of value	This site and its surrounding environment are committed for avoidance by the project.
HTP-C-GG05	45-3-5006	Grinding groove	High	EnergyCo has committed to avoiding direct impacts on this site of high significance	None	No loss of value	This site and its surrounding environment are committed for avoidance by the project.
HTP-C-RS02	37-6-4492	Rock shelter (no cultural markers)	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site would be minimally affected by the project.
CSS-10 (HTP-C-FA01)	37-6-4490	Subsurface cultural deposit	Moderate	Within construction support site	Direct	Complete loss of value	Due to the potential ground disturbance activities associated with construction support sites within the construction impact area, this site is expected to be wholly impacted by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
CSS-72, CSS-58 & CSS-56 (HTP-C-FA02)	37-6-4489	Subsurface cultural deposit	Moderate	Within construction support site	Direct	Complete loss of value	Due to the potential ground disturbance activities associated with construction support sites within the construction impact area, this site is expected to be wholly impacted by the project.
CSS-96 (HTP-C-FA03)	37-6-4491	Subsurface cultural deposit	Moderate	Within construction support site	Direct	Complete loss of value	Due to the potential ground disturbance activities associated with construction support sites within the construction impact area, this site is expected to be wholly impacted by the project.
HTP-C-BS1	N/A	Background scatter	Low	Entire construction impact area	Direct	Negligible loss of value	This site represents part of a broader scatter of cultural materials extending across the region, and a loss of a portion of the cultural deposit is considered to have limited impact to its value.
Watagan Creek ACD	45-3-4623	Cultural place	Moderate	Stringing activities between potential transmission towers	Indirect	No loss of value	This site reflects past visitation and resources associated with Watagan Creek, which would remain unchanged by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
Wishing well (HTP-S-CS01)	45-3-5009	Cultural place	Moderate	Ancillary activities – access road upgrades (Martinsville Hill Road)	Direct	Complete loss of value	Due to the potential ground disturbance activities associated with access road widening upgrades, this site is expected to be wholly impacted by the project.
HTP-S-GG01	45-3-5005	Grinding groove	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site, while wholly within the construction impact area, would be minimally affected by the project.
HTP-S-RS16	45-3-5007	Rock shelter	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site, while wholly within the construction impact area, would be minimally affected by the project.

Site	AHIMS #	Site type	Significance	Location and/or activity causing harm	Type of potential harm	Consequence of harm	Likely impacts
HTP-S-RS19	45-3-5008	Rock shelter	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site, while wholly within the construction impact area, would be minimally affected by the project.
HTP-S-RS20	45-3-5004	Rock shelter	Moderate	Stringing activities between potential transmission towers	Direct	Complete loss of value	This site is partially within the construction impact area, located under a span where minimal ground disturbance or vegetation clearance is anticipated to be required. Therefore, it is anticipated that this site, while wholly within the construction impact area, would be minimally affected by the project.
HTP-S-BS1	N/A	Background scatter	Low	Entire project impact area	Direct	Negligible loss of value	This site represents part of a broader scatter of cultural materials extending across the region, and a loss of a portion of the cultural deposit is considered to have limited impact to its value.

9.4 Potential impacts – operation

Activities during operation with potential to impact on Aboriginal cultural heritage items and values may include:

- ongoing visual impacts to cultural viewlines and viewscapes
- vegetation maintenance within the transmission line easement
- improved access by general public and other users (i.e. maintenance workforce) to Aboriginal sites and places through maintenance of a transmission easement
- maintenance of access tracks
- maintenance of the transmission line and towers, including heavy machinery placement
- maintenance of stormwater drainage systems.

Visual assessments carried out as part of the cultural values mapping study for the viewlines and viewscapes between elevated landscapes within and surrounding the project impact area have shown that there would be no substantive obstruction of many of these viewlines, with the project not being visible in several instances. However, the project would impact on some locations where viewlines are prominent, notably location SL5 and SL8 (see Figure 9.3 and *Appendix D.2 (Cultural values mapping study)* of *Technical Report 2 – Aboriginal Cultural Heritage Assessment*). Ongoing discussions with Aboriginal participants have indicated that they perceive the project as impacting these viewlines and viewscapes, and that it would inhibit their ability to relay cultural information to others. As such, it is considered that the project would result in indirect impact to these culturally important viewlines and viewscapes. Similarly, despite being within the working landscape of the State forest, Aboriginal participants consider that the project would impact the Trig Road, Dora Creek, Dora Pinnacles, and Flat Rock cultural landscapes.

Mitigation measures to manage any operational impacts to Aboriginal cultural heritage, including potential impacts to viewlines and viewscapes and to cultural landscapes are included in *section 9.5*.

9.5 Mitigation and management

9.5.1 Environmental management

Environmental management for the project would be carried out in accordance with the approach detailed in *Chapter 24 (Environmental Management).* Impacts to Aboriginal heritage would be minimised through the application of mitigation and management measures and the implementation of an Aboriginal cultural heritage management plan (ACHMP) for the project.

The ACHMP will be developed by a heritage specialist in consultation with the RAPs to provide the post-approval framework for managing archaeological mitigation and Aboriginal heritage within the project impact area. The ACHMP will consider guiding principles presented in the ACHA and will address the following:

- processes, timing, communication methods and project involvement (e.g. on-site activities) for maintaining Aboriginal community consultation and participation through the remainder of the project. This will include a grievance mechanism that is readily available and designed for use by the local Aboriginal community
- descriptions and methods to avoid any inadvertent impacts to identified Aboriginal objects and sites and areas of archaeological sensitivity outside of the construction impact area. A suitable regime of monitoring these activities will also be outlined, including locations, methods, personnel and timing
- descriptions and methods of any additional investigative actions that may be required prior to construction works commencing or during the project for sites that are to be adversely impacted. Activities should include suitable archival recording and cultural material recovery (e.g. relocation of key components, surface collection and/or archaeological excavations). These should include opportunity for Aboriginal participants to recover and relocate culturally important flora species at HTP-C-AR01 and HTP-C-AR02. For these activities, details of locations, methods, personnel, and timing will be included
- description and methods for undertaking further Aboriginal cultural heritage assessment, investigation and mitigation of any areas of the project that have changed following completion of the ACHA or during the final design and construction of the project
- description and methods of post-excavation analysis and reporting of the archaeological investigations and activities implemented as part of the ACHMP. For excavations, these will include suitable collection and processing of stone artefacts, and chronological, soil, and environmental samples
- reinforcement of how the cultural landscape is to be considered throughout the project's construction and detail the rehabilitation of the construction impact area. Assessment of rehabilitation of areas where infrastructure is not remaining after construction of the project will be undertaken to determine suitable ecological communities and other factors in returning the cultural landscape as close to its current state as feasible
- procedures for managing the unexpected discovery of Aboriginal objects, sites and/or human ancestral remains during the project
- procedures for the curation and long-term management of cultural materials recovered or relocated as part of the works outlined in the ACHMP and any preceding stages associated with the project
- processes for reviewing, monitoring, and updating the ACHMP as the project progresses
- procedures for the long-term management of cultural materials that remain within the operational impact area following construction activities
- suitable knowledge transfer procedures for personnel changes between project planning and delivery to minimise loss or mistranslation of the intent of the information, findings and future steps for heritage management.

9.5.2 Mitigation measures

The mitigation measures that will be implemented to avoid or minimise potential impacts to Aboriginal heritage are listed in Table 9.5. These should be read in conjunction with the guiding principles in *Appendix H* of *Technical Report 2 - Aboriginal cultural heritage assessment*.

Mitigation measures in other chapters that are relevant to the management of Aboriginal cultural heritage include:

- Chapter 10 (Landscape and visual), including measures which address visual impacts on the wider landscape
- Chapter 16 (Noise and vibration), including measures which address vibration impacts on heritage sites.

Table 9.5 Proposed mitigation and management measures - Aboriginal cultural heritage

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AH01	Cultural heritage management	An ACHMP will be developed by a heritage specialist in consultation with the RAPs to provide the post-approval framework for managing archaeological mitigation and Aboriginal heritage within the project impact area (see *section 9.5.1*).	Detailed design Construction	Project impact area, and all identified Aboriginal objects, sites and deposits identified in the ACHA that will be adversely impacted by the project.
AH02	Aboriginal objects outside the project impact area	Additional assessment will occur in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (2010a) for areas where ground disturbing activities are required in locations outside of the previously assessed area. Where required, additional heritage surveys will be carried out with the RAPs prior to ground disturbing activities occurring in any such areas (including areas where only visual inspection has been undertaken). If no Aboriginal objects are found or if Aboriginal objects are found and they would not be impacted, then a letter report will be prepared by an archaeologist that documents the findings and gives clearance to proceed.	Construction Operation	Activities outside of the project impact area

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AH03	Aboriginal objects of high significance	Direct and indirect impacts to all highly significant identified Aboriginal objects and sites and their immediate environment (at least 55 metres) within and in the vicinity of the project impact area will be avoided.	Detailed design Construction Operation	• DEEP CK MOTHER SWA (rock shelter) • Flat Rock lookout HTP-C-CP01 (cultural place) • HTP-C-CVM08 (cultural place) • HTP-C-GG03 (grinding groove) • HTP-C-GG05 (grinding groove) • Identified significant sites outside the impact area referenced in Table G.2 of *Technical Report 2 – Aboriginal cultural heritage assessment*

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AH04	Impact avoidance and minimisation	The project will investigate the micro-siting of project infrastructure and optimisation of construction activities in consultation with an Aboriginal heritage specialist to avoid or minimise impacts to all identified Aboriginal objects and sites within the project impact area. Some guiding principles for consideration of avoidance of Aboriginal sites and objects during construction of the project include (but are not limited to): • incorporation of the sites, cultural deposits, curtilages, and obligations for their protection into cultural inductions for the construction workforce • establishment of fencing and/or signage during works in and around identified sites and cultural deposits, which would be implemented in consultation with an Aboriginal heritage specialist and/or RAPs • where necessary, establishment of surface protection such as heavy-duty ground protection mats, or equivalent, which would be implemented in consultation with an Aboriginal heritage specialist and/or RAPs. Any site-specific avoidance measures developed to address this commitment will be integrated into AH1.	Detailed design Construction	• All identified Aboriginal sites and objects presented in Table 10.1 of *Technical Report 2 – Aboriginal cultural heritage assessment*
AH05	Cultural heritage management	Prior to construction impact, archaeological test excavations will be carried out in areas where ground disturbance to areas of high cultural significance would occur during construction on the remaining sites noted in *section 9.3* of the ACHA. Test excavations will adopt approaches and methods outlined in the ACHA.	Detailed design	Areas of high cultural significance, including areas predicted to contain Warkworth sand system deposits

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AH06	Cultural heritage management	A cultural values mitigation strategy will be developed in consultation with the Awabakal Elders and key knowledge-holders who participated in the cultural values mapping study for the project. This will be undertaken to explore mitigations for the perceived social and cultural impacts to important viewlines and viewscapes between major promontories in HTP Central, and localised cultural landscapes at Trig Road, Flat Rock, Dora Creek and the Dora pinnacles. The strategy will include, but not be limited to: • implementation of Aboriginal-led cultural inductions throughout the project impact area • support for cultural monitoring of development activities through the Trig Road cultural landscape, Flat Rock cultural landscape, and within 200 m of the Dora pinnacles and Dora Creek. This will include approaches and methods for cultural monitors to be able to relay concerns to the project for consideration and subsequent management • support for an Aboriginal-led research program to investigate cultural areas of interest and associated Aboriginal sites and places at Trig Road cultural landscape and Flat Rock cultural landscape. This will include but not be limited to: HTP-C-RS14 (#45-3-5-5013), Corrabare State Forest Road 2 (#45-3-3582), Corrabare State Forest Western Side of Langans Road SWA (#45-3-3583), and Corrabare (#45-3-2140).	Construction	Flat Rock cultural landscape, Trig Road cultural landscape, Dora Creek, Dora pinnacles

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AH07	Cultural heritage management	Where possible, the clearing of vegetation between significant cultural viewing locations and the project impact area will be minimised in discussion with Awabakal Traditional Owners. Where practicable, any intervening vegetation will be protected to reduce the potential for views of the project from Flat Rock lookout, including the view from the top of the rock as well as the setting and access track.	Detailed design Construction	Flat Rock Lookout (HTP-C-CP01 45-3-5003) Other important cultural viewlines and viewscapes, including but not limited to SL5 and SL8
AH08	Cultural heritage management	Where practicable, project elements will be positioned to maximise the distance from and/or minimise their visibility within culturally important view-lines, notably SL5, in consultation with the Awabakal Traditional Owners.	Detailed design Construction	Important cultural viewlines and viewscapes, including but not limited to SL5

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AH09	Heritage interpretation	A heritage interpretation strategy will be developed by a heritage specialist to identify the Aboriginal heritage values throughout the project impact area, and to provide direction for potential interpretive opportunities for the project or off-site (e.g. at Broke, Cessnock or Martinsville). This strategy will be made available for consultation and feedback with the Wonnarua, Awabakal and Darkinjung Traditional Owners. Following consultation and feedback on the strategy, a heritage interpretation plan will refine the strategy with content (visual and textual) and design details in order to allow the implementation of the plan. The interpretation strategy and interpretation plan will be co-designed and closely developed with local Wonnarua, Awabakal and Darkinjung Traditional Owners. This includes identification of initial aims and ideas, content and structure. Content should include, but not be limited to: • the ethnographic and historical record, which includes post contact and contemporary associations with the site and immediate environs • consultation and input from the Wonnarua, Awabakal and Darkinjung Traditional Owners • information obtained from the archaeological excavations and findings undertaken for the project.	Construction Operation	All locations
AH10	Consultation	The Aboriginal community consultation process for this project will continue throughout detailed design and construction.	Detailed design Construction	N/A
AH11	Consultation	A copy of the ACHA and all relevant AHIMS site recording forms and information for the project will be lodged with Heritage NSW and provided to each of the RAPs, as relevant.	Detailed design	N/A

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AH12	Operation	Following construction of the project, all Aboriginal sites and objects unharmed and/or partially impacted would be subject to a site condition assessment (including mapping and recording in GIS systems) by a heritage specialist in consultation with the RAPs. The site condition assessment will identify management requirements for the future conservation and protection of all documented cultural materials in the context of future operation and maintenance of the operation impact area. This will include consideration of increased access to Aboriginal sites and places as a result of the establishment and maintenance of the transmission easement.	Construction Operation	Project impact area

9.6 Summary and conclusions

The ACHA has involved meaningful engagement and comprehensive investigations of Aboriginal heritage values of the project. The project impact area and surrounds comprise rich, complex and ceremonial landscapes. There are 32 discrete Aboriginal sites and places identified throughout the project impact area.

The project would result in localised ground disturbance and vegetation clearance within the project impact area. Following completion of the construction period, there are impacts that would continue throughout the operational period, primarily in the form of vegetation management. Of the 32 Aboriginal sites and places within the project impact area, around 14 are likely to be subject to direct impacts from the project resulting in their complete or partial loss. Notwithstanding, EnergyCo has committed to avoid 5 Aboriginal sites and places assessed as having an overall high Aboriginal cultural significance.

Additionally, 88 hectares of the Warkworth sand system is predicted to be within the project impact area, with extensive areas of this system likely to be between proposed transmission towers. As such, avoidance of substantive parts of the soil profile are probable where limited ground disturbance activities are proposed. Around 2351 hectares of the project impact area are considered to encompass a low-density background scatter that is present intermittently and disparately across the region and would also be partially impacted.

A series of management measures are proposed to protect Aboriginal cultural heritage values including preparation of an ACHMP.

Landscape and visual

10

10 Landscape and visual

This section provides a summary of the impacts of the Hunter Transmission Project (HTP, the 'project') on landscape and visual amenity and identifies appropriate mitigation and management measures. *Technical Report 3 – Landscape character and visual impact* provides a detailed landscape character and visual impact assessment (LCVIA) for the construction and operation of the project. The relevant Planning Secretary's environmental assessment requirements (SEARs) as they relate to landscape and visual amenity, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A Assessment requirements compliance.*

10.1 Assessment approach

10.1.1 Legislation, policies, plans and guidelines

The Landscape Character and Visual Impact Assessment (LCVIA) has been undertaken in accordance with the *Transmission Guideline, Technical Supplement for Landscape Character and Visual Assessment* (DPHI 2024a) (the Technical Supplement). The Technical Supplement provides guidance for the assessment of landscape character and a detailed methodology for the assessment of visual impacts of transmission projects.

Where the Technical Supplement does not provide guidance, this LCVIA draws upon methodology from other national and international guidelines and standards, including:

- *Guidance Note for Landscape and Visual Assessment*, Australian Institute of Landscape Architects Queensland, 2018
- *Guidelines for Landscape and Visual Impact Assessment*, Third Edition, 2013, prepared by the Landscape Institute and Institute of Environmental Management & Assessment
- *AS/NZS 4282 Control of the obtrusive effects of outdoor lighting,* 2019.

The assessment also considered relevant state, regional and local planning strategies as outlined in *Technical Report 3 - Landscape character and visual impact assessment.*

10.1.2 Study area

The study area for this LCVIA has been determined in accordance with the Technical Supplement. This includes different study areas for landscape character and visual impacts, as follows:

- the landscape character study area includes all areas within 5 kilometres of the HTP corridor, that is a 10-kilometre-wide corridor including the 140-metre wide transmission line corridor
- the visual study area is all areas within 1.625 kilometres of the HTP corridor (based on a maximum structure height of 85 metres).

Construction support sites located outside the landscape study area have also been considered for temporary landscape character and visual impact.

10.1.3 Assessment methodology

The assessment of landscape character and visual impacts of the project is based on a concept design. The final design of project infrastructure, including locations of transmission towers, would be confirmed during detailed design.

Visual impact

In accordance with the Technical Supplement, the assessment of the visual impacts of the project involved:

- use of a 3D digital terrain model (i.e. a digital graphic representation of elevation data to represent existing landform) and the project concept design, with details such as the height of transmission towers to identify areas from which the project would potentially be visible
- a visual impact assessment from public viewpoints, which involved:
  - a site inspection to verify the selection of representative public viewpoints used in the assessment. These viewpoints were chosen to represent places where the local community can view the project, including local roads, highways and scenic routes, and rest stops
  - completion of viewpoint photography, and the preparation of photomontages for some viewpoints to show areas of higher sensitivity and typical views from landscape character types (included in *Technical Report 3 – Landscape character and visual impact assessment*)
  - determining the daytime visual sensitivity (based on 4 categories from very low to high), and magnitude of change (based on 5 categories from very low to very high) for each representative viewpoint
  - assigning a level of landscape character impact (very low to high) by combining the visual sensitivity and magnitude of change to viewpoint (based on an impact matrix)
- visual impact assessment from private receivers (dwellings), which involved:
  - identification of all private receivers within the visual study area
  - determining the setback distance. For this project a rural sensitive receiver setback is used. With a tower height of 85 metres the rural sensitive receiver setback distance is 400 metres
  - a simple visual assessment to identify potentially impacted private dwellings in the study area. The assessment excluded: the host landowner; dwellings within operational mining lease areas; dwellings within the Singleton Military Area; ancillary farm, industrial or commercial buildings; heritage ruins and non-habitable heritage items (see *Technical Report 3– Landscape character and visual impact assessment* for further explanation). This is aimed at eliminating dwellings where a very low and low visual impact are likely to be experienced and involved:
    - a screening based on the conservative vertical field of view (1.625 kilometre for an 85-metre tower) and potential magnitude thresholds

    - identifying the private dwellings from the screening assessment that require an intermediate visual impact assessment
- intermediate visual assessment of the private dwellings identified as having a moderate or higher visual impact, which involved:
    - preparing 3D modelled views of the project using LiDAR data to more accurately determine the magnitude of change. These 3D modelled views show the existing landform, existing vegetation and a 3D model of the project
    - identifying the private dwellings from the screening assessment that require a detailed visual impact assessment
- detailed visual assessment of the identified private dwelling to determine the potential impacts of the project. This involved:
    - detailed site inspections and photography (completed December 2024, March and June 2025) at each private dwelling with an intermediate assessment of a moderate or higher impact rating
    - preparing a photomontage in accordance with the specifications of the Technical Supplement
    - adjusting the ratings of visual sensitivity (very low to high) and scenic quality (low, moderate, high) of individual views
    - assigning a level of visual impact (very low to high) by combining the visual sensitivity and magnitude of change (see Table 10.1) to each viewpoint. It is important to note that in this assessment those dwellings on properties or part of a broader land holding, that would also host permanent project infrastructure have not been identified. This is relevant as these landowners would have negotiated landowner agreements for compensation from the impacts of the project

- cumulative landscape character and visual impact assessment to identify the potential cumulative impacts from the project and other projects within 5 kilometres of the project
- identification of mitigation measures to avoid, minimise and manage any potential visual impacts of the project.

Figure 10.1 provides a graphical summary of the approach used for the visual impact assessment. Detailed descriptions of visual sensitivity levels, magnitude of change levels, and impact levels specific to both day and night-time assessments are included in section 3.5 of *Technical Report 3 - Landscape character and visual impact assessment*. To support the assessment of visual impacts, photomontages and 3D modelling have been prepared for some viewpoints (including public viewpoints and private viewpoints where access and permission to take photographs was granted). These illustrate impacts at locations where the project would be seen from locations of moderate and higher visual sensitivity and to show a typical view within some of the landscape character types.

Photomontages are intended to illustrate the size and scale of the project and aim to accurately represent the project infrastructure based on the project concept design.

A detailed description of the methodology for the development of photomontages and 3D models is included in section 3.5 of *Technical Report 3 - Landscape character and visual impact assessment*.

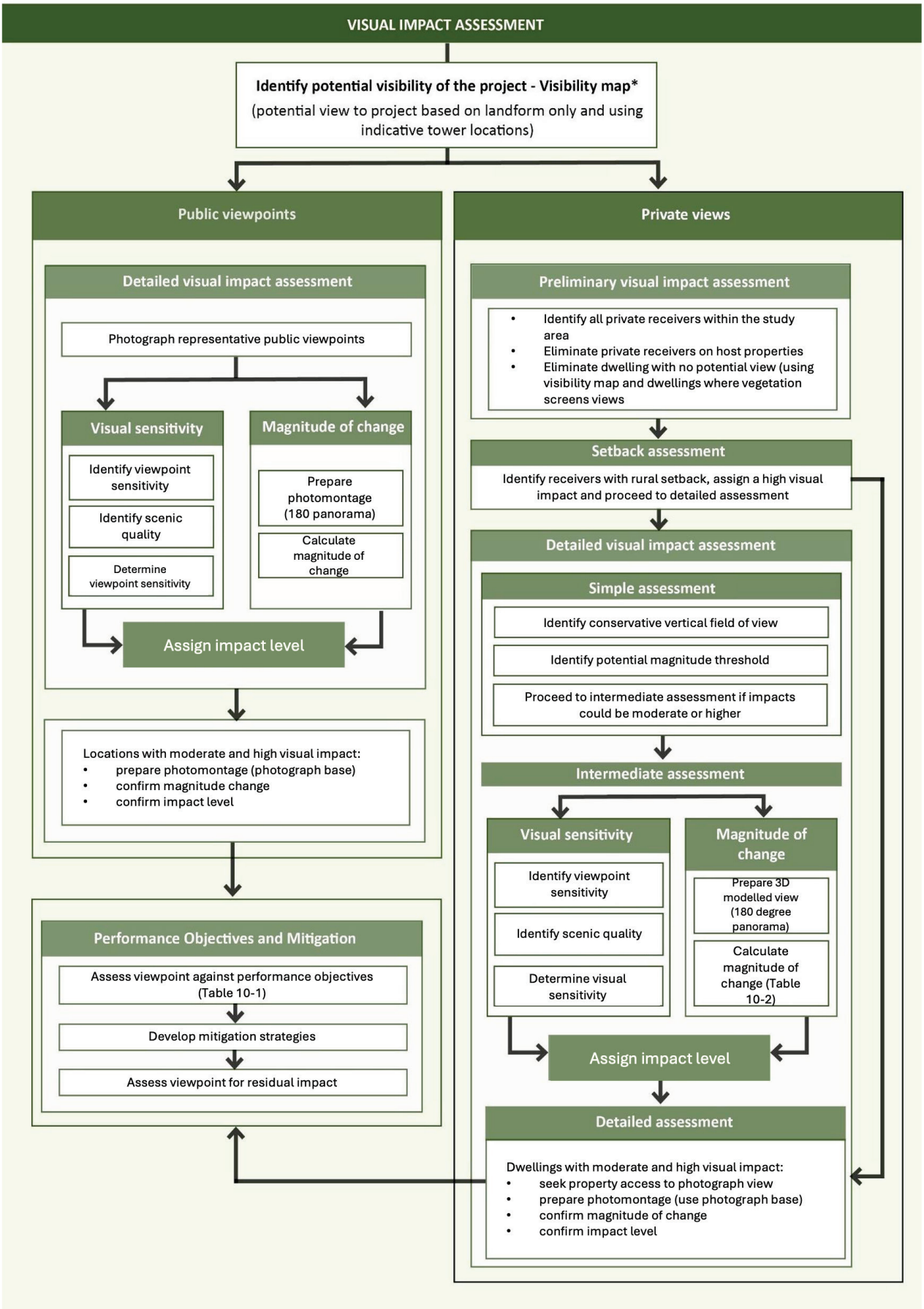


Figure 10-1 Visual impact assessment process

The following table lists the visual performance objectives for each visual impact level (see Table 10.1).

Table 10.1 Visual performance objectives (Source: Table 9, DPHI 2024a)

Impact level	Visual performance objective
High visual impact	This level of impact should be avoided unless the proponent can justify that: • all reasonable efforts have been made to avoid the impact and alternative project designs are not feasible or would be unlikely to materially reduce the impact • all reasonable mitigation options have been considered, and the proposed mitigation measures would effectively mitigate the impact and would not result in a significant obstruction of views.
Moderate visual impact	**Public road viewpoints** As far as reasonable and feasible, the proponent should seek to reduce moderate visual impacts to road users. Appropriate mitigation options include vegetation or other screening. Mitigation should only be considered if it would not obstruct important views and sight lines, could be confined to a relatively small area (i.e. vegetation screening would not be required for several hundred metres along a transport corridor) and was agreed with the relevant road or rail authority. **All other private receivers and public viewpoints** Visual impact mitigation should be implemented within the project corridor and/or offered to the affected landowner and should be proportionate to the scale of the impact. There is no expectation this mitigation should eliminate the view of the development entirely, but it must reduce the impact to an acceptable level and not create unacceptable visual impacts to other receivers.
Low and very low visual impact	No mitigation is required.

For the intermediate and detailed assessment, magnitude of change is determined by first producing a 3D model of the project (such as a bare earth render or photomontage) that comprises 180 degree horizontal field of view; overlaying a transparent grid provided by DPIE in the Technical Supplement; and identifying the number of occupied cells. The magnitude rating in the intermediate and detailed visual assessments is determined based on the number of cells and the thresholds shown in Table 10.2. See Figure 10.9 to see the cells overlaid on a photomontage.

Table 10.2 Visual magnitude thresholds (Source: Table 2, DPHI 2024)

Number of occupied cells	Visual magnitude rating
1 to 7	Very low
8 to 14	Low
15 to 25	Moderate
26 to 36	High
More than 37	Very high

Landscape character

The assessment of landscape character impacts involved:

- the identification of landscape character zones within the landscape character study area. These landscape character zones are identified based on grouping areas of similar characteristics such as geology, topography, vegetation cover, water courses, built form and land use patterns. These landscape character zones are used as the basis of the landscape character assessment
- an assessment of daytime landscape character by:
  - determining the sensitivity of each identified landscape character zone. This considers the value of the landscape and how susceptible it is to change and is based on the frequency and volume of use, the types of activities which occur and the presence of any specific values such as scenic quality, contribution to sense of place, and its rarity. There are 4 landscape sensitivity levels that apply to this assessment from very low to high
  - identifying the magnitude of change that would be experienced as a result the construction and operation of the project. This considers the scale of the change that would be experienced and geographical area and is based on 5 categories from very low to very high
  - assigning a level of landscape character impact (very low to very high) by combining the landscape sensitivity and magnitude of change to each landscape character zone (based on an impact matrix)
- an assessment of night-time landscape character, carried out with a similar approach to the daytime assessment, however considering the guidance contained in the *AS4282 Control of the obtrusive effects of outdoor lighting (2019)*. This publication identifies specific guidance on the identification of landscape sensitivity and the magnitude of change, appropriate to night-time periods and specific night-time values such as dark sky regions, and the predominant existing night-time environment
- identification of mitigation measures to avoid, minimise and manage any potential impacts of the project on landscape character.

The structure of the landscape character impact assessment in shown in Figure 10.2.

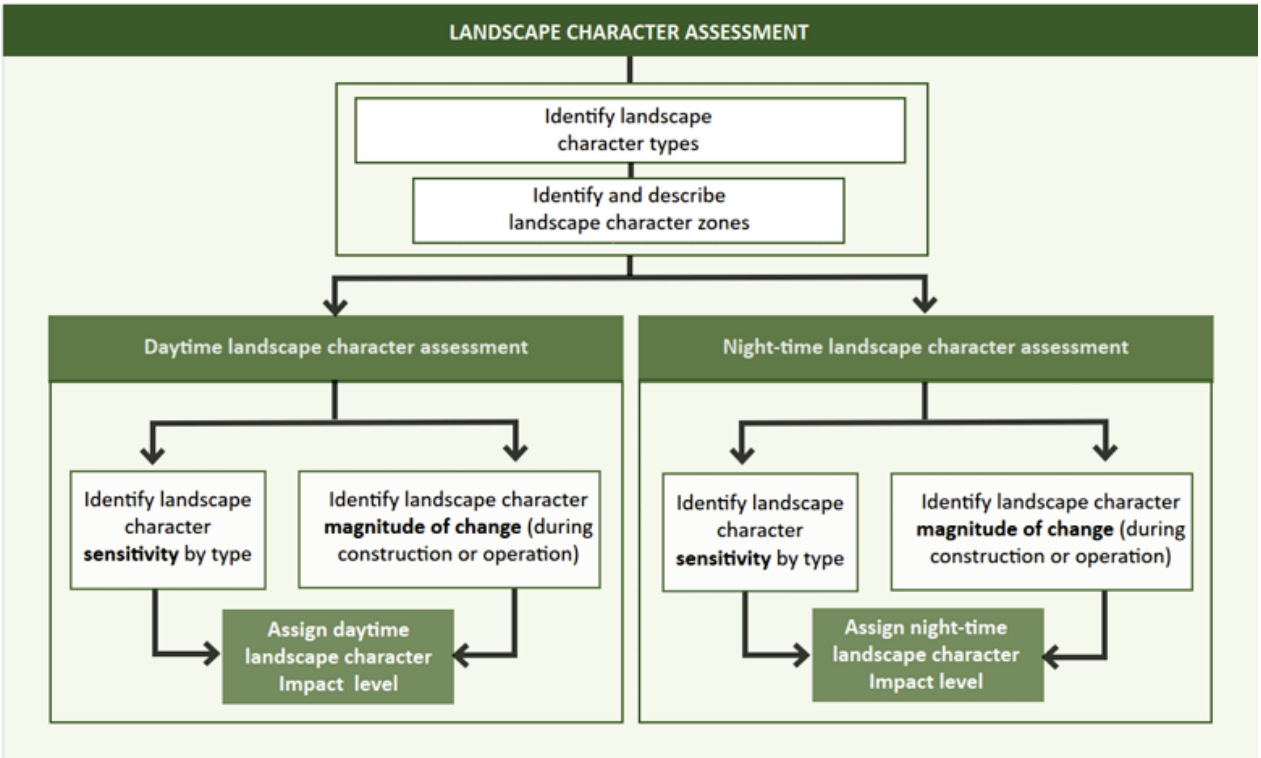


Figure 10-2 Structure of this landscape character impact assessment

10.2 Existing environment

10.2.1 Landscape values and visual sensitivity of the study area

The landscape values, sensitivities, historical and Aboriginal items within the landscape character study area (that is, within 5 kilometres of the HTP corridor) are discussed below.

Sensitive locations

There are several locations within the landscape character study area, or within its vicinity, that have increased landscape sensitivity. These items are summarised in Table 10.3.

Table 10.3 Sensitive locations within (or in the vicinity of) the landscape character study area

Type of sensitive location	Sensitive location	Within study area
Rural villages	• Broke • Jerrys Plains	Yes
Rural dwellings	• Hunter River valley (Lemington, Maison Dieu, Hambledon Hill, Long Point, Wylies Flat, Glenridding) • Wollombi Brook valley west of Broke • Congewai Creek rural valley west of Millfield	Yes
Viticulture and tourism area	• Broke – Fordwich vineyard precinct	Yes
	• Pokolbin/Hermitage Road	No

Type of sensitive location	Sensitive location	Within study area
State or National Parks	• Watagan National Park	Yes
	• Mount Yengo and Yengo National Park (of Aboriginal cultural significance) • Greater Blue Mountains Area World Heritage Property (which includes Wollemi and Yengo national parks west of the landscape character study area)	No
Tourist and scenic routes	• Wollombi Road, NSW Tourist Drive 33 from Calga to Branxton • Golden Highway west of Jerrys Plains (gateway to the equine and viticulture area to the west) • The Great North Walk (walking trail from Sydney to Newcastle) • Broke Road (while not designated a scenic road, Broke Road connects two important vineyard areas (Hermitage Road and Broke-Fordwich) and is used by tourists visiting both wine precincts)	Yes
Lookouts	• Flat Rock Lookout (within Watagan State Forest) • Yellow Rock Lookout (within Corrabare State Forest)	Yes
	• The Narrow Place Lookout (within Watagans National Park) • Bimbadeen Lookout • Mount Bright Lookout • 125r Lookout	No

Heritage items

Heritage items can be sensitive to changes in the landscape. The heritage items shown in Table 10.4 have been identified within the landscape character study area (see *Technical Report 8 – Historic heritage impact assessment).* Those heritage items which are habitable dwellings and are located within the 1.625 kilometre visual study area, have been included in the visual assessment.

Table 10.4 Heritage listed items within the landscape character study area

Item name	Item no.	Heritage Register/Listing	Significance
Murinbin House complex	SMA ID: 170131	Singleton Military	Commonwealth
Blacksmith's shop and forge – Vere township	170113	Singleton Military Area	Commonwealth
Unidentified site – Vere township	170118	Singleton Military Area	Commonwealth

Item name	Item no.	Heritage Register/Listing	Significance
Vere school and second range warden's residence	170119	Singleton Military Area	Commonwealth
Loder Family Sawmill	170125	Singleton Military Area	Commonwealth
Oakley Estate	170126/ 170127	Singleton Military Area	State Commonwealth
Warringah Stud/Old Myrtle	170129	Singleton Military Area	Commonwealth
Original Forest House Site	Osf 15	Section 170 (NSW National Parks and Wildlife Service (NPWS))	Not stated on inventory form
The Wishing Well	Osf 26	Section 170 (NPWS)	Not stated on inventory form
Sawmill site (Cnr Martinsville Hill and Watagan Forest Roads)	NA	Section 170 (NPWS)	None available
'Stafford', homestead and 'Clifford', homestead (ruins)	I142	Singleton LEP 2013	Local
Brick farm house	I40	Singleton LEP 2013	Local
Archerfield and outbuildings	I141	Singleton LEP 2013	Local
'Abbey Green' and outbuildings	I39	Singleton LEP 2013	Local
Hambledon Hill Homestead	I24	Singleton LEP 2013	Local
Clark's Slab House	I47	Cessnock LEP 2011	Local

Aboriginal heritage landscape sensitivity

Technical Report 2- Aboriginal heritage impact assessment includes Aboriginal heritage landscape sensitivity mapping, to which heritage sensitivity/significance ratings have been applied. Locations of high or moderate heritage sensitivity include:

- level to gently inclined landforms near reliable water (associated with Aboriginal camp sites)
- terraces and dunes up to around a kilometre from watercourses (as they can include deposits of high research value)
- prominent ridges and peaks have potentially very high Aboriginal cultural significance (as they are associated with pathways and travelling routes)
- outcrops of sandstone in cliffs, boulders and overhangs (as they have high potential to feature Aboriginal rock shelters, and include art panels and grinding grooves)
- watercourses with exposed sandstone (due to their potential use as grinding grooves or implement grinding or food processing).

Important view-lines identified and mapped in *Technical Report 2 – Aboriginal heritage impact assessment* are primarily between Mount Yengo to/from Mount Sugarloaf, Mount Vincent and Mount Warrawolong. The Flat Rock lookout has been identified as having cultural significance and has been identified and assessed as public viewpoint P08 (discussed further below). See *Technical Report 3 – Landscape character and visual impact assessment* for further discussion on other view-lines.

10.2.2 Public viewpoints

As outlined in *Section 10.1.3* a visibility analysis was undertaken to identify the areas from which the project is potentially visible. This visibility analysis used a 3D digital terrain and points at the height of each transmission tower (using the project concept design), to identify the areas from which views to the transmission line and towers may be seen. This analysis, combined with a site inspection, was then used to select 12 representative publicly accessible viewpoints (shown on Figure 10.3). The viewpoints include representative significant views which are mostly a State highway and other public roads, a village and lookout. Two of the public viewpoints (01 and 02) are outside of the visual impact study area, however, they are included in the assessment as: the New England Highway (01) is an important regional road and major tourism route; and Jerrys Plains (02) is of regional importance as a gateway to the scenic equine and viticulture area of Muswellbrook Shire to the northwest.

Each public viewpoint and its assessed visual sensitivity is described included in Table 10.5 and the location of each viewpoint is shown in Figure 10.3. Further detail on the assessment of each public viewpoint is contained in Appendix E of *Technical Report 3 - Landscape character and visual impact assessment*.

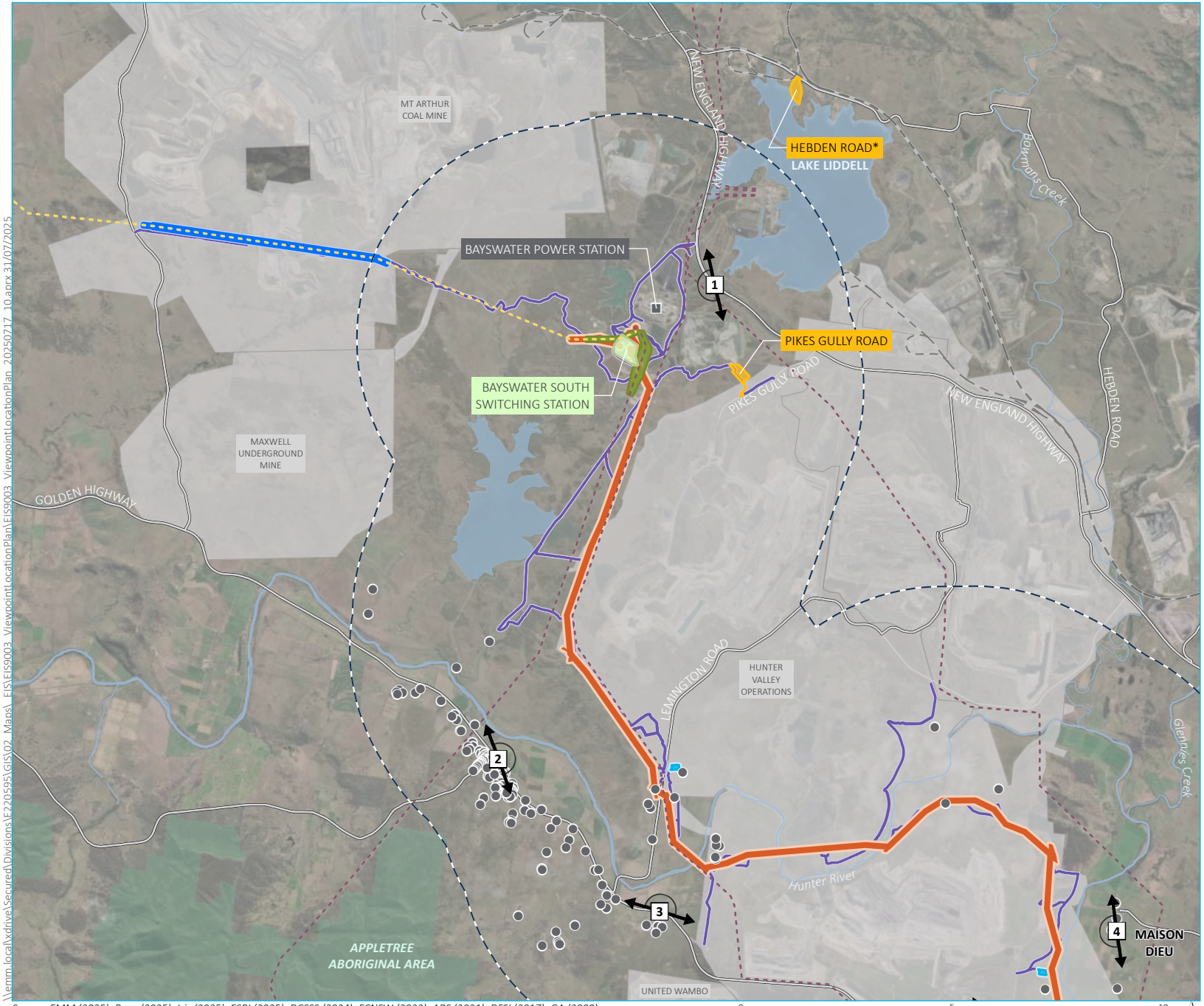
Table 10.5 Public viewpoints

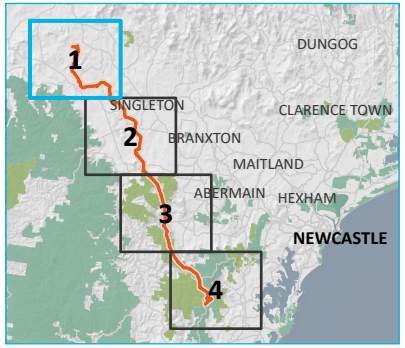
No.	Location	Viewpoint type	Sensitivity	Scenic quality	LCZ[1]
01	New England Highway	Public road	Very low: State highway	Very low: Dominating presence of infrastructure and highly modified landscape	LCZ 1 Energy and mining
02	Jerrys Plains	Town centre	Low: Town centre	Moderate: District gateway to vineyards, equine and scenic areas to the north	LCZ 2 Jerrys Plains rural village
03	Golden Highway	Public road	Low: State highway	Moderate: Recognised as a regionally significant scenic route (Gyde, 2024)	LCZ 3 Hunter River (Lemington) rural valley

No.	Location	Viewpoint type	Sensitivity	Scenic quality	LCZ[1]
04	Shearers Lane	Public road	Very low: Unsealed road	Low: Presence of mining infrastructure and highly modified landscape	LCZ 4 Hunter River (Maison Dieu) rural valley
05	Hunter Valley Gliding Club	Community recreational facility	Low: Gliding Club	Low: Presence of energy infrastructure and highly modified landscape	LCZ 1 Energy and mining
06	Putty Road	Public road	Very low: Classified main road	Low: Dominating presence of infrastructure and highly modified landscape	LCZ 4 Hunter River (Maison Dieu) rural valley
07	Cessnock Road	Public road	Low: Scenic drive (not classified as a tourist drive, however, used by tourists accessing vineyards) and entry to Broke village	High: Visually dominant steep ranges, rocky outcrops, broad pastoral valley	LCZ 7 Wollombi Brook rural valley
08	Wollombi Road (looking east)	Public road	Low: Part of NSW Tourist Drive 33 (Calga to Branxton). Used by tourists accessing vineyards and is near the entry to Millfield village	Moderate: Open pastoral land with distinctive rugged ranges	LCZ 11 Narrow rural valley
09	Wollombi Road (looking west)	Public road	Low: Part of NSW Tourist Drive 33 (Calga to Branxton). Used by tourists accessing Wollombi area	Moderate: Open pastoral land with forest background	LCZ 7 Wollombi Brook rural valley

No.	Location	Viewpoint type	Sensitivity	Scenic quality	LCZ[1]
10	Flat Rock Lookout	Lookout	Low: Publicly accessible lookout	High: Wide regional outlook (north to east) over pastoral land and rugged ranges. The project location is to the south and west	LCZ 8 Forested hills
11	Olney Campground and picnic area	Campground and picnic area	Low: Publicly accessible picnic and recreation area	Low: Small clearing within forest with minor infrastructure for tourist camping, adjacent dominant, cleared forestry area	LCZ 8 Forested hills
12	Watagan Forest Road	Public road	Very low: Unsealed forestry road, low traffic volume	Moderate: Tall, dense forest	LCZ 8 Forested hills

1: Landscape character zone (LCZ) - see *section 10.2.3 for discussion and identification of LCZs*





KEY

- Viewpoint location
- Sensitive receiver
- Viewpoint direction
- 1 Landscape character study area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining

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

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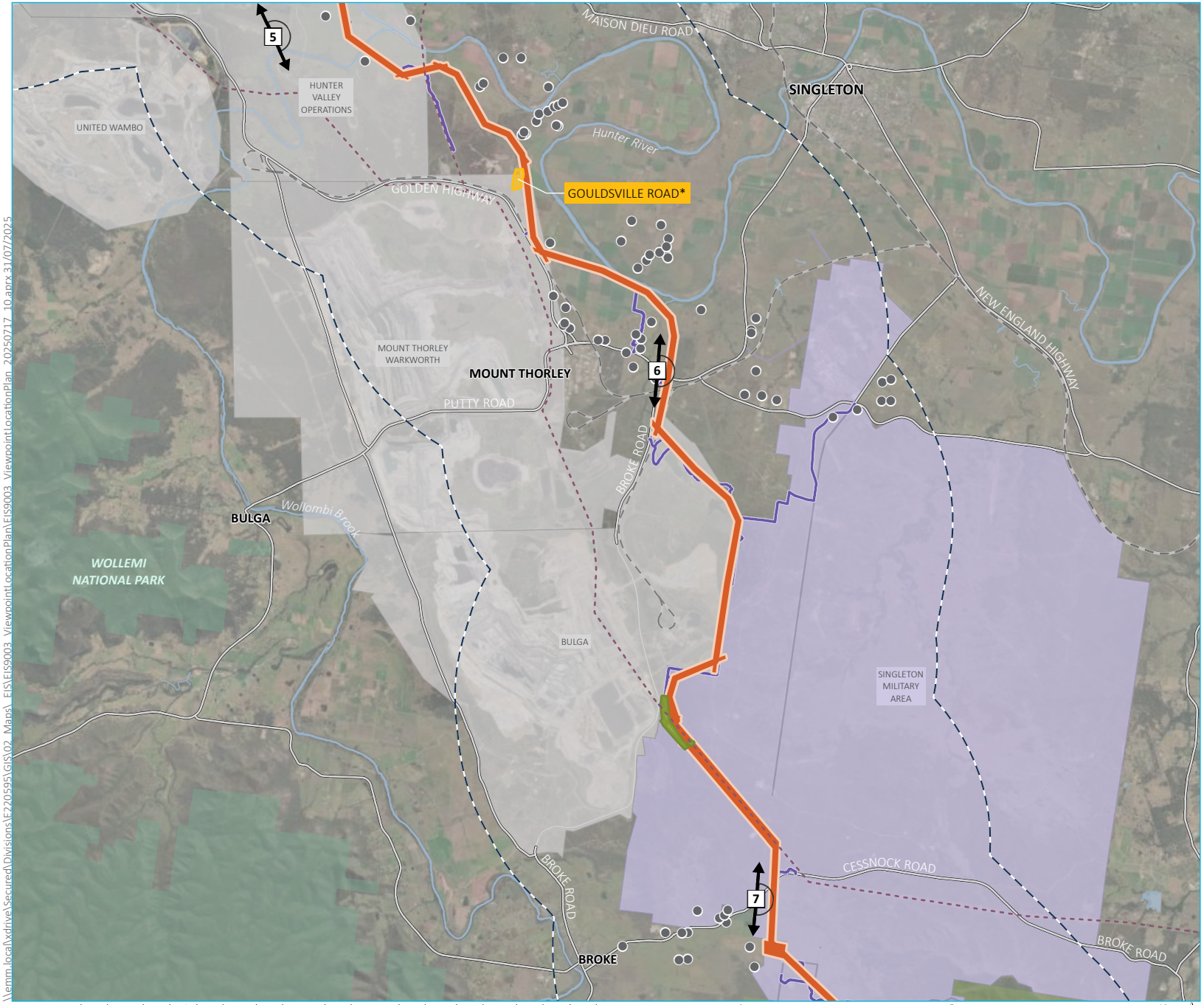
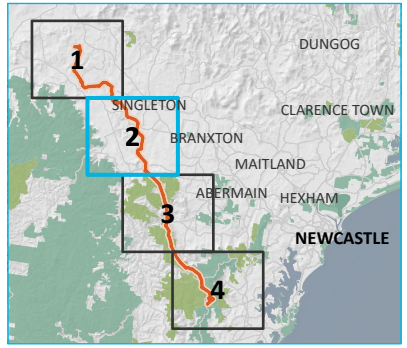
Viewpoint location plan
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.3

EMM
creating opportunities





KEY

- Viewpoint location
- Sensitive receiver
- Viewpoint direction
- Landscape character study area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

Viewpoint location plan
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.3

EMM
creating opportunities

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

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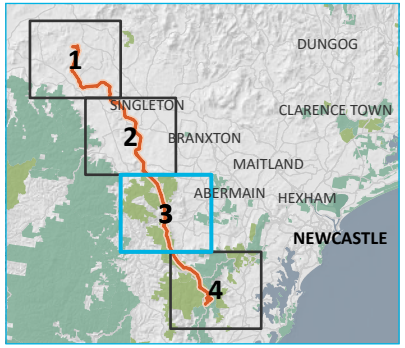

KEY

- Viewpoint location
- Sensitive receiver
- Viewpoint direction
- Landscape character study area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence

Viewpoint location plan
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.3

EMM
creating opportunities

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

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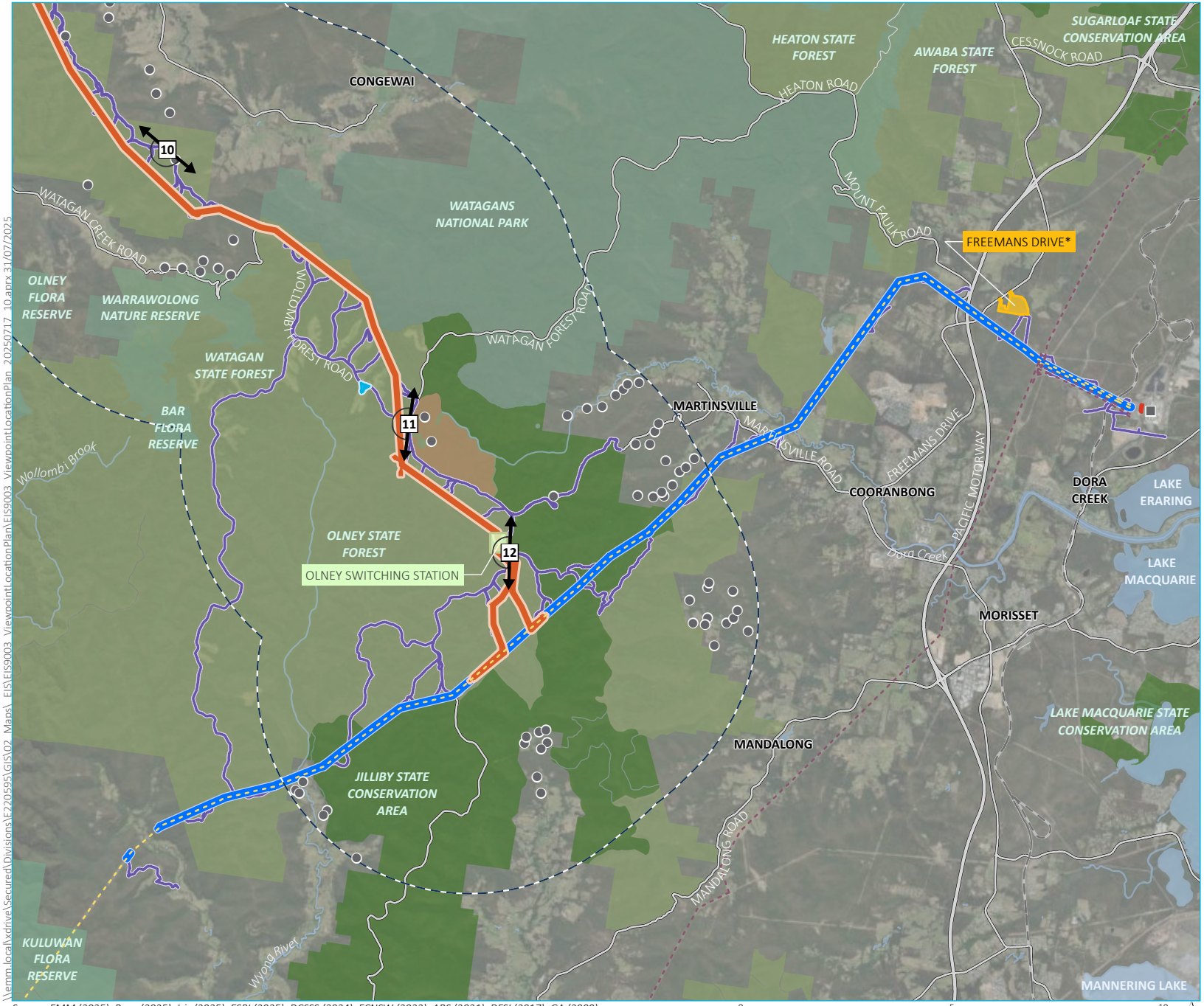

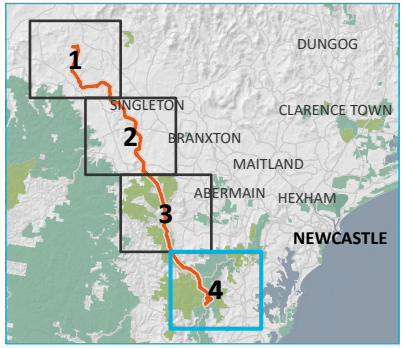

KEY

- Viewpoint location
- Sensitive receiver
- Viewpoint direction
- Landscape character study area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Recreation area

Viewpoint location plan
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.3

EMM
creating opportunities

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

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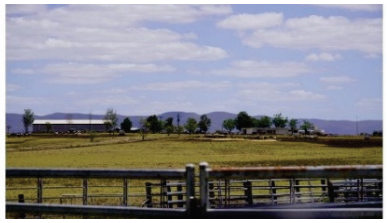
10.2.3 Landscape character types and daytime landscape sensitivity

Due to the nature and scale of the project there are several landscape character zones (LCZ) across the study area which have similar characteristics in terms of geology, topography, vegetation cover, watercourses, built form and land use pattern. For this landscape character assessment, the study area was divided into 12 LCZ which have their own local characteristics.

This section includes descriptions and examples of each LCZ in Table 10.6. The location of each zone is included in Figure 10.3.

Table 10.6 Description and sensitivity of landscape character zones

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 1 Energy and mining	The energy and mining LCZ is highly modified for mining operations and power stations; open-cut pit excavation is extensive. The vegetation is mostly cleared of tall vegetation with some juvenile rehabilitation areas. Water bodies are engineered and associated with mining and power operations. Buildings and services include an industrial area, transmission lines, tall power station stacks, and isolated residences owned by mining operations. Includes existing transmission lines and towers, substations and associated cleared vegetation corridors. Operations within this LCZ are continual (daytime and night-time) and include external night lighting of operations areas and access roads by vehicles.		Daytime Very low Night-time Very low
LCZ 2 Jerry Plains rural village	The Jerrys Plains rural village LCZ is on flat to gently undulating land above the floodplain around 500 m from the Hunter River. The vegetation is mostly cleared with pockets of taller trees on larger lots and road verges. The village is fringed with cleared paddocks. It includes a few services, such as a hotel, church, primary school, recreation/camping ground and service station. Housing is mostly timber/weatherboard single story, detached. There is an existing 330 kV transmission line adjacent to the village to the north.		Daytime Moderate Night-time Low

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 3 Hunter River (Lemington) rural valley	The LCZ comprises flat to undulating land formed by the Hunter River in the vicinity of Lemington. The valley is broad and expansive, with a ridgeline along the east. Landform becomes increasingly hilly with proximity to the ridgeline. The ridgeline encloses the LCZ and visually separates it from the coal mining and power station infrastructure to the north. The rural valley is open, cleared, cultivated land with vegetation along the river, scattered within road verges and paddocks. Vegetation density increases on steeper land and with proximity to the elevated ridges. The rural valley supports agricultural uses. Rural residences are interspersed within agricultural land holdings. The LCZ includes transmission lines and towers.		Day time Moderate Night-time Moderate
LCZ 4 Hunter River (Maison Dieu) rural valley	The LCZ comprises flat to undulating land formed by the Hunter River in the vicinity of Maison Dieu. The valley is broad and expansive. Landform is more elevated and becomes increasingly hilly toward the east. The rural valley has open, cleared, cultivated land with some dense remnant vegetation along the river and in paddocks. The rural valley supports agricultural uses, including cropping and grazing. Rural dwellings are interspersed within agricultural land holdings which include large sheds and farm equipment. The LCZ includes transmission lines and towers and associated cleared vegetation corridors.		Day time Low Night-time Moderate

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 5 Bushland and open forest	The LCZ comprises hilly land above the floodplain and on lower slopes of steeply elevated ridges. It is mostly vegetated with native trees and shrubs and has open, dry forest with trees to around 18 m. It includes small open pockets, larger cleared areas with denser vegetation occurs along creek lines with a few creeks and smaller water bodies. The LCZ supports military uses (training facility, Australian Army School of Infantry, Infantry Museum, practice range, storage areas) and agricultural uses (primarily grazing). There are some scattered residences associated with agricultural land use. The LCZ includes existing transmission lines and towers (132 kV).		Day time Low Night-time Moderate
LCZ 6 Broke rural village	The LCZ is on the banks of the Wollombi Brook, on flat to gently undulating land. Vegetation within the village includes pockets of taller trees in parks, on larger lots and road verges. Along Wollombi Creek, vegetation is dense however cleared paddocks fringe the village. The village supports local tourism and includes tourist accommodation, cafes, a village store, as well as local services, such as a church and primary school. Housing is mostly single story, detached. There are no existing transmission lines within or adjacent to the village.		Day time High Night-time Low

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 7 Wollombi Brook rural valley	The LCZ is comprised of flat to undulating land within a broad valley formed by Wollombi Brook and its tributaries. The valley is enclosed by distinctive steeply elevated ridges and rocky outcrops (Yengo National Park, Wollemi State Conservation Area and Pokolbin Forest). Landform becomes increasingly hilly further from the creeks and closer to the ridges. The valley floor is open and expansive. Trees are scattered in paddocks. Vegetation density increases on steeper land and closer to the elevated ridges. Intermittent remnant vegetation occurs along the edges of Monkey Place Creek and denser vegetation lines Wollombi Creek. The rural valley supports cropping, grazing, and a small area of viticulture. Rural residences are interspersed within the agricultural land holdings. Supporting built infrastructure includes large sheds and farm equipment. There are no transmission towers within the LCZ.	 	Day time Moderate Night-time Moderate

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 8 Forested hills	The LCZ comprises steeply elevated, rugged ridges and elevated plateau with rocky outcrops. It is densely vegetated with tall, closed forest or plantation forestry (20 to 30 metres tall) and has open clear-felled (forestry) areas. Waterbodies are not visually prominent in this LCZ. Watagans National Park (to the east), Jilliby State Conservation Area, and other National Parks and Wildlife managed land are within this LCZ and along the route of the HTP corridor. Timber within forestry land is actively harvested. Recreational use is supported via designated camping areas, sheltered picnic areas and hiking trails including part of the Great North Walk. The southern end of the LCZ includes an existing transmission line and towers and associated cleared vegetation corridor through the Jilliby State Conservation Area.	 	Day time Moderate Night-time High
LCZ 9 Millfield suburban area	The LCZ is on gently undulating land within a broad rural valley. Vegetation is mostly cleared with pockets of taller trees on larger lots, road verges, and creek lines. Congewai Creek borders the LCZ to the south-west with several larger water bodies nearby. Housing is mostly detached single story, with a mix of smaller lot, older, timber/weatherboard houses, and larger lot, newer brick and tile houses. There are no existing transmission towers within the LCZ.		Day time Low Night-time Low

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 10 Congewai Creek rural valley	The LCZ comprises a broad rural valley formed by Congewai Creek and its tributaries. The valley is broad and expansive, and enclosed by steep ridges. Landform becomes increasingly hilly with distance from the creeks and proximity to the surrounding ridges. The rural valley is typified by open, cleared, cultivated land with (often dense) remnant vegetation along creeklines, road verges and scattered in paddocks. Vegetation density increases on steeper land and with proximity to the elevated ridges. The rural valley supports agricultural uses, including cropping, grazing and viticulture. Rural residences are interspersed within agricultural land holdings. Supporting built infrastructure includes large sheds and farm equipment. There are no existing transmission lines within the LCZ.	 	Day time Moderate Night-time Moderate

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 11 Narrow Rural Valleys	The LCZ comprises several narrow, cleared rural valleys along Watagan Creek and the upper reaches of Congewai Creek and its tributary, Cedar Creek, and upper valleys near Lemon Tree and Cooranbong. The valley floors are narrow and enclosed by steeply elevated ridges, creating an enclosed landscape. The rural valleys are typified by cleared, cultivated land with dense vegetation along the creek lines and scattered in paddocks. Vegetation density increases on steeper land and with proximity to the elevated ridges. The rural valleys support agricultural uses. Rural residences are interspersed within the agricultural land holdings. Supporting built infrastructure includes large sheds and farm equipment. There are no existing transmission lines within the LCZ.		Day time Moderate Night-time Moderate

LCZ	Description	Landscape character images	Landscape sensitivity
LCZ 12 Managed Forestry	The LCZ comprises steeply elevated, rugged ridges and elevated plateau with rocky outcrops. It is densely vegetated with tall, closed forest designated for forestry purposes and includes NSW State forest (Olney State Forest, Pokolbin State Forest, Corrabare State Forest and Watagan State Forest) along the route of the project. Timber within forestry land is actively harvested. Recreational use is supported via designated camping areas and sheltered picnics areas. Two lookouts are identified, however, have no supporting tourist infrastructure. The Great North Walk travels within the Olney State Forest from Watagan Creek Road via Flat Rock Lookout to the Congewai Valley. The southern end of the LCZ includes an existing 500 kV transmission line and towers.	 	Day time Low Night-time High

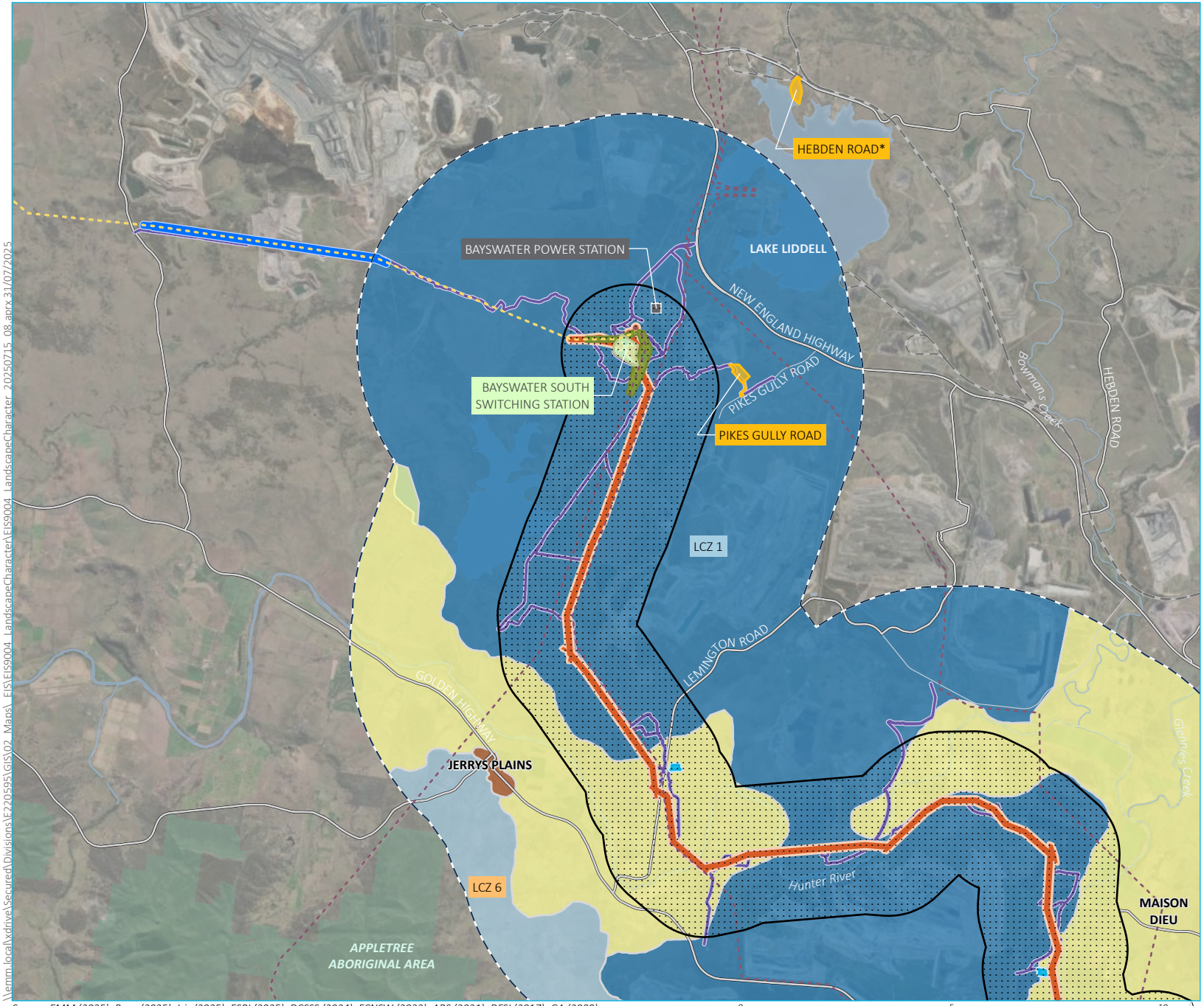
There are 2 locations beyond the landscape character study area where temporary construction support sites would be located. These 2 areas are summarised in Table 10.7 .

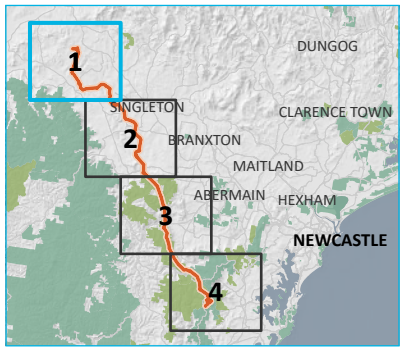
Table 10.7 Landscape character beyond the study area

Landscape character location	Description	Landscape sensitivity	
		Day	Night
Hebden Road	Hebden Road is at the northern end of Lake Liddell. The area is zoned for recreation and along the road is an open space and recreation area, and a speedbowl. Adjacent are railway lines and mining infrastructure. The area is partially cleared of vegetation. See Figure 10.4.	Very low	Low
Freemans Drive	Freemans Drive is largely vegetated with tall trees either side. It has an open, forest character, with large cleared agricultural areas. The area is partly zoned rural landscape and partly conservation. Rural residences are along the road and scattered throughout the vicinity. See Figure 10.5.	Low	Moderate

Figure 10-4 View from Hebden Road to the temporary construction support site

Figure 10-5 View from Freemans Drive towards the temporary construction support site





KEY

Visual study area

10 km locality buffer

LEGEND

- Bushland and open forest
- Energy and mining
- Rural valleys
- Rural villages

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
- Minor road
- Named watercourse
- NPWS reserve

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

0 5 10 km

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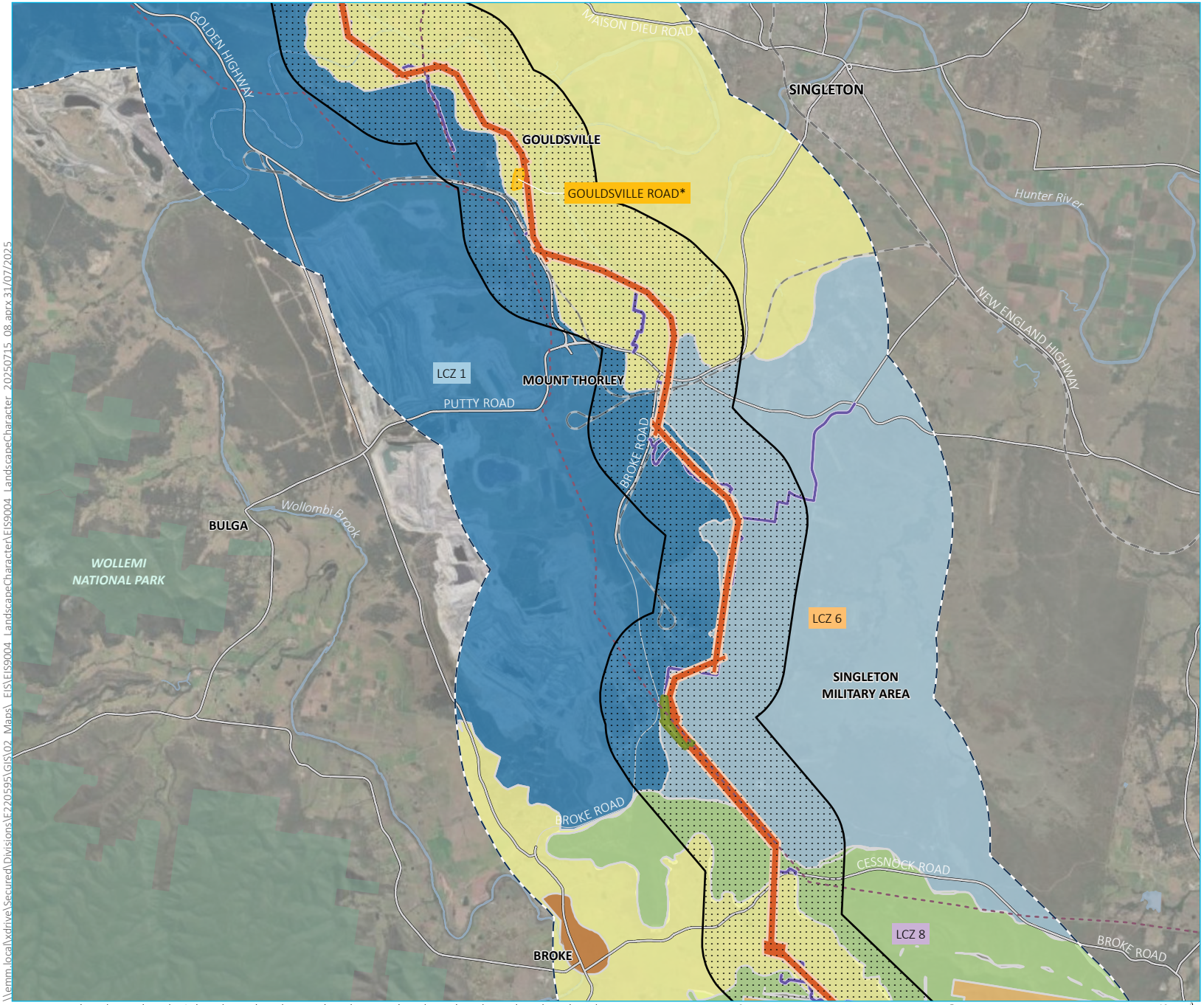
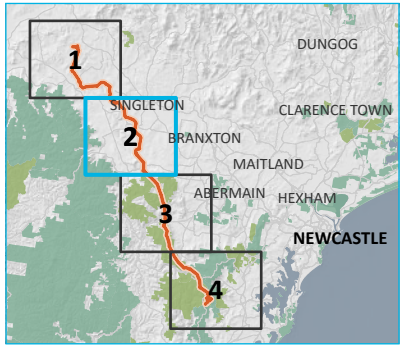
Landscape character zones
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.6

EMM
creating opportunities





KEY

- Visual study area
- 10 km locality buffer

LEGEND

- Bushland and open forest
- Energy and mining
- Forested hills
- Managed Forestry
- Rural valleys
- Rural villages

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
- Minor road
- Named watercourse
- NPWS reserve
- State forest

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

0 5 10 km

GDA2020 MGA Zone 56

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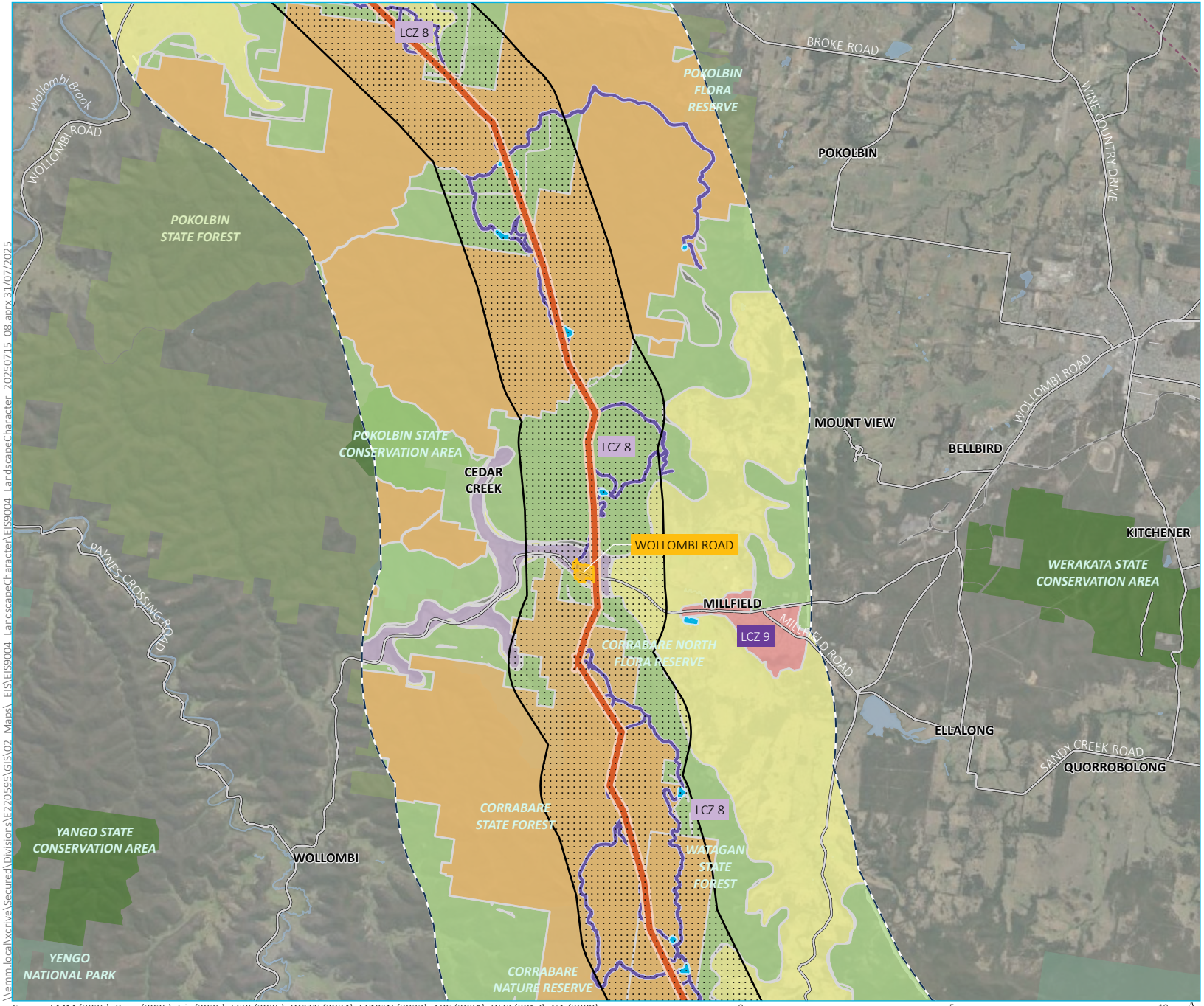
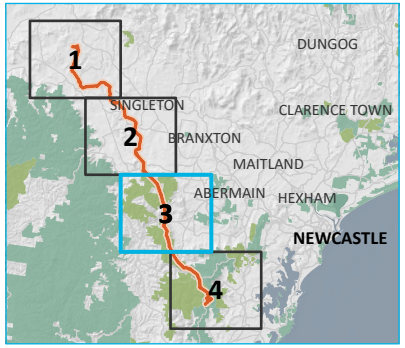
Landscape character zones
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.6

EMM
creating opportunities





KEY

Visual study area

10 km locality buffer

LEGEND

- Forested hills
- Managed Forestry
- Millfield suburban area
- Narrow Rural Valley
- Rural valleys

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
- Minor road
- Named watercourse
- NPWS reserve
- State conservation area
- State forest

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

0 5 10 km

GDA2020 MGA Zone 56

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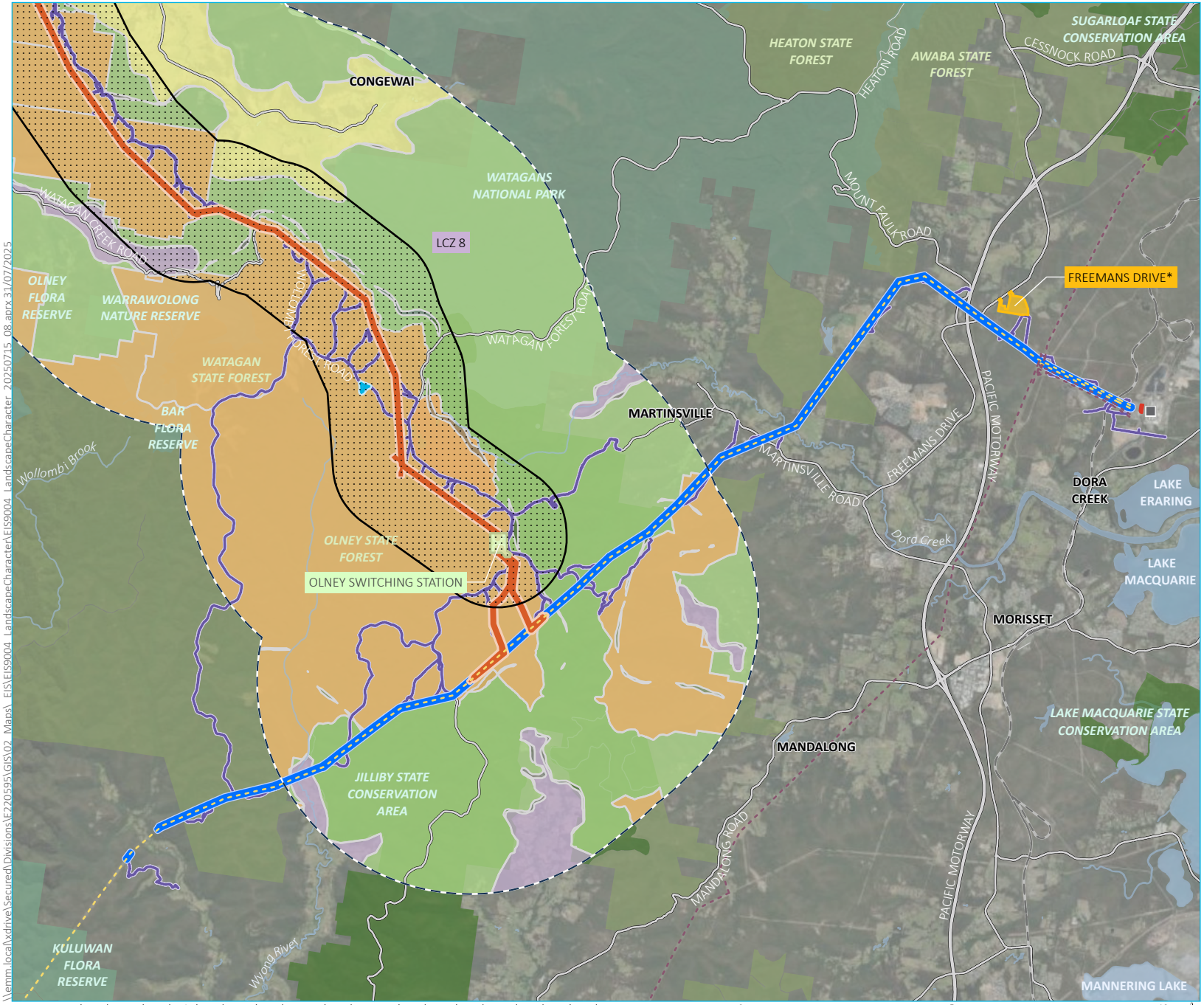
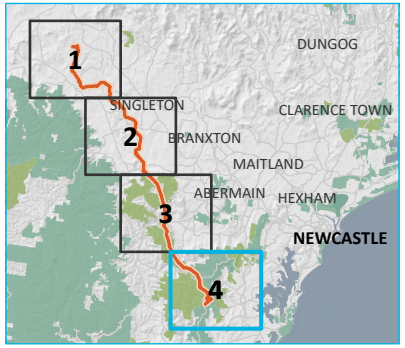
Landscape character zones
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.6

EMM
creating opportunities





KEY

Visual study area

10 km locality buffer

LEGEND

- Forested hills
- Managed Forestry
- Narrow Rural Valley
- Rural valleys

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
- Minor road
- Named watercourse
- Recreation area
- NPWS reserve
- State conservation area
- State forest

Landscape character zones
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 10.6

EMM
creating opportunities

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

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10.3 Potential impacts – construction

Construction of the project would result in temporary changes to the visual amenity and landscape character of the study area, which would impact residents, tourists, and road users.

Construction of the project would potentially result in visual impacts and changes to the landscape character as a result of ground disturbance, vegetation clearance, the use of large-scale equipment and supporting infrastructure, the establishment and use of construction support sites including workforce accommodation facilities and night-time lighting.

10.3.1 Visual impacts

Potential daytime visual impacts

Public viewpoints

There would be temporary visual impacts from public viewpoints on roads to the HTP construction area, construction support sites, or the flight path of helicopters. Public viewpoints that would experience the highest change to the view during construction would be:

- 08 and 09 Wollombi Road – the Wollombi construction support site would be located next to Wollombi Road, west of Millfield and would be clearly visible and close to public road users. Activities within the support site would occur 24 hours a day and would significantly contrast the existing view, Helicopter activities may temporarily draw attention as aerial movement would be a new element in the landscape
- 10 Watagan Forest Road – significant change would occur during construction of Olney switching station as a result of tree removal, construction vehicles and construction activities
- 05 Cessnock Road– construction of the transmission towers and line stringing would be clearly visible within the open valley, and contrast the agricultural setting, and scenic background.

The construction support sites would be in place for 2.5 years however the impacts would be experienced by road users for a short period, while in transit, travelling past the construction support sites. Following construction, the construction support sites would be repaired and reinstated to their former use.

Private viewpoints

The level of impact to private views during construction would vary according to the visibility of proposed construction support sites and construction activities such as vegetation clearing, earthworks and movement of large plant, equipment and vehicles. Construction activities would be transitory along the project impact area and would not remain at individual transmission tower locations for longer than a few weeks. Construction would also occur at multiple locations throughout the construction impact area at any one time.

Generally, views of construction activities would be more prominent and would contrast more noticeably within existing rural and forested settings. Views from rural dwellings around Maison Dieu, Gouldsville, and Hambledon Hill may include the installation of transmission towers, however,

ground disturbing activities would be unlikely to be visible at the distances of these dwellings. These impacts would, however, be intermittent along the HTP corridor, and temporary in all locations.

The construction support sites (including those with temporary worker accommodation at Hebden Road, Gouldsville Road and Freemans Drive) would result in greater contrast and change in the view than smaller laydown areas. Most construction support sites including the 3 worker accommodation sites on Hebden Road, Gouldsville Road and Freemans Drive would be located away from dwellings and are not anticipated to result in visual impacts from private viewpoints. The daytime visual impacts of the construction support sites are summarised in Table 10.8 .

Table 10.8 Construction support site daytime visual impacts

Construction support site	Visual impact
Pikes Gully construction support site	• Located in the vicinity of the energy and mining landscape • No private views of the construction support sites
Hebden Road construction support site (worker accommodation)	• Views include Lake Liddel and are dominated by power station stacks and buildings • No dwellings within one km of this site
Gouldsville Road construction support site (worker accommodation)	• Located next to the Golden Highway and near a railway line • Closest dwelling (ID 2928) is over 800 m away and will have views across the landscape to this facility during construction • Views are dominated by open cut mining operations • Travelers along Gouldsville Road would have brief views to the worker accommodation and activities at the construction support site during the construction period
Freemans Drive construction support site (worker accommodation)	• Closest dwelling is about 400 m from the temporary worker accommodation facility and about 75 m from an access point to the construction support site • Visibility into the support site would be limited due to the surrounding trees however an increase in vehicle movements along Freemans Drive and helicopter movements may be noticed from nearby rural dwellings
Wollombi Road A construction support site	• Located in the Congewai Creek rural valley • Closest dwelling is around 500 m away however views from these dwellings would be screened by dense vegetation surrounding the dwellings • Dwellings with a more direct view (although still screened by vegetation) are more than one km away • Installation of transmission towers and associated vegetation clearance on the elevated ridge on either side of the valley would likely be visible from some rural dwellings in the Congewai Creek rural valley • Travelers along Wollombi Road (public viewpoints 06 and 07) may have temporary and brief views of the workers accommodation and construction support site

Construction support site	Visual impact
Wollombi Road B construction support site	• Located in the Wollombi Brook rural valley • Closest dwelling is around 500 m away however views from these dwellings would be screened by dense vegetation surrounding the dwellings • Would be visible to dwellings on the foothills of surrounding ridges, and from dwellings within the open, pastoral valley • Installation of the transmission towers across the rural valley floor would also be visible from these dwellings

Rural dwellings around Maison Dieu, Gouldsville, Hambledon Hill, Mount Thorley, east of Broke and west of Millfield would have views to ground construction activities, the installation of transmission towers, laydown sites and line stringing activities. This work would include the potential for views to construction vehicles and helicopters.

Potential night-time visual impacts

Most construction works are expected to occur during standard construction hours, when construction lighting would not be required. However, in some instances, lighting would be required to facilitate construction activities in the winter months when days are shorter, or when out-of-hours works are required.

Construction activities associated with the transmission line infrastructure which may also be required during the night-time, would require the use of lighting at active construction areas only. This would be temporary and related to specific task lighting as well as lighting from vehicle movements along access tracks which may be visible from nearby dwellings.

At night there may be temporary visual impacts from public roads and dwellings with a view to construction support sites with temporary worker accommodations which would be in use 24 hours per day. While the temporary worker accommodation facilities would include lighting, only the lighting at Freemans Drive and Gouldsville Drive worker accommodations would be distantly visible however they would not significantly change the existing night-time view.

10.3.2 Landscape character impacts

Daytime impacts

In most instances, daytime impacts to landscape character would be negligible to low as construction works would result in a negligible to low magnitude of change. The exception to this is LCZ 7 (Wollombi Brook rural valley), LCZ 8 (Forested Hills) and LCZ 11 (Narrow Rural Valley) where the construction of the project would result in a temporarily moderate and high magnitude of change, respectively (see Table 10.9).

The moderate and high magnitudes of change are a result of the contrast between the construction activity and the existing, more remote rural landscapes which currently do not contain large scale electricity infrastructure. It is also influenced by the intensity and extent of the construction activities (such as areas where multiple new transmission lines would be constructed).

Within LCZ 7, there would be a large stringing site, around 15 hectares in size which would temporarily occupy the open, rural land in this LCZ which would result in a moderate magnitude of change. Combined with the existing daytime moderate landscape sensitivity, construction of the project would have a moderate daytime construction visual impact to landscape character within LCZ 7.

Within LCZ 8, relatively short sections of the LCZ within private landholdings would be occupied by the HTP corridor. While the corridor would occur in existing cleared areas where possible, tree removal is likely and construction activities to remove trees within the corridor and install the transmission towers would contrast existing characteristics. This would result in a moderate magnitude of change. Combined with the existing daytime moderate landscape sensitivity, construction of the project would have a moderate visual impact to landscape character within LCZ 8.

A large construction support site within LCZ 11 around 15 hectares in size would result in a high magnitude of change to the LCZ. Combined with the daytime moderate landscape sensitivity, construction of the project would have a moderate daytime construction visual impact to landscape character within LCZ 7.

Nighttime impacts

Construction of the project during the nighttime is expected to result in negligible to low impacts to nighttime landscape character. Negligible to low impacts are expected as nighttime construction works would result in a negligible to low magnitude of change to the landscape character. The exception to this is the proposed construction support site at Freemans Drive. At Freemans Drive, nighttime construction would have a moderate magnitude of change; however, the Freemans Drive area has an existing moderate landscape sensitivity, resulting in a moderate night-time impact to landscape character during construction (see Table 10.9).

In most instances, night-time impacts to landscape character would be negligible to low as the construction works would result in a negligible to low magnitude of change. While the magnitude of change at LCZ 12 (Managed Forestry) is low, the landscape character sensitivity is high which would result in a moderate landscape character impact. Impacts to landscape character during the nighttime would occur where nighttime lighting is introduced, and there is greater vegetation removal and prominence of temporary construction activities. This would include at the Olney switching station (in LCZ 12) and the temporary worker accommodation (at Freemans Drive) which would operate 24/7 and include external lighting of access roads, car parks and pathways. Table 10.9 provides a summary of the landscape character zone impacts during construction.

Table 10.9 Visual impact to landscape character zones - construction

Landscape character zone	Daytime			Nighttime		
	Sensitivity	Magnitude	Impact	Sensitivity	Magnitude	Impact
LCZ 1 Energy and mining	Very low	Very low	Very low	Very low	Negligible	Negligible
LCZ 2 Jerrys Plains rural village	Moderate	Negligible	Negligible	Low	Negligible	Negligible

Landscape character zone	Daytime			Nighttime		
	Sensitivity	Magnitude	Impact	Sensitivity	Magnitude	Impact
LCZ 3 Hunter River (Lemington) rural valley	Moderate	Low	Low	Moderate	Negligible	Negligible
LCZ 4 Hunter River (Maison Dieu) rural valley	Low	Low	Low	Moderate	Low	Low
LCZ 5 Bushland and open forest	Low	Very low	Very low	Moderate	Negligible	Negligible
LCZ 6 Broke rural village	High	Negligible	Negligible	Low	Negligible	Negligible
LCZ 7 Wollombi Brook rural valley	Moderate	Moderate	Moderate	Moderate	Negligible	Negligible
LCZ 8 Forested hills	Moderate	Moderate	Moderate	High	Low	Moderate
LCZ 9 Millfield suburban area	Low	Low	Low	Low	Negligible	Negligible
LCZ 10 Congewai Creek rural valley	Moderate	Low	Low	Moderate	Negligible	Negligible
LCZ 11 Narrow rural valleys	Moderate	High	Moderate	Moderate	Negligible	Negligible
LCZ 12 Managed forestry	Low	Low	Low	High	Low	Moderate
Locations beyond the study area						
Hebden Road	Very low	Low	Very low	Low	Low	Low
Freemans Drive	Low	Low	Low	Moderate	Moderate	Moderate

10.4 Potential impacts – operation

The project would result in the introduction of new permanent transmission infrastructure within the landscape, including transmission line towers up to a maximum of 85 metres in height (this is a worst case tower height with most towers ranging from 68 to 75 metres) and 2 new switching stations. Opportunities to minimise the potential landscape and visual impacts of the project have been considered in the design and alignment of the permanent infrastructure (see *Chapter 3 (Alternatives and options)),* in consultation with landowners (see *Chapter 6 (Engagement)*). This included:

- where possible, locating parts of the transmission line and switching stations in previously disturbed areas (such as the mining areas)
- consideration of the topography and any existing screening vegetation or other features

- refining the transmission line corridor through private properties in Cedar Creek, Millfield and Laguna to minimise the impacts on landowners
- maximising the distance between the transmission lines and towers and existing dwellings and towns
- minimising vegetation clearance requirements where practicable, including development of partial vegetation clearance areas rather than full easement clearance
- minimising impacts on conservation areas, cultural heritage places (such as Flat Rock lookout) and major recreation areas.

10.4.1 Visual impacts – public viewpoints

Simple assessment

A simple visual assessment has been undertaken for the 12 public viewpoints selected to represent views to the project. The simple assessment identified a potential high visual impact from one public viewpoint (07 Cessnock Road), potential moderate visual impact from 5 public viewpoints, 3 low visual impacts and 3 very low visual impacts (see Table 10.10). Those viewpoints with a low or very low visual impact were eliminated from further assessment.

Table 10.10 Summary of visual impacts – public views

No.	Location	Sensitivity	Maximum vertical field of view (degrees)	Potential magnitude	Potential impact rating
01	New England Highway	Very low	2	Very low	Very low
02	Jerrys Plains	Low	2	Very low	Very low
03	Golden Highway	Low	4	Low	Low
04	Shearers Lane	Very low	4	Low	Low
05	Hunter Valley Gliding Club	Low	4	Low	Low
06	Putty Road	Very low	17	Very high	Moderate
07	Cessnock Road	Moderate	12	Very high	High
08	Wollombi Road (looking east)	Low	9	Very high	Moderate
09	Wollombi Road (looking west)	Low	3	Very low	Very low
10	Flat Rock Lookout	Moderate	6	High	Moderate
11	Olney Headquarters campground and picnic area	Low	14	Very high	Moderate
12	Watagan Forest Road	Very low	20	Very high	Moderate

Intermediate visual assessment

As there has been requests from the community to see photomontages of the project, and access to the public viewpoint was available for photography, the viewpoints proceeded to detailed visual assessment for more accurate calculation of magnitude, without undertaking the interim intermediate assessment step.

Detailed visual assessment

A detailed assessment has been undertaken on the 6 public viewpoints with the potential for a moderate and high visual impact:

- 06: Putty Road
- 07: Cessnock Road
- 08: Wollombi Road (looking west)
- 10: Flat Rock Lookout
- 11: Olney Headquarters campground and picnic area
- 12: Watagan Forest Road.

A photomontage (or reference bare earth render where there is considerable intervening vegetation) was prepared to illustrate the location and scale of the project in the view, from which the actual magnitude of change can be measured (see Figure 10.7 to Figure 10.9). An explanation of the magnitude rating is provided in Table 10.2. The detailed assessment for 07: Cessnock Road is summarised in Table 10.11.

The detailed assessment found that the impact to 07: Cessnock Road would decrease from high (in the simple assessment) to a moderate visual impact, and all the other public viewpoints would reduce from a moderate potential impact (in the simple assessment) to a low visual impact.

Cessnock Road connects 2 important vineyard areas (Hermitage Road and Broke-Fordwich) and is used by tourists visiting both wine precincts. Open views of the landscape are intermittent, depending on direction of travel, the extent of tall vegetation within the road reserve, and orientation of the road.

At the location of 07: Cessnock Road, there is a broad, open view to the south of the Wollombi Brook rural valley, with the prominent and distinct ridges of the Broke Back Range in the background. The view toward the ranges is relatively unobstructed across agricultural pastures, although there are some native trees in the middle ground which screen the foothills of the range, and road signage in the foreground which somewhat detract from the view.

Further information on the detailed assessment is contained in Appendix G of *Technical Report 3 - Landscape character and visual impact assessment*.

Table 10.11 Summary of detailed assessment - public viewpoints

No.	Location	Viewpoint sensitivity	Scenic quality	Visual sensitivity	Number of cells	Magnitude rating	Impact
06: Putty Road	295	Very low	Very low	Very low	35	High	Low
07: Cessnock Road	410	Low	High	Moderate	31	High	Moderate
08: Wollombi Road (looking east)	540	Low	Moderate	Low	12	Low	Low
10: Flat Rock Lookout	820	Low	High	Moderate	0	None	None
11: Olney Headquarters campground and picnic area	365	Low	Low	Low	18	Moderate	Low
12: Watagan Forest Road	235	Very low	Moderate	Very low	0	None	None

Figure 10-7 07 Cessnock Road existing - 180 degree panorama

Figure 10-8 07 Cessnock Road photomontage - including indicative structure locations

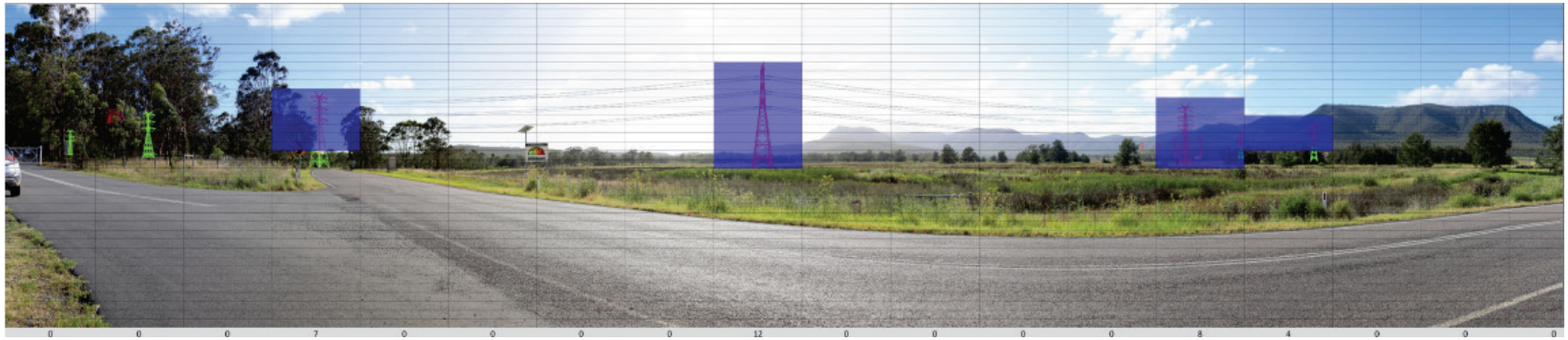


Figure 10-9 07 Cessnock Road photomontage with project in silhouette (red in view, green out of view), magnitude tool overlay and occupied cell count

Performance objectives

In accordance with the Technical Supplement, viewpoints from public roads with moderate visual impacts, proponents must aim to reduce these impacts where reasonable and feasible. Mitigation methods such as vegetation or screening may be used, but only if they:

- do not obstruct important views and sight lines
- could be confined to a relatively small area (e.g. vegetation screening would not be required for several hundred meters along transport corridors)
- are endorsed by the relevant road authority.

For receivers with a low or very low visual impact, no mitigation is required.

A moderate visual impact has been identified from viewpoint 07: Cessnock Road, near the proposed crossing point of the HTP. The use of screening vegetation in this location is not recommended, as it would obstruct this important view. Given the short distance over which the moderate impact would be experienced and the potential loss of important views, screening is not proposed. However, in this area, the transmission line tower height would be minimised as far as practical to reduce the magnitude of change and reduce the visual impact.

Night-time visual impacts

There is no operational lighting proposed along the transmission line.

Lighting would be installed at the Bayswater and Olney switching station, however, there is unlikely to be regular operational or maintenance activity at night at either switching station, or along the transmission line unless for emergencies.

Occasional lighting at Olney switching station would increase localised lighting for road users travelling along Watagan Forest Road (within LCZ 12 – Managed forestry). The switching station is surrounded by trees, and lighting would appear briefly, while in transit past the switching station.

10.4.2 Visual impacts – private viewpoints

Rural setback

The rural setback for an 85 metres high transmission tower is 400 metres, in accordance with the assessment requirements outlined with the Technical Supplement. Any dwelling within these rural setback areas is identified as having a high potential visual impact in the simple visual assessment and must be assessed against high impact performance criteria.

Five dwellings have been identified within the setback (ID 2928, 2929, 2930, 2931 and 2932). All of these dwellings are located on the one landholding and are clustered together. The closest dwelling to the HTP corridor (ID 2931) is 310 metres away from to a proposed transmission tower and is therefore within the setback. However, in accordance with the Technical Supplement, as the transmission tower would be partially screened by vegetation, the sensitive receiver is exempt from the setback and a proportionate visual assessment process is followed, starting with the simple assessment. See *Technical Report 3 - Landscape and visual impact assessment* for further detail. The nearest transmission tower would also be screened from the remaining dwellings on the property.

Simple assessment

A simple visual assessment was undertaken for 68 dwellings identified within the visual impact study area. This assessment has identified:

- 12 viewpoints with a potential high visual impact
- 22 viewpoints with a potential moderate visual impact
- 34 viewpoints with low visual impacts.

Those viewpoints with a low visual impact have been eliminated from further assessment.

See *Technical Report 3 - Landscape and visual impact assessment* for further detail on the simple assessment.

Intermediate assessment – private viewpoints

An intermediate assessment was undertaken on those dwellings identified as having the potential for a moderate or higher visual impact. A photomontage was prepared to illustrate the views from these dwellings which includes a modelled view of the project, from which the actual magnitude of change can be measured. The modelled view does not include existing trees or other existing structures that could limit the view of the project.

The intermediate assessment has identified the potential for:

- 8 private viewpoints with a potential high visual impact
- 13 private viewpoints a moderate visual impact from
- a low or no visual impact from remaining viewpoints.

Table 10.12 Summary of intermediate assessment

				Simple assessment		Intermediate assessment	
ID	Address	Sensitivity	Number of cells	Potential magnitude	Potential impact rating	Potential magnitude	Potential impact rating
65	956b Maison Dieu Road, Maison Dieu	Moderate	12	Low	Low	Low	Low
72	20 Shearers Lane, Maison Dieu	Moderate	12	Low	Low	Low	Low
92	50 Shearers Lane Maison Dieu	Moderate	17	Low	Low	Moderate	Moderate
95	20 Shearers Lane, Maison Dieu	Moderate	Refer ID71	Low	Low	Low	Low
132	318 Dights Crossing Road, Maison Dieu	Moderate	12	Low	Low	Low	Low

				Simple assessment		Intermediate assessment	
ID	Address	Sensitivity	Number of cells	Potential magnitude	Potential impact rating	Potential magnitude	Potential impact rating
163	133 Long Point Road East, Long Point	Moderate	0	Low	Low	None	None
164	131 Long Point Road East, Long Point	Moderate	0	Low	Low	None	None
166	121 Long Point Road East, Long Point	Moderate	8	Low	Low	Low	Low
168	99 Long Point Road East, Long Point	Moderate	4	Low	Low	Very low	Low
170	83 Long Point Road East, Gouldsville	Moderate	14	High	Moderate	Low	Low
173	66 Long Point Road East, Gouldsville	Moderate	25	Very high	High	Moderate	Moderate
229	535c Hambledon Hill Road, Hambledon Hill	Moderate	14	Moderate	Moderate	Low	Low
232	609a Hambledon Hill Road, Hambledon Hill	Moderate	21	High	Moderate	Moderate	Moderate
238	609c Hambledon Hill Road, Hambledon Hill	Moderate	31	High	High	High	Moderate
251	'Abbey House', 478 Putty Road, Mount Thorley	High	26	Very high	High	High	Moderate
264	984 Putty Road, Mount Thorley	Moderate	0	Low	Low	None	None
270	984 Putty Road, Mount Thorley	Moderate	0	Low	Low	None	None
277	896 Putty Road, Mount Thorley	Moderate	39	Moderate	Moderate	Very high	High
301	887 Putty Road, Mount Thorley	Moderate	30	High	Moderate	High	Moderate
463	385 Cessnock Road, Broke	High	8	Moderate	Moderate	Low	Moderate

				Simple assessment		Intermediate assessment	
ID	Address	Sensitivity	Number of cells	Potential magnitude	Potential impact rating	Potential magnitude	Potential impact rating
465	367 Cessnock Road, Broke	High	14	Moderate	Moderate	Low	Moderate
466	395 Cessnock Road, Broke	High	14	Low	Moderate	Low	Moderate
467	368 Cessnock Road, Broke	High	19	Moderate	Moderate	Low	Moderate
471	118 Oakley Lane, Broke	High	31	Very high	High	High	High
472	36 Oakley Lane, Broke	High	27	Very high	High	Moderate	High
1478	436 Cedar Creek Road, Cedar Creek	Moderate	4	High	Moderate	Very low	Low
1495	436 Cedar Creek Road, Cedar Creek	Moderate	Trees intervene	Low	Low	None	None
1661	83 Lewis Road, Millfield	Moderate	0	Low	Low	None	None
1665	1726 Wollombi Road, Cedar Creek	Moderate	0	Moderate	Moderate	None	None
1679	83 Lewis Road, Millfield	Moderate	8	Moderate	Moderate	Low	Low
1684	Wollombi Road, Cedar Creek	Moderate	5	Moderate	Moderate	Very low	Low
1685	1700 Wollombi Road, Cedar Creek	Moderate	Refer 2926	High	Moderate	Very low	Low
1685b	‘Clark’s Slab House’, 1726 Wollombi Road, Cedar Creek	High	6	High	High	Very low	Low
1689	1739 Wollombi Road, Sweetmans Creek	Moderate	8	Low	Low	Low	Low
1978	L 25 Wollombi Road, Millfield	Moderate	0	Low	Low	None	None

				Simple assessment		Intermediate assessment	
ID	Address	Sensitivity	Number of cells	Potential magnitude	Potential impact rating	Potential magnitude	Potential impact rating
2037	1469 Wollombi Road, Millfield	Moderate	0	Moderate	Moderate	None	None
2184	52 Millfield Road, Millfield	Moderate	0	Low	Low	None	None
2198	232 Millfield Road, Millfield	Moderate	8	Low	Low	Low	Low
2203	147 Trig Road, Congewai	Moderate	Trees intervene	Low	Low	None	None
2205	284 Thursbys Road, Congewai	Moderate	Trees intervene	Low	Low	None	None
2214	168 Eglinford Lane, Congewai	Moderate	0	Low	Low	None	None
2218	191 Eglinford Lane, Congewai	Moderate	Trees intervene	Moderate	Moderate	None	None
2219	153 Eglinford Lane, Congewai	Moderate	Refer ID 2221	Moderate	Moderate	None	None
2221	121 Eglinford Lane, Congewai	Moderate	0	Low	Low	None	None
2222	125 Eglinford Lane, Congewai	Moderate	Refer ID 2221	Low	Low	None	None
2223	Eglinford Lane, Congewai	Moderate	Refer ID 2221	Low	Low	None	None
2224	Eglinford Lane, Congewai	Moderate	0	Low	Low	None	None
2228	940 Congewai Road, Congewai	Moderate	0	Low	Low	None	None
2254	1297 Watagan Creek Road, Laguna	Moderate	Trees intervene	Low	Low	None	None
2274	1831 Watagan Creek Road, Laguna	Moderate	Trees intervene	Moderate	Moderate	None	None

				Simple assessment		Intermediate assessment	
ID	Address	Sensitivity	Number of cells	Potential magnitude	Potential impact rating	Potential magnitude	Potential impact rating
2277	1713 Watagan Creek Road, Laguna	Moderate	0	Low	Low	None	None
2278	1999 Watagan Creek Road, Laguna	Moderate	Trees intervene	Low	Low	None	None
2279	1753 Watagan Creek Road, Laguna	Moderate	0	Low	Low	None	None
2283	1861 Watagan Creek Road, Laguna	Moderate	Trees intervene	Low	Low	None	None
2918	478 Putty Road, Mount Thorley	Moderate	Trees intervene	High	Moderate	None	None
2920	887 Putty Road, Mount Thorley	Moderate	22	Moderate	Moderate	Moderate	Moderate
2923	41 Trefolly Road, Wylies Flat	Moderate	4	Low	Low	Very low	Low
2924	535A Hambledon Hill Road, Hambledon Hill	Moderate	See 2927	Low	Low	Low	Low
2926b	‘Hambledon Hill’, 535C Hambledon Hill Rd, Hambledon Hill	High	14	Moderate	Moderate	Moderate	Moderate
2925b	‘Hambledon Hill’, 535cHambledon Hill Road, Hambledon Hill	Moderate	22	Moderate	Moderate	Moderate	Moderate
2928	16 Long Point Road East, Gouldsville	Moderate	13	Very high	High	High	High
2929	16 Long Point Road East, Gouldsville	Moderate	39	Very high	High	High	High
2930	16 Long Point Road East, Gouldsville	Moderate	See 2929	Very high	High	High	High
2931	16 Long Point Road East, Gouldsville	Moderate	See 2929	Very high	High	High	High
2932	16 Long Point Road East, Gouldsville	Moderate	See 2929	Very high	High	High	High

Detailed assessment – private viewpoints

A detailed assessment was conducted for the receivers with a moderate or higher rating. Where possible, a site visit was conducted for each receiver with an intermediate assessment of moderate or higher rating and views toward the project were photographed from each location so a photomontage could be prepared. Alternative methods of assessment were used for receivers where property access was either denied or the property owners were not contactable during the assessment. The alternative methods of assessment included representative viewpoints and 3D modelling using Light Detecting and Ranging (LiDAR) point cloud data (see *Technical Report 3 – Landscape and visual impact assessment* for further details on alternative methods of assessment).

During the site inspection, the viewpoint sensitivity changed as follows:

- ID 471 the view toward the HTP was assumed to be 'moderate' however reduced to 'low'
- ID 2927b the view toward the HTP was assumed to be 'high' however reduced to 'low'.

During the site inspection, the rating of scenic quality changed as follows:

- ID 2928, 2929, 2930, 2931 and 2932 - the scenic quality of the views toward the HTP were assumed to be 'moderate' however were reduced to 'low'
- ID 463, 471 and 472 – the scenic quality of the views toward the HTP were assumed to be 'high' however were reduced to 'moderate'.

During the site inspection, ratings of viewpoint sensitivity and scenic quality of individual views were evaluated and adjusted if required, affecting the overall visual sensitivity rating. In addition, during the site visit, the following adjustments were made:

- ID 2928, 2929, 2930, 2931 and 2932 - 2 principal dwellings were identified (ID 2928 and 2929) that would have views to the transmission lines and towers. Photomontages were taken from both viewpoints and both dwellings were included in the detailed assessment
- ID 465, 92 and 232 representative viewpoints were used from adjacent properties or roads for these properties where access was not granted
- ID 2927 ('Hambledon Hill'), 301 and 472 - viewpoints were revised to ensure they represented the primary viewpoint from these dwellings.

The full detailed assessment and photomontages are included in Appendix G of the *Technical Report 3 – Landscape and visual impact assessment.* The results of the assessment are summarised in Table10.13 and have identified the potential for:

- no private viewpoints with a high visual impact
- a moderate impact from: ID 238, 465, 466 and 467, 2920 and ID 2928
- a low or no visual impact from the remaining viewpoints.

Table10.13 Summary of detailed assessment

ID	Address	Distance to the project	Viewpoint type	Viewpoint sensitivity	Scenic quality	Visual sensitivity	Occupied cells	Magnitude of change	Potential impact rating
92	5339 New England Highway, Rixs Creek	1339 m	Primary view from rural dwelling	Moderate	Moderate	Moderate	7	Low	Low
132	318 Dights Crossing Road, Maison Dieu	1150 m	Primary view from rural dwelling	Moderate	Moderate	Moderate	4	Very Low	Low
173	66 Long Point Road East, Gouldsville	725 m	Primary view from rural dwelling	Moderate	Moderate	Moderate	11	Low	Low
232	609a Hambledon Hill Road, Hambledon Hill	845 m	Primary view from rural dwelling	Moderate	Low	Moderate	9	Low	Low
236	609c Hambledon Hill Road, Hambledon Hill	706 m	Primary view from rural dwelling	Moderate	Low	Moderate	30	High	Moderate
251	'Abbey House', 478 Putty Road, Mount Thorley	742 m	Historic rural homestead	High	Moderate	High	6	Very low (based on point-cloud survey)	Low
277	896 Putty Road, Mount Thorley	740 m	Primary view from rural dwelling	Moderate	Low	Moderate	13	Low (based on point-cloud survey)	Low

ID	Address	Distance to the project	Viewpoint type	Viewpoint sensitivity	Scenic quality	Visual sensitivity	Occupied cells	Magnitude of change	Potential impact rating
301	887 Putty Road, Mount Thorley	825 m	Primary view from rural dwelling	Moderate	Low	Moderate	11	Low	Low
463	385 Cessnock Road, Broke	1058 m	Primary view from rural dwelling	Moderate	Moderate	Moderate	0	None	None
465	367 Cessnock Road, Broke	1132 m	Primary view from rural dwelling	Moderate	High	High	8	Low (based on point cloud survey)	Moderate
465b	367 Cessnock Road, Broke	1132	Representative viewpoint	Moderate	High	High	4	Very low	Low
466	395 Cessnock Road, Broke	1251 m	Primary view from rural dwelling	Moderate	High	High	9	Low (based on point cloud survey)	Moderate
467	368 Cessnock Road, Broke	1080 m	Primary view from rural dwelling	Moderate	High	High	8	Low	Moderate
471	118 Oakley Lane, Broke	516 m	Secondary view from rural dwelling	Low	Moderate	Low	25	Moderate (based on point-cloud survey)	Low
472	36 Oakley Lane, Broke	689 m	Primary view from rural dwelling	Moderate	Moderate	Moderate	8	Low	Low

ID	Address	Distance to the project	Viewpoint type	Viewpoint sensitivity	Scenic quality	Visual sensitivity	Occupied cells	Magnitude of change	Potential impact rating
2920	887 Putty Road, Mount Thorley	980 m	Primary view from rural dwelling	Moderate	Low	Moderate	17	Moderate	Moderate
2925	'Hambledon Hill', 535C Hambledon Hill Road, Hambledon Hill (Living area, not heritage structure)	1200 m	Secondary view from historic homestead	High	Moderate	High	4	Very low	Low
2926	535A Hambledon Hill Road, Hambledon Hill	1586 m	Primary view from rural dwelling	Moderate	Moderate	Moderate	4	Low	Moderate
2926b	'Hambledon Hill', 535cHambledon Hill Road, Hambledon Hill	1200 m	Primary view from historic homestead	High	Moderate	Moderate	4	Very low (based on point cloud survey)	Low
2927c	'Hambledon Hill', 535c Hambledon Hill Road, Hambledon Hill (Secondary dwelling)	1200 m	Primary view from rural dwelling	Moderate	Moderate	Moderate	12	Low	Low

ID	Address	Distance to the project	Viewpoint type	Viewpoint sensitivity	Scenic quality	Visual sensitivity	Occupied cells	Magnitude of change	Potential impact rating
2928	16 Long Point Road East, Gouldsville (representative of a cluster of closely sited dwellings)	334 m	Primary view from rural dwelling	Moderate	Low	Moderate	22	Moderate	Moderate
2929	16 Long Point Road East, Gouldsville	334 m	Primary view from rural dwelling	Moderate	Low	Moderate	0	None	None
2930	16 Long Point Road East, Gouldsville	334 m	(refer ID 2929)	Moderate	Low	Moderate	0	None	None
2931	16 Long Point Road East, Gouldsville	334 m	(refer ID 2929)	Moderate	Low	Moderate	0	None	None
2932	16 Long Point Road East, Gouldsville	334 m	(refer ID 2929)	Moderate	Low	Moderate	0	None	None

Performance objectives

In accordance with the Technical Supplement, visual impact mitigation measures must align with the level of impact and performance objectives for each viewpoint. For private receivers with a moderate viewpoint, mitigation should be offered to the affected landowner and scaled appropriately. For receivers with a low or very low visual impact, no mitigation is required.

Table 10.14 identifies the specific mitigation measures proposed to address the moderate visual impacts identified for the project and includes a revised assessment of affected private viewpoints, factoring in these mitigation efforts to determine the residual impact rating. Photomontages incorporating screening vegetation to reduce visibility of the project is shown in Appendix K of *Technical Report 3 - Landscape character and visual impact assessment.*

These opportunities would reduce the visual impact level from moderate to low for ID 2928, 238, 467 and 2920. There would be two remaining moderate visual impacts: ID 465 and 466.

Table 10.14 Response to performance objectives - Private viewpoints

ID	Address	Visual impact	Mitigation opportunity	Residual visual impact rating
238	609c Hambledon Hill Road, Hambledon Hill	Moderate	Opportunity for screening vegetation along property boundary to reduce visibility of the project over time to be offered to landowner.	Low
465	367 Cessnock Road, Broke	Moderate	Screening vegetation (either within the project corridor or offsite) would not be effective as the visible towers are distant and any screening of the view would also obstruct the high scenic quality views of the rocky escarpments and ridgeline. It is proposed that individual transmission tower heights be minimised as far as practicable. A reduction in the height of these structures would reduce the obstruction of ridgeline (of high scenic quality) and reduce the visual prominence of the transmission towers in this view.	Moderate

ID	Address	Visual impact	Mitigation opportunity	Residual visual impact rating
466	359 Cessnock Road, Broke	Moderate	Screening vegetation (either within the project corridor or offsite) would not be effective as the visible towers are distant and any screening of the view would also obstruct the high scenic quality views of the rocky escarpments and ridgeline. It is proposed that individual transmission tower heights be minimised as far as practicable. A reduction in the height of these towers would reduce the obstruction of ridgeline (of high scenic quality) and reduce the visual prominence of the transmission line towers in this view.	Moderate
467	368 Cessnock Road, Broke	Moderate	Opportunity for screening vegetation along property boundary to reduce visibility of the project over time to be offered to landowner. Screening vegetation should avoid obstructing the view of the ridgeline (of high scenic quality).	Low
2920	887 Putty Road, Mount Thorley	Moderate	Screening vegetation adjacent to the cabin to screen towers to the east. Screening vegetation should avoid obstructing views of the distant hills to the north (of higher scenic quality).	Low
2928	16 Long Point Road East, Gouldsville	Moderate	Opportunity for screening vegetation along property boundary to reduce visibility of the project over time to be offered to landowner.	Low

Assessment of viewpoints beyond the study area

A visual impact assessment on the following specific sensitive viewpoints beyond the study area was requested by various government agencies:

- Greater Blue Mountains Area World Heritage Property (GBMA)
- other prominent viewing areas on National Parks and Wildlife Service (NPWS)-managed land
- Golden Highway toward Muswellbrook
- Mount Yengo.

Detailed cultural mapping has been undertaken as part of the Aboriginal cultural heritage assessment process and identified 8 Dreaming places and stories within and surrounding the project impact area. Two of these locations were identified as being subject to significant impacts: SL5 a location associated with the viewline between Mount Warrawolong and Mount Vincent/Mount Sugarloaf, and SL8 – a promontory at the northern extent of Burma Road and the viewline between Mount Warrawolong and Mount Vincent/Mount Sugarloaf. See *Technical Report 2 - Aboriginal cultural heritage assessment* for further detail on cultural values mapping.

The project is not anticipated to impact the above viewpoints given the distance from the project impact area. The HTP corridor would not be visible from the GBMA, other prominent viewing areas on NSW NPWS managed land or Mount Yengo. No impacts are anticipated on landscape characteristics or aesthetic values of the viewpoints.

A representative viewpoint from the Golden Highway was selected for the assessment (03). Viewpoint 03 is the closest point of the Golden Highway to the HTP corridor (around 1.5 kilometres) and has potential for clear views of the project. The assessment determined a low visual impact to the viewpoint from the HTP corridor.

The HTP corridor is 500 metres from the culturally significant view SL5 and the vegetation partially obstructing the view toward Mount Warrawolong would not be affected by the project. It is likely the view southwest would remain somewhat obstructed by vegetation. A mitigation measure is included in *section 0* to ensure a tower is not located within the viewline.

The culturally significant view SL8 is located on the southern side of the HTP with a view to Mount Warrawolong oriented to the southwest and away from the HTP corridor. As such, the HTP corridor would not be located between SL8 and Mount Warrawolong, and the viewline to Mount Warrowalong from SL8 would not be affected.

10.4.3 Landscape character impacts

Daytime impacts

Operation of the project and the presence of permanent project infrastructure would have negligible to low landscape character impacts within the identified landscape character zones during the daytime. The exceptions to this are within the LCZ 7 (Wollombi Brook rural valley), LCZ 8 (Forested Hills) and LCZ 11 (Narrow rural valleys). The introduction of large transmission towers would contrast with the character of the rural valleys. There is currently no energy infrastructure in these locations and the transmission towers and lines would be a new noticeable element to the landscape. However, adjacent bushland and open forest in LCZ 5 (Bushland and open forest) would likely provide a background and partially absorb the visual characteristics of the project. Transmission towers within the corridor are less likely to be a noticeable new feature of the landscape (due to surrounding screening by existing trees) except where the corridor and transmission towers are in an elevated, prominent location, such as in the vicinity of Congewai Creek/Wollombi Road in LCZ 8 (Forested Hills).

A summary of the daytime impacts the project is expected to have on landscape character types and zones are outlined in Table 10.15.

Night-time impacts

Operation of the project would introduce some low-level lighting at the Olney switching station, increasing the lighting within LCZ 12 (Managed forestry), and contrasting the existing nighttime landscape of the LCZ. This would result in a moderate impact. In all other locations, the project would have a negligible to low impact on landscape character during the nighttime as no permanent lighting is proposed along the transmission lines.

Maintenance activities would generally be undertaken during standard hours (see *Chapter 4 (Project description)*), however if these activities require additional lighting, impacts would be temporary, related to specific task lighting, and would unlikely result in impacts to landscape character.

Table 10.15 provides a summary of the landscape character zone impacts during operation.

Table 10.15 Nighttime visual impact to landscape character zones – operation

Landscape character zone	Daytime			Nighttime		
	Sensitivity	Magnitude	Impact	Sensitivity	Magnitude	Impact
LCZ 1 Energy and mining	Very low	Very low	Very low	Low	Negligible	Negligible
LCZ 2 Jerrys Plains rural village	Moderate	Negligible	Negligible	Low	Negligible	Negligible
LCZ 3 Hunter River (Lemington) rural valley	Moderate	Low	Low	Moderate	Negligible	Negligible
LCZ 4 Hunter River (Maison Dieu) rural valley	Low	Low	Low	Moderate	Negligible	Negligible
LCZ 5 Broke rural village	Low	Very low	Very low	Moderate	Negligible	Negligible
LCZ 6 Bushland and open forest	Moderate	Negligible	Negligible	Low	Negligible	Negligible
LCZ 7 Wollombi Brook rural valley	Moderate	Moderate	Moderate	Moderate	Negligible	Negligible
LCZ 8 Forested hills	Moderate	Moderate	Moderate	High	Negligible	Negligible
LCZ 9 Millfield suburban area	Low	Negligible	Negligible	Low	Negligible	Negligible
LCZ 10 Congewai Creek rural valley	Moderate	Negligible	Negligible	Moderate	Negligible	Negligible
LCZ 11 Narrow rural valleys	Moderate	Moderate	Moderate	Moderate	Negligible	Negligible
LCZ 12 Managed forestry	Low	Moderate	Low	High	Low	Moderate

10.5 Mitigation and management

10.5.1 Environmental management

Impacts to landscape character and visual amenity would be managed in accordance with the landscape character and visual impact management plan (LCVIMP). The LCVIMP would identify the methods and protocols to be implemented to ensure that that the project minimises impacts on landscape character, and visual impacts to views within the public domain and private dwelling views.

The LCVIMP would include mitigation measures to manage:

- potential impacts on landscape character during the day during construction and operation
- potential impacts on landscape character at night during construction and operation
- potential impacts on views from the public domain during construction and operation where there is a moderate or higher potential visual impact
- potential impacts on views from private dwellings, that are not associated with property that is hosting project infrastructure, and that have a predicted moderate or higher potential visual impact during construction and operation
- details regarding the installation and maintenance of any proposed on-site mitigation measures such as vegetation for screening.

10.5.2 Mitigation measures

The mitigation measures that would be implemented to avoid or minimise potential landscape and visual impacts are listed in Table 10.16. Mitigation measures in other chapters that are relevant to the management of construction and operation impacts to landscape character and visual amenity include:

- *Chapter 8 (Biodiversity)*, with respect to the clearing of vegetation, and tree protection measures
- *Chapter 9 (Aboriginal heritage),* with respect to preservation of cultural sightlines
- *Chapter 11 (Traffic and transport)*, with respect to the management of construction traffic and use of access tracks and access roads
- *Chapter 21 (Hazards and risk)* with respect to the generation of dust.

It should be noted that some environmental impacts assessed in this EIS are relevant to multiple technical aspects and therefore will share common mitigation measures. Where this occurs, the mitigation measure has not been duplicated but rather one ID number has been provided for the particular measure and a cross reference to that ID number has been included in other related environmental aspects. In line with this approach, reference has been made to the management of impacts to cultural heritage viewlines in line with mitigation measures AH7 and AH8 in Table 10.16.

Table 10.16 Proposed mitigation and management measures – landscape and visual

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
LV1	Vegetation retention	Vegetation clearance for the project will be limited to the minimum extent necessary for construction and operation to maximise existing visual screening and retention of the existing landscape character. Retained vegetation will be clearly demarcated on site as 'no-go zones' prior to the commencement of construction. Construction personnel will be made aware of no-go zones as part of environmental site induction(s).	Detailed design Construction Operation	All locations
LV2	Construction lighting	Lighting at construction support sites will be designed and operated in accordance with *AS 4282 2019 Control of the obtrusive effects of outdoor lighting.*	Detailed design Construction	Construction support sites
LV3	Visual changes near residences	For private properties assessed as having a moderate or higher visual impact, screening options would be agreed with the landowners. Screening options may include vegetation that would be installed and established by a contractor. Any screening vegetation will be installed in accordance with a plan and specification prepared by a qualified Landscape Architect or designer.	Construction	Private dwellings assessed as having a moderate or higher visual impact
LV4	Visual changes near residences	Opportunities will be investigated to reduce the height of the transmission towers visible from those dwellings with a moderate visual impact in the vicinity of Cessnock Road, Broke.	Detailed design	Private dwellings assessed as having a moderate or higher visual impact near Cessnock Road, Broke.

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
-	Cultural heritage management	The clearing of vegetation between significant cultural viewing locations would be managed in accordance with Aboriginal heritage mitigation measure AH07.	Detailed design Construction	Flat Rock Lookout (HTP-C-CP01 45-3-5003) Other important cultural viewlines and viewscapes, including but not limited to SL5 and SL8
-	Cultural heritage management	The positioning of project elements to minimise their visibility within culturally important view-lines would be managed in accordance with Aboriginal heritage mitigation measure AH08.	Detailed design Construction	Important cultural viewlines and viewscapes, including but not limited to SL5

10.6 Summary and conclusion

The objective of the LCVIA is to identify and assess the potential impacts of the HTP to landscape character (the overall impact of the project on the area's character and sense of place), and to public and private views.

The landscape character assessment identified 12 LCZs and found the project would have a very low or negligible impact during both day and nighttime on the majority of LCZs. The LCZs that were assessed as having moderate impacts during the daytime would be due to higher scenic qualities of the LCZ and a higher magnitude of change. Moderate impacts during the nighttime would primarily be due to the introduction of localised artificial light into otherwise dark environments.

The visual impact assessment identified and assessed both public and private viewpoints. Ten public viewpoints were selected to represent views to the project and include a State highway and other public roads, a village and a culturally significant lookout. All viewpoints were assessed as having a very low to low visual impact with the exception of views from 07: Cessnock Road, which would have a moderate impact.

The detailed visual impact assessment for private viewpoints identified the potential for moderate visual impact for 6 rural dwellings. Screening options within private properties will be offered to landowners where private viewpoints have a visual impact of moderate or higher to reduce the visual impact. Specific mitigation measures have been proposed to address the moderate visual impacts. Through the implementation of these measures, the visual impact rating for four of these properties would reduce to a low impact. There would be two moderate visual impacts remaining.

The project would result in the introduction of new permanent transmission infrastructure within the landscape. Opportunities to minimise the potential landscape and visual impacts of the project have been considered in the design and alignment of permanent infrastructure such as transmission lines and towers, and switching stations through extensive consultation with landowners. EnergyCo will continue considering transmission line structure and location, and vegetation screening within the design to further minimise visual impacts.

EnergyCo's commitment to transparency, collaboration, and adaptive planning will ensure that mitigation measures are effectively designed to minimise impacted private properties.

Traffic and transport

11

11 Traffic and transport

This chapter provides a summary of the potential impacts of the construction and operation of the Hunter Transmission Project (HTP, the project) on traffic and transport and identifies appropriate mitigation and management measures. A detailed assessment is provided in *Technical Report 4 – Traffic and transport impact assessment*. The relevant Planning Secretary's environmental assessment requirements (SEARs) as they relate to traffic and transport, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance)*.

The construction and ongoing maintenance of new and upgraded access tracks for the project are discussed in *Chapter 4 (Project description)*.

11.1 Assessment approach

11.1.1 Legislation, policies, plans and guidelines

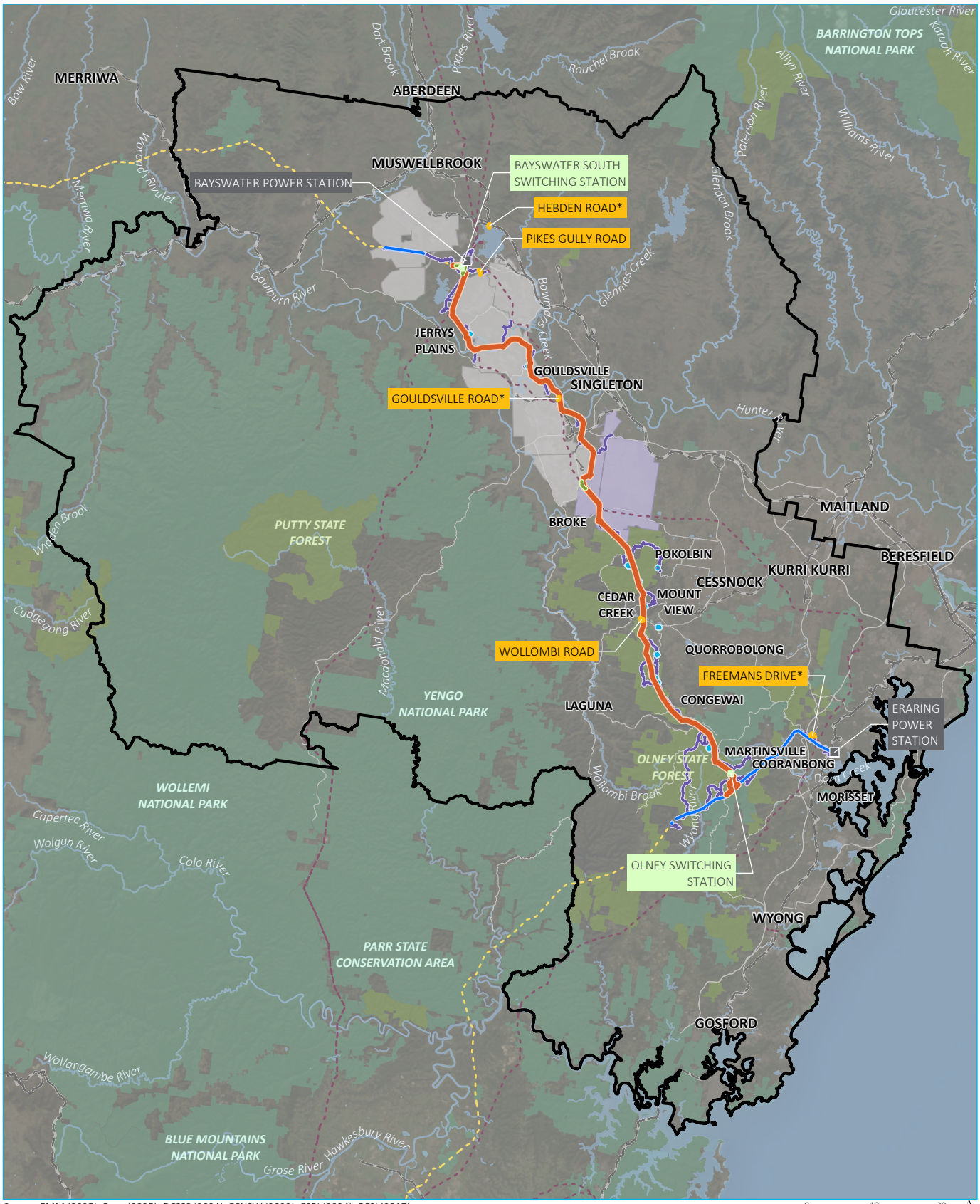
The traffic and transport impact assessment (TTIA) was undertaken in accordance with the project SEARs and with reference to the requirements of relevant legislation, policies and assessment guidelines, including:

- NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)
- NSW *Roads Act 1993*
- NSW *Road Rules 2014*
- *Austroads Guide to Traffic Management and Road Design* (Austroads 2022)
- *Traffic Control at Work Sites - Technical Manual* (TfNSW 2022a)
- *Guide to Transport Impact Assessment* (Transport for NSW, 2024) (previously Guide to Traffic Generating Developments (RTA 2002))
- *2026 Road Safety Action Plan* (TfNSW 2022b)
- *NSW Heavy Vehicle Access Policy Framework* (NHVR 2020).

11.1.2 Study area

The TTIA study area (the study area) includes the transport networks that may be impacted by the construction and operation of the project within the Muswellbrook, Singleton, Cessnock, Lake Macquarie and Central Coast local government areas (LGAs). The study area is shown in Figure 11.1.

The TTIA has considered transport infrastructure and haulage routes beyond the study area, particularly regarding the movement of oversize and/or overmass (OSOM) vehicles to the project impact area.



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

0 10 20 km
GDA2020 MGA Zone 56

N

KEY

Traffic and transport study area

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 forest
- Defence
- Mining

Study area - traffic and transport

Hunter Transmission Project
Environmental Impact Statement
Figure 11.1

EMM creating opportunities

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11.1.3 Assessment methodology

The assessment methodology for the TTIA involved:

- a desktop review and spatial mapping analysis to identify, describe and qualitatively assess the existing conditions of construction routes, including road classification, lane configuration, speed limit, pavement type, pedestrian/cyclist facilities, existing heavy vehicle restrictions, crash history (between 2018 to 2022), intersection treatment, traffic operating performance, and public transport provisions
- data collection at appropriate locations to understand the existing conditions, traffic demand and patterns to further assess the impact of the project
- intersection traffic counts on Wednesday 21 March 2024 and Tuesday 8 April 2025 to capture the traffic movements at key intersections in the study area. The survey provided separated traffic counts for light and heavy vehicles
- mid-block counts (automatic traffic counters) at key locations from 21 to 28 March 2024 to capture 24 hours and 7 days traffic data including volume, speed and vehicle classifications across this period
- site inspections of the project impact area and key construction access roads to understand likely impacts on the road and transport network for road users and the local community
- review of the proposed construction activities and methodology to derive the expected traffic generation and traffic distribution during the construction of the project
- assessment of the potential impacts associated with the construction of the project with regards to road capacity, road condition, road safety, road efficiency, heavy vehicle access, access to construction support sites and temporary worker accommodation, temporary access tracks, property access, stringing of transmission lines over the road and rail network, active transport and public transport
- review of operational activities (i.e. maintenance of the transmission line, switching stations, substations and access tracks) and assessment of the potential impacts associated with road capacity, road condition, road safety, efficiency, active transport, public transport and property access
- review of potential cumulative impacts resulting from traffic generated from the project and other nearby developments, which considers approved changes in the road network and land developments within the study area
- identification of mitigation and management measures to be applied to the construction and operation of the project to avoid, minimise and manage the potential traffic and transport impacts of the project, as far as practicable
- consultation with relevant stakeholders on the anticipated traffic and transport impacts and proposed mitigation measures, including Transport for NSW, relevant councils and Australian Rail Track Corporation (ARTC) (see *Chapter 6 (Engagement)*).

Further detail on the methodology for the TTIA is provided in *Technical Report 4 – Traffic and transport impact assessment.*

Peak periods

Peak periods refer to a one hour period in the morning and afternoon where traffic volumes are the highest in the road network. The peak one hour periods for each road within the study area vary based on several variables including surrounding land use.

The peak periods of trips generated by the project would be shaped by the planned workers' shifts which results in a morning peak between 6:00 am and 7:00 am and an afternoon peak between 5:00 pm and 6:00 pm. These hours are referred as the 'HTP peak periods' for construction. These hours may not align with typical peak periods for the road network within the study area, particularly in areas surrounding the mining operations and State forests.

Construction routes

The construction routes for the project have been classified as:

- general construction routes – construction routes required on a regular basis to enable construction activities, including:
  - delivery of plant and materials required to construct the project
  - travel between construction support sites (some with temporary worker accommodation), laydown areas and stringing sites
  - movement of earthworks materials between sections of the construction impact area, as required
  - transport of water to temporary worker accommodation, construction support sites and other ancillary sites
- construction routes for OSOM vehicles — construction routes that would be used for OSOM movements between ports to the construction impact area for the delivery of project infrastructure and specialist transmission equipment. These routes were selected with consideration of existing gazetted OSOM approved routes.

Key construction routes, including OSOM routes, are listed in Table 4.7 and are shown in Figure 4.10 within *Chapter 4 (Project description)*.

Level of Service

Level of Service (LoS) is used to describe the operation of an intersection. LoS ranges from A (good intersection operation) to F (unsatisfactory intersection operation with excessive queuing). Performance up to LoS D is considered typically acceptable by Transport for NSW (TfNSW), however this depends on the typical traffic volumes and road conditions on any given road.

LoS has been used to describe the existing road network performance within the study area and the potential road network performance during construction of the project.

11.2 Existing environment

11.2.1 Road network and performance

The existing road network across the study area consists of a combination of National, State, regional, local and forest roads. These roads are shown on Figure 4.10 in *Chapter 4 (Project description)*.

The key National and State roads within the study area include New England Highway, Golden Highway, Hunter Expressway, Pacific Highway, Denman Road, John Renshaw Drive, Mandalong Road, Freemans Drive, Wine Country Drive and the Pacific Motorway. These roads are sealed, bidirectional 2 lane roads mostly with a 100 kilometre per hour speed limit which reduces near urban areas. The Pacific Motorway is a dual carriageway National road which consists of 2 lanes in each direction through the study area.

Regional roads within the study area include Broke Road, Cessnock Road and Wollombi Road. These roads are sealed, bidirectional 2-lane roads with posted speed limits between 80 and 100 kilometres per hour outside of urban areas, reducing to 60 kilometres per hour within townships such as Cessnock, Bellbird and Broke.

There are 35 local roads within the study area that would be used by construction vehicles for the project. Most are sealed except for Cedar Creek Road, Hayes Road, Martinsville Hill Road, MF1 Road, Mount Baker Road, Mount View Road, Pokolbin Mountains Road, Heaton Road, Mount Faulk Road, Alton Road and Hawke Mount Road. These roads are generally bidirectional 2 lane roads (one lane in each direction), although Mount Baker Road, Hayes Road, Mount Faulk Road, Hawke Mount Road and Pokolbin Mountains Road are single lane roads. The posted speed limit of local roads varies between 50 and 100 kilometres per hour, with the exception of Archerfield Road (40 kilometres per hour) and an unnamed road to Bayswater Power Station (20 kilometres per hour).

The study area also covers extensive parts of New South Wales (NSW) State forests and conservation areas, with the roads within these areas providing access for forestry activities and to recreational areas. These roads are typically bidirectional unsealed roads with a posted speed limit of 60 kilometres per hour (with some small sections with a posted speed limit of 40 kilometres per hour). Drivers are expected to drive to conditions of the road.

Based on the outcomes of mid-block surveys, almost all roads in the study area currently operate at LoS A during a typical peak hour under existing traffic conditions. The only exceptions are:

- New England Highway (west of Lemington Road in Ravensworth), which operates at LoS D in the AM peak and LoS B in the PM peak in the westbound direction, and LoS C in the PM peak in the eastbound direction
- Golden Highway (east of Gouldsville Road in Gouldsville), which operates at LoS B in the westbound direction in the AM peak
- Broke Road (east of McDonalds Road in Pokolbin), which operates at LoS B in the eastbound direction in the PM peak
- Freemans Drive (south of Martinsville Road in Martinsville), which operates at LoS C in the AM peak in both directions, and LoS C in the northbound direction and LoS D in the southbound direction in the PM peak.

Overall, this indicates that the road network currently performs at an acceptable level of service or better during typical peak hours.

Mid-block survey results for the HTP peak periods show that almost all roads in the study area operate at LoS A during these times (see *section 11.1.3*), with the exception of:

- New England Highway (west of Lemington Road in Ravensworth), which operates at LoS B in the westbound direction in the AM peak, and LoS B in both directions in the PM peak
- Freemans Drive (south of Martinsville Road in Martinsville), which operates at LoS B in the eastbound direction in the AM peak, and LoS C in both directions in the PM peak.

This indicates that the road network currently performs at an acceptable level of service or better during HTP peak periods.

Intersection performance

Existing intersection performance for intersections proposed to be used for construction of the project varies between LoS A to LoS F during road network peak periods, with most intersections performing at LoS A. During the proposed HTP peak periods (described in *section 11.1.3*), most intersections to be used for construction currently operate between LoS A and LoS B.

Heavy vehicle route restrictions

Some highways within the study area are part of the existing OSOM network. Some of the regional roads, such as Broke Road (east of Broke) and Wollombi Road, provide approved access for restricted access vehicles (specifically 25 to 26-metre-long B-Double trucks), however Cessnock Road is currently not approved for these vehicles.

Along the proposed construction routes, some of the local roads (such as Freemans Drive, and Mandalong Road) provide approved access for restricted access vehicles (specifically 25 to 26-metre-long B-Double trucks), however most local roads are not part of the existing approved restricted access vehicles or OSOM network.

OSOM routes to be used during the construction of the project are shown in Figure 4.10 within *Chapter 4 (Project description)*. Further detail, including an assessment of the proposed OSOM routes, has been included in *Technical Report 4 – Traffic and transport impact assessment*.

Road safety

Crash history data along proposed construction routes was analysed to understand crash severity and to provide a safety overview of road network conditions within the study area. The number of crashes recorded between 2018 and 2022 for National, State and regional roads identified as construction routes are outlined in Table 11.1. A breakdown of crashes, including the number of fatal or serious injury crashes, is included in *Technical Report 4 – Traffic and transport impact assessment*.

Table 11.1 Crash history between 2018 and 2022

Road category	Road name	Number of crashes
National	Pacific Motorway	228
State	New England Highway	143
	Golden Highway	47
	Hunter Expressway	109
Regional	Broke Road (north of Broke)	2
	Broke Road (east of Broke)	16
	Cessnock Road	2
	Putty Road (including John and Queen streets)	16
	Wollombi Road	63

11.2.2 Public transport

There are several bus services within the study area near Singleton, Cessnock and Morisset that provide access to surrounding towns and suburbs. Most of these services operate at varying frequencies, from 2 services per day on weekdays in each direction to 17 services per day on weekdays in each direction. There are also school buses which use roads in the study area to service local schools and the community. Further detail on bus routes within the study area is outlined in *Technical Report 4 - Traffic and transport impact assessment*.

Regional passenger trains are provided within the study area on the Sydney to Newcastle rail line which travels through the Eraring and Dora Creek area in a north-south direction with railway stations at Dora Creek and Morisset.

11.2.3 Active transport

In the study area, footpath networks, providing separated walking facilities from the adjacent traffic lanes, are typically only provided in town centres. Outside of the towns and urban areas, there are limited active transport facilities due to the rural nature of the regional and local roads and generally high-speed traffic environment.

While overall cycling facilities are limited within the study area, a review of *Infrastructure Cycleway Data* (TfNSW 2025b) and relevant council websites shows cycling facilities are available (either cycle lanes on road shoulders or off-road shared paths) on the following roads proposed to be used as construction routes:

- Wollombi Street, Broke
- McDonalds Road, Pokolbin
- Broke Road, Pokolbin

- Allandale Road, Cessnock and Wine Country Drive, Pokolbin
- Wollombi Road in Cessnock town centre and built-up residential areas (i.e. Bellbird and Millfield)
- Freemans Drive, Cooranbong.

Recreational activities such as mountain biking and bush walking are undertaken within the forestry area (Corrabare, Watagan and Olney State forests). Recreational users of State forests are known to use forestry roads assigned as construction routes, such as Watagan Forest Road, Wollombi Forest Road and others within the State forests, for these activities. In addition, camping grounds within the Watagan and Olney State forests are located near the project impact area. These are typically accessed via forestry roads, including Watagan Forest Road.

11.2.4 Rail network (freight)

The proposed construction routes do not interact with any level crossings based on TfNSW's *Public Level Crossing Finder* (TfNSW 2025a). The HTP corridor crosses the Whittingham to Mount Thorley line (operated by Australian Rail Track Corporation (ARTC)) at 2 locations near the corner of Putty Road (Golden Highway) and Broke Road. The Whittingham to Mount Thorley line provides coal transport to Mount Thorley, Wambo and Bulga mining complexes. The project impact area also crosses the Sydney to Newcastle rail line (managed by TfNSW) where upgrades to the existing the 500 kV transmission line are proposed near the Eraring Power Station in Cooranbong.

11.3 Potential impacts – construction

During construction of the project, there is the potential for traffic and transport impacts associated with the movement of construction vehicles carrying plant and equipment, materials and workers.

11.3.1 Road network impacts

Traffic generation and distribution

Table 11.2 shows the maximum vehicle movements generated from the construction support sites during the HTP peak one-hour periods (morning (AM) and afternoon (PM)).

Heavy vehicle traffic would be distributed across the identified construction routes within the study area, making deliveries to work sites or delivering of construction material. Light vehicle traffic would move between the construction support sites (and to a lesser degree towns close to the construction impact area), and active work sites (including laydown areas, HTP corridor and switching station/substation sites).

Table 11.2 Peak hourly traffic generation during peak construction (2028)

Construction support site	HTP peak period	Traffic movements per hour		
		Light vehicle	Heavy vehicle	Total
Hebden Road	6:00 am to 7:00 am Morning peak	60	43	103
Pikes Gully Road		50	35	85
Gouldsville Road		60	38	98
Wollombi Road		50	35	85
Freemans Drive		80	50	130
Hebden Road	5:00 pm to 6:00 pm Afternoon peak	50	36	86
Pikes Gully Road		40	30	70
Gouldsville Road		50	36	86
Wollombi Road		40	30	70
Freemans Drive		60	40	100

Road capacity and efficiency

A road capacity assessment was carried out to assess potential impacts of peak construction traffic (see Table 11.2) in the context of the predicted future 2028 base traffic volumes. Following the addition of construction traffic to the 2028 base traffic volumes, the assessment found that almost all roads to be used for construction would operate at a LoS A in 2028 during the HTP peak period, except for:

- New England Highway (west of Lemington Road in Ravensworth), which would operate at LoS C in the westbound direction in the AM and PM peaks and LoS B in the eastbound direction in the AM and PM peaks
- Freemans Drive (south of Martinsville Road in Martinsville), which would operate at LoS B in the AM peak in both directions and LoS D in the PM peak in both directions.

This indicates that, following the addition of construction traffic to predicted future traffic volumes, the road network would continue to perform at a good level of service during construction on almost all construction routes, with the New England Highway operating to at least a satisfactory level of service and Freemans Drive operating at or near capacity.

Road safety

The project has aimed to spread the construction support sites (including temporary worker accommodation) throughout the project impact area to reduce travel times between construction support sites and various construction work areas to minimise driver fatigue. The use of minibuses to transfer workers between construction support sites, temporary worker accommodation and construction work areas would also reduce the number of light vehicles on the road network.

Where construction activities are likely to impact the existing operational conditions of a road (i.e. during partial closures), temporary traffic management measures would be implemented to address the risk of accidents (see *section 11.5*).

In addition, passing bays would be implemented along State forest roads which are only suitable for one lane movement of heavy vehicles. These, alongside traffic control for heavy vehicle movements along forest roads, would minimise risks associated with construction traffic travelling through State forests.

As such, the project is unlikely to lead to a deterioration in road safety within the study area. Further information is provided below on intersection safety within the study area.

Road condition

Pavement fatigue generally occurs because of repeated heavy vehicle traffic movements. Pavement impacts from construction traffic are expected to be minor in general and moderate on those roads where construction support sites are located as a result of higher heavy vehicle movements on these roads. However, the extent of any potential impacts would depend on the existing pavement condition and remaining life of the pavement. For unsealed roads, including within State forests, light and heavy vehicle movements have the potential to impact road condition, including during wet weather or prolonged dry weather periods.

Road dilapidation surveys and routine inspections will be completed prior to construction and during construction along all nominated construction routes on local roads and existing access tracks to ensure that routes are maintained to safe standard during construction. Where rectification works are required due to project impacts, consultation with the appropriate road authority will be undertaken to confirm the scope of the work required.

Stringing of the transmission lines across roads

As outlined in *Chapter 4 (Project description)*, at locations where the new transmission line crosses the road network, a drone or helicopter would typically be used to take a lead wire over the road to allow cables to be pulled and strung to each tower. In some cases, temporary hurdles (including net and rope) and cranes would be used. Stringing of transmission lines would be carried out to achieve vertical clearances above ground level in accordance with Austroads requirements, as well as other relevant standards. Table 11.3 outlines roads over which stringing of the new transmission line would occur within the study area.

Table 11.3 Roads over which stringing of the new transmission line would occur

LGA	Road	Road classification
Singleton	Putty Road (near its intersection with Broke Road)	State road
	Cessnock Road (east of Broke)	Regional road
	Gouldsville Road (near its intersection with Long Point Road West)	Local road
	Long Point Road West (near its intersection with Gouldsville Road)	Local road
	Archerfield Road (in 2 locations near Hunter Valley Operations)	Local road
	Lemington Road (near its intersection with Old Lemington Road)	Local road
	Oakley Lane (near its intersection with Cessnock Road)	Local road
Cessnock	Wollombi Road (near the proposed Wollombi Road construction support site)	Regional road

Traffic management would typically be required during stringing work over these roads, with specific arrangements to be confirmed during detailed design in consultation with the relevant road authority and subject to the requirements of a road occupancy licence. In line with pre-EIS consultation this may entail short-term road closure, implementing localised traffic controls (stop/go), and/or a reduction in speed limit. Where feasible, temporary closures would be planned outside of peak periods to minimise impacts on the road network.

Stringing activities for the new transmission line would also occur over various roads in State forests, on mining land and power station land. Stringing methodologies over these roads and traffic management requirements would be refined during detailed design in consultation with relevant stakeholders.

In addition, upgrades to existing transmission lines would require stringing over the Pacific Motorway, Freemans Drive, Mount Nellinda Road, Mount Faulk Road and Alton Road in Cooranbong and Martinsville Road in Martinsville. A pully system would be used to guide the earthwire across the existing transmission line over the road corridor.

During stringing along the existing transmission line at these locations, traffic controls would be implemented to safely manage traffic passing below stringing activities as required, including stop/slow signs and/or reductions in speed limit. These works would occur outside of peak periods to minimise disruption to road users. For the crossing of the M1 Pacific Motorway, stringing activities would not require road closures, however traffic management would be in place as a risk management strategy and works would be carried out outside of peak periods where feasible.

TfNSW has been consulted throughout the development of this EIS, including on proposed stringing methodologies, and would continue to be consulted on specific arrangements for stringing over State and national roads, including the M1 Pacific Motorway, during detailed design.

The specific arrangements for any road closures or traffic control arrangements during stringing works over the road corridor would be confirmed during detailed design and construction in consultation with the relevant road authority. A road occupancy licence and/or a section 138 consent under the *Roads Act 1993* would be sought as required. The anticipated impacts of full or

partial road closures would be temporary and would largely relate to a potential increase in travel time and distance due to any detouring or speed restrictions. Potential impacts on road users would be minimised through the implementation of mitigation measures detailed in *section 11.5.*

Property access

The project is expected to have some impact to property accesses during construction particularly on roads only wide enough for one heavy vehicle to pass. These are typically unsealed roads in the Pokolbin, Mount View and Millfield areas, as well as the State forest roads in Corrabare and Olney. These roads often provide access to rural residential properties as well as to recreational areas in the State forests.

Not all construction routes would be used for the entire construction period. As such, impacts to property access would only occur while each construction route with affected properties is in use. Notwithstanding, measures would be implemented to minimise disruptions to residents on construction routes. This would include traffic management, including passing bays, which are proposed to manage safety risks and impacts on users of these roads. This will require traffic controllers to be present at passing bays during work hours to ensure the roads are only operating under one-way conditions to prevent mid-block passing. In addition, residents with driveway access between the 2 passing bays would be provided with a contact number to inform traffic controllers when exiting their properties to minimise the risk of mid-block passing.

OSOM deliveries

OSOM deliveries for the project would include the transportation of the following:

- transformers from the Port of Newcastle to Eraring substation (7 deliveries)
- reactors from the Port of Newcastle to Bayswater South switching station (3 deliveries)
- auxiliary services buildings to each of the new switching stations (2 deliveries).

A concept level route analysis for OSOM movements was carried out for the project, which identified likely works and mitigations required to safely transport key OSOM components during construction of the project. These measures are summarised in *Technical Report 4 - Traffic and transport impact assessment*. In addition to these, the following requirements would generally apply for all identified high-risk OSOM movements:

- a permit from the NHVR prior for transportation of the components
- night travel
- additional pilot vehicles
- traffic management at intersections along OSOM routes during each manoeuvre.

During detailed design and construction planning, the haulage routes to be used would be confirmed and the required approvals would be obtained from relevant road authorities prior to construction. Applicable haulage routes from the Port of Newcastle to the project impact area are outlined in *Technical Report 4 – Traffic and transport impact assessment*.

Intersection performance

An assessment of the performance of key project intersections during peak construction in the context of the predicted future (2028) base traffic volumes concluded that most existing

intersections would perform at an acceptable level of service with construction traffic, except for the intersections outlined in Table 11.4. Ongoing refinements to construction planning will be carried out in detailed design to determine appropriate measures to minimise impacts of construction traffic to these intersections (see *section 11.5*).

Table 11.4 Intersections with an unsatisfactory level of service for future (2028) base traffic volumes with construction traffic

Intersection	HTP peak period	2028 base traffic volumes without construction traffic	2028 base traffic volumes with construction traffic
New England Highway/Hebden Road	6:00 am to 7:00 am Morning Peak	LoS F	LoS F
Golden Highway/Range Road		LoS F	LoS F
Mandalong Road/Freemans Drive/Wyee Road		LoS E	LoS F
New England Road/Hebden Road	5:00 pm to 6:00 pm Afternoon peak	LoS F	LoS F

The New England Highway/Hebden Road intersection operates at LoS F in both the weekday AM and PM peaks under the future base case. The LoS at this intersection deteriorates from a LoS A (current) to LoS F in the future base case due to a very small number of right turning movements (<5) out from Hebden Road onto the New England Highway. The intersection would continue to fail following the introduction of construction traffic due to these future base conditions (i.e. the intersection would not fail as a result of construction traffic). Given this intersection would fail as a result of future base traffic conditions rather than as a result of construction traffic, no upgrades are proposed. Notwithstanding, measures will be put in place so that HTP construction traffic would turn left out from Hebden Road onto the New England Highway in the AM peak and right in during the PM peak so as not to contribute to the turning movements which cause the intersection to fail under the future base case conditions.

The Golden Highway/Range Road intersection operates at LoS F in the weekday AM peak and LoS B in the weekday PM peak under existing conditions. Under the future base case, this intersection will perform at LoS F in the weekday AM peak and LoS C in the weekday PM peak. This intersection will fail in the weekday AM peak due to a very small number of through and right turning vehicles out from both sides of Range Road onto the Golden Highway. The intersection would continue to fail in the weekday AM peak following the introduction of construction traffic due to these future base conditions (i.e. the intersection would not fail as a result of construction traffic). Given this intersection would fail as a result of future base traffic conditions rather than as a result of construction traffic, no upgrades are proposed. Notwithstanding, measures will be put in place so that construction traffic will be right in during the AM peak and left out during the PM peak so as to not contribute to the turning movements which cause the intersection to fail under the future base conditions.

The Mandalong Road/Freemans Drive/Wyee Road intersection would deteriorate to perform at LoS E in the future base case during the AM peak due to expected growth in the area. This issue has already been identified by TfNSW and an update to a signalised intersection is proposed.

Implementing the proposed signal design of the intersection would improve the future performance to LoS C, which is an acceptable level of operation. However, the timing of these works may coincide with the HTP construction program and discussions are ongoing with TfNSW regarding the suitability of this intersection for use during construction of HTP. Should the intersection upgrade coincide with HTP construction, project construction traffic would utilise the M1 Pacific Motorway / Freemans Drive interchange for access to Freemans Drive instead. The cumulative impacts of the proposed intersection upgrade and construction traffic from the HTP are considered in *Chapter 23 (Cumulative impacts)*.

Turn warrant assessment

Turn warrant assessments were carried out at existing intersections to assess the intersection's ability to safely accommodate the required turning movements for the heavy vehicles proposed by the project. Based on this assessment the following intersections were identified for an upgrade to meet relevant standards for safe turning movements (upgrade details provided in *Chapter 4 (Project description)*):

- Golden Highway/Lemington Road in Jerrys Plains
- Golden Highway/unknown road (east of Lemington Road) in Warkworth
- Golden Highway/Comleroi Road in Warkworth
- Golden Highway/Gouldsville Road in Gouldsville
- Putty Road/access tracks in Mount Thorley
- Broke Road/existing access tracks in Mount Thorley
- Wollombi Road/Mount View Road in Cessnock
- Wollombi Road/access road to the Wollombi Road construction support site in Millfield
- Freemans Drive/Martinsville Road in Cooranbong
- Freemans Drive/Mount Faulk Road in Cooranbong
- Freemans Drive/access road to the Freemans Drive construction support site in Cooranbong
- Freemans Drive/Mount Nellinda Road in Cooranbong.

The upgrades nominated above would improve safety at these intersections by providing additional turning lanes as well as acceleration and deceleration lanes, where required. These intersections would also be widened to accommodate the largest design vehicle swept path anticipated to access these locations. Traffic controllers are proposed at locations where 2-way traffic using the largest design vehicle cannot be accommodated. Consultation will continue with TfNSW and relevant councils, as the road authorities, for these intersection upgrades.

Further information on the turn warrant assessments undertaken and the proposed intersection upgrades is found in *Technical Report 4 - Traffic and transport impact assessment.*

Sight distance

The suitability of intersection locations based on sight distances was also assessed. The TTIA assessed the ability of drivers on a major road to observe, react and decelerate sufficiently to avoid a crash if a vehicle enters from a minor road and moves into a potential conflict point causing collision. The assessment shows that most existing and proposed intersection locations are compliant except for the following proposed accesses:

- Broke Road/existing access tracks in Mount Thorley
- Putty Road/new access track in Mount Thorley
- Long Point Road West/existing access track in Gouldsville
- Gouldsville Road/access road to the Gouldsville Road construction support site in Gouldsville
- Cessnock Road/new access track in the Singleton Military Area
- Wollombi Road/access roads to the Wollombi Road construction support site in Millfield
- Wollombi Road/new access track in Millfield
- Martinsville Road/Watagan Road in Martinsville
- Watagan Forest Road/Martinsville Hill Road in Martinsville
- Freemans Drive/access road to the Freemans Drive construction support site in Cooranbong.

To improve driver sight distances at these intersections, additional advance warning signs, reduced temporary speed limits and/or clearing of vegetation would be implemented as required. Further information about treatments for sight distance at these intersections is included in *Chapter 4 (Project description)*.

11.3.2 Public transport

Overall, bus services are not expected to experience significant disruptions on the assigned construction routes in the study area. There may, however, be some minor delays experienced by bus services where upgrades are required at intersections/access gates. These works would typically require traffic management or a reduced speed limit to provide a safe environment for workers and the public.

Vehicles travelling to and from construction support sites and laydown areas would increase traffic on the road network, however this additional traffic is anticipated to have a negligible impact on bus services within the study area.

11.3.3 Active transport

Most of the construction activities would be undertaken along the HTP corridor, at switching stations and substations, which are outside of road reserves and associated active transport facilities. Construction traffic has the potential to interact with active transport users where walking and cycling facilities are located along construction routes, however impacts to active transport are anticipated to be negligible. During construction, workers would be informed of the locations of active transport facilities, including off-road shared paths and bicycle lanes, and would be educated on the safe driving practices to be implemented on these roads.

Recreational activities such as mountain biking and bush walking are likely to take place within the forestry areas (Corrabare, Watagan and Olney State forests) during construction. These activities may be undertaken on roads within the State forests proposed as construction routes, such as Watagan Forest Road and Wollombi Forest Road.

To minimise impacts to recreational users of State forests, drivers of construction vehicles would follow safe driving practices on these roads, including driving at a safe speed, ensuring visibility of vehicles and education for drivers. The traffic management plan (TMP) will outline all of the sensitive land uses along the construction routes, such as accommodation, schools, residential properties, community facilities, wineries and recreational places, where walking and cycling activities are observed and the safe driving practices to be expected on these roads (see *section 11.5*).

11.3.4 Rail network

The only operational rail line crossed by the new transmission line would be the Whittingham to Mount Thorley line (operated by ARTC) at 2 locations near the Putty Road/Broke Road intersection. This line provides coal transport to Mount Thorley Warkworth, Wambo and Bulga mining complexes.

Stringing activities at these locations would be undertaken during rail maintenance periods or during rail possessions (periods during which rail lines are not in use) in consultation with ARTC. As such, no disruptions to rail services are expected.

Upgrades to the existing transmission line 5A1 and 5A2 (earthwire upgrade) would cross the Sydney to Newcastle rail line near the Eraring Power Station in Cooranbong. Stringing activities in this location would also be undertaken during maintenance periods or during rail shut downs in consultation with TfNSW.

11.4 Potential impacts – operation

11.4.1 Road network impacts

Traffic generation

During operation, traffic and transport impacts would be limited to routine maintenance of the transmission line and switching stations as required. Emergency response activities would also be carried out as needed in response to unexpected issues.

The maintenance workforce would typically consist of 3 to 5 workers for routine inspections and maintenance, with some less frequent inspections requiring up to 10 personnel. Routine maintenance activities are likely to only require a light vehicle or a 4-wheel drive. Average daily vehicle movements would be less than 10.

During operation, access to the transmission lines and switching stations would be via existing public and private roads and access tracks established during construction of the project. Access easements may be required to provide the network operator with access from the nearest public road to the easement. These access easements would be negotiated with landowners. Ongoing

maintenance of access tracks would largely be carried out with light vehicle access within the easement, with repairs and upgrade works likely requiring heavy vehicles as needed.

The switching stations would not accommodate full-time staff or contractors. Maintenance work would typically include ad-hoc attendance (up to 3 times a week) by one or 2 workers to undertake planned and unplanned operations and maintenance. It is expected that these activities would only require light vehicles and/or small to medium plant (depending on the works required).

Overall traffic generation during operation of the project would be negligible.

Road capacity and efficiency

Traffic generation during operation would have negligible impact on the efficiency of the road network in the study area. Road upgrades carried out to facilitate construction access would be more than sufficient to cater for the negligible traffic generation expected during operation.

Intersection performance

Intersection upgrades carried out to facilitate construction access would be more than sufficient to cater for the negligible traffic generation expected during operation.

Road safety

The road and intersection upgrades carried out during construction of the project are expected to improve road safety for all road users. Due to the low magnitude, the additional light vehicle traffic generated during operation is expected to have a negligible impact on road safety in the study area.

Road condition

The low traffic movements and the ad hoc infrequent use of heavy vehicles for operation and maintenance activities would have a negligible impact on the road pavement condition throughout the study area.

Property access

Access to properties for residents (including for emergency vehicle access and egress) would be maintained throughout operation. Consultation with the affected landowner would be undertaken beforehand if a short-term restriction for a particular property is required.

OSOM deliveries

Non routine maintenance may require the use of OSOM vehicles to transport equipment to and from Bayswater South switching station, Olney switching station or Eraring substation. All necessary approvals would be in place for any OSOM vehicle movements during operation. Public transport

Due to the expected low numbers of vehicle traffic generated during operation, impacts on the public transport network in the study area are expected to be negligible.

11.4.2 Active transport

Maintenance and operational activities are anticipated to occur within the transmission line easement, switching stations and substations. Vehicle movements from these activities would have limited interactions with existing active transport facilities. As such, the additional vehicle traffic

generated during operation is expected to have a negligible impact on the active transport network in the study area.

11.4.3 Rail network

All maintenance and operational activities would occur outside the existing rail corridor. As such, there would be no impacts to rail operations during operation of the project.

11.5 Mitigation and management

11.5.1 Environmental management

A traffic management plan (TMP) will be prepared to manage the potential traffic and transport impacts of the project. The TMP will be developed in consultation with the relevant road/rail authorities and will include as a minimum:

- confirmation of construction routes
- measures to maintain access to local roads and properties
- driver safety measures, including a driver code of conduct, requirements for in-vehicle monitoring systems, a driver fatigue management plan and the locations of rest areas along construction routes
- site specific traffic control measures (including signage) to manage and regulate traffic movement prepared in consultation with the relevant road authorities and implemented by licenced traffic management contractors
- measures to maintain pedestrian and cyclist access
- requirements and methods to consult and inform the local community of impacts on the local road network
- coordination with TfNSW and councils for road and intersection works and road crossings
- coordination with ARTC for rail line crossings
- requirements to obtain relevant approvals, including road occupancy licence(s), for any potential works in the road corridor and access by restricted access vehicles or OSOM vehicles required for the project. Where feasible, temporary road closures will be planned to occur outside of the traffic peak periods to minimise impacts to the road network
- access to construction sites including entry and exit locations and measures to prevent construction vehicles queueing on public roads
- maintenance and safety measures required along access tracks and at access points to construction support sites, including appropriate line marking and signage and wheel cleaning facilities as required
- a response plan for any construction traffic incident, or complaints management process
- requirements for routine inspections of construction routes
- consideration of other developments that may be under construction to minimise cumulative impacts.

11.5.2 Mitigation measures

The mitigation and management measures that will be implemented to avoid or minimise potential impacts to traffic and transport are listed in Table 11.5.

Table 11.5 Proposed mitigation and management measures - traffic and transport

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
TT1	Construction traffic impacts	A TMP will be prepared as part of the project environmental management strategy.	Detailed design Construction	Construction routes, access tracks, construction support sites and temporary worker accommodation accesses
TT2	Road and intersection upgrades	Upgrades will be carried out for intersections where turn warrant assessments have determined that works are required for construction vehicles to carry out safe turning movements. Intersections will be upgraded in line with the required works outlined in *Chapter 4 (Project description)*. In addition, safety measures will be implemented as required at intersections assessed as being non-compliant with safe intersection sight distance criteria, including the provision of additional advance warning signs, temporary reductions in speed limits and/or clearing of vegetation in consultation with the relevant road authority. Safety measures will be implemented in line with the required works outlined in *Chapter 4 (Project description)*.	Construction	Intersections identified as requiring upgrades for turn warrant treatment or safe intersection sight distance

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
TT3	Intersection performance impacts	Ongoing investigation will be carried out to determine appropriate measures at the New England Highway/Hebden Road intersection to minimise impacts of right turning construction traffic from Hebden Road onto the New England Highway in the AM and PM peaks. Measures to minimise intersection performance impacts as a result of construction traffic will be investigated in consultation with relevant stakeholders.	Detailed design Construction	New England Highway/Hebden Road intersection
TT4	Intersection performance impacts	Ongoing investigation will be carried out to determine appropriate measures at the Golden Highway/Range Road intersection to minimise the impacts of through and right turning movements in the AM peak, Measures to minimise intersection performance impacts as a result of construction traffic will be investigated in consultation with relevant stakeholders.	Detailed design Construction	Golden Highway/Range Road intersection
TT5	Road safety – design related	All accesses will be designed to accommodate the required construction vehicle(s) in line with the TTIA and in accordance with relevant Austroads guidelines (where applicable).	Detailed design	Construction routes, access tracks, construction support sites and temporary worker accommodation accesses
TT6	Road condition	Pre-construction road dilapidation surveys and routine inspections will be completed along all nominated construction routes on local roads. Where rectification works are required due to project impacts, consultation with the appropriate road authority will be undertaken to confirm the scope of the work required.	Detailed design Construction	Local roads

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
TT7	Access to properties	Access to properties will be maintained throughout construction, where feasible. Where that is not feasible, temporary alternative access arrangements will be provided following consultation with affected landowners and in accordance with the requirements of the construction communication and engagement plan. Disruptions to property access and traffic will be notified to landowners at least 5 business days prior and in accordance with the relevant community consultation processes outlined in the EMS.	Construction	Construction impact area
TT8	Pedestrian and cyclist access	Ongoing consultation will be carried out with local bicycle groups where available and with Forest Corporation NSW for walking and biking trails in State forest. Safe pedestrian and cyclist access will be maintained where the project interacts with existing pedestrian or bicycle facilities on public roads. Where this is not feasible, temporary alternative access arrangements will be provided following consultation with affected stakeholders and the relevant roads authority.	Construction	Construction impact area
TT9	OSOM vehicle access	Ongoing consultation will be undertaken with TfNSW regarding the use of State roads for OSOM vehicle routes and appropriate permits will be obtained from the National Heavy Vehicle Regulator for OSOM movements.	Detailed design Construction	OSOM routes
TT10	Cumulative impact with Hunter Valley Operations (HVO) Continuation Projects	Further analysis and coordination with HVO would be undertaken during detailed design and construction planning regarding works required in the vicinity of Lemington Road and any associated staging/timing to minimise adverse performance and road safety impact on Lemington Road and at its intersections with the New England Highway and Golden Highway.	Detailed design Construction	Lemington Road and surrounding roads near HVO in the northern section of the project impact area

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
TT11	Cumulative impact of the Mandalong Road upgrade works by TfNSW	Further analysis and coordination with TfNSW would be undertaken during detailed design and construction planning on the proposed construction activities requiring access on Mandalong Road and associated staging/timing to minimise adverse performance and road safety impacts at the Mandalong Road/Freemans Drive/Wyee Road intersection. Alternative routes will be used should use of this intersection not be possible.	Detailed design Construction	Mandalong Road and surrounding areas in the southern portion of the project impact area

11.6 Summary and conclusions

The existing road network surrounding the project consists of a combination of National, State, regional, local and forest roads. Almost all roads in the study area would operate at a LoS A during the HTP peak period, except for the New England Highway, which would operate at LoS C in the westbound direction in the AM and PM peak and LoS B in the eastbound direction in the AM and PM peak, and Freemans Drive, which would operate at LoS B in the AM peak in both directions and LoS D in the PM peak in both directions.

During peak construction, intersection performance would not be impacted at most locations except for the New England Highway/Hebden Road intersection and the Golden Highway/Range Road intersection, as well as the Freemans Drive/Wyee Road/Mandalong Road intersection, which is proposed to be upgraded by TfNSW (see *Chapter 23 (Cumulative impacts)* for further details on the potential cumulative impacts of this upgrade with HTP). Further investigations will be undertaken to in consultation with TfNSW and council to minimise impacts at these intersections and to agree suitable management measures to be implemented as part of construction planning.

Based on the outcomes of the turn warrant assessment, a number of intersection upgrades are required to meet relevant standards based on existing conditions, the proposed design for new access gate locations, and to achieve appropriate sight distances.

During construction, potential impacts to road condition because of construction traffic are expected to be minimal. Impacts to the rail network, public transport and active transport are expected to be limited and manageable with the implementation of mitigation measures.

Operation of the project would involve routine maintenance of the transmission line, switching station and substation infrastructure which would result in minimal traffic generation. This minimal traffic generation during operation would have negligible impact on the efficiency, condition and safety of the road network in the study area.

A series of management measures are proposed to manage traffic and transport impacts, including the preparation of a TMP as part of the project environmental management strategy.

Land use and property

12

12 Land use and property

This section provides an overview of the existing environment as it relates to land use and property, an assessment of potential land use and property impacts of the Hunter Transmission Project (HTP, 'the project') and identifies mitigation and management measures to be adopted to minimise and manage these potential impacts. The Planning Secretary's environmental assessment requirements (SEARs) as they relate to the assessment of land use and property and where in this environmental impact statement (EIS) these have been addressed are summarised in *Appendix A (Assessment requirements compliance)*.

12.1 Assessment approach

12.1.1 Legislation, policies, plans and guidelines

The potential land use and property impacts as a result of the project were assessed with consideration of the following legislation and policies:

- *NSW Crown Land Management Act 2016 (CLM Act)*
- *NSW Forestry Act 2012*
- *NSW Land Acquisition (Just Terms Compensation) Act 1991*
- *NSW Local Land Services Act 2013*
- *NSW Mining Act 1992*
- *NSW Coal Mine Subsidence Compensation Act 2017*
- *NSW National Parks and Wildlife Act 1974*
- *Commonwealth Native Title Act 1993*
- *NSW Native Title Act 1994*
- *NSW Aboriginal Land Rights Act 1983*
- Commonwealth Civil Aviation Safety Regulation 1998
- Various local environmental plans (LEPs) applicable to the local government areas (LGAs) in which the project is located, including:
  - *Muswellbrook Local Environmental Plan 2009*
  - *Singleton Local Environmental Plan 2013*
  - *Cessnock Local Environmental Plan 2011*
  - *Central Coast Local Environmental Plan 2022*
  - *Lake Macquarie Local Environmental Plan 2014*

- Local strategic plans for the local councils which the project is located within, including:
  - the *Hunter Regional Plan 2041*, which applies to the Muswellbrook, Singleton, Cessnock and Lake Macquarie LGAs
  - the *Central Coast Regional Plan 2041*, which applies to the Central Coast LGA.

12.1.2 Study area

The project impact area was used as the study area for the land use and property impact assessment. Where relevant, the assessment has also considered the various LGAs within which the project is located.

12.1.3 Assessment methodology

The methodology for assessing the potential land use and property impacts of the project involved:

- reviewing the legislative and policy context relevant to land use and property within and surrounding the project impact area
- identifying and mapping existing land uses within and surrounding the project impact area based on a desktop review of spatial data, aerial photography, land use zoning mapping and other available information
- analysing and describing the existing environment as it relates to land use and property
- investigating whether any native title claims existing within the project impact area through searches of the following databases on 11 November 2024:
  - the Register of Native Title Claims
  - the National Native Title Register
  - the Register of Indigenous Land Use Agreements
  - native title applications, registration decisions and determinations
- reviewing Aboriginal land claims, including a search of the NSW Register of Aboriginal Land Claims
- reviewing previous reports and relevant technical reports developed to support the preparation of this EIS
- assessing the potential changes to land use and impacts to property from construction and operation of the project, including consideration of the issues raised through engagement with the community, stakeholders and landowners (see *Chapter 6 (Engagement)*)
- identifying mitigation and management measures to avoid, minimise or manage land use and property impacts from the construction and operation of the project.

12.2 Existing environment

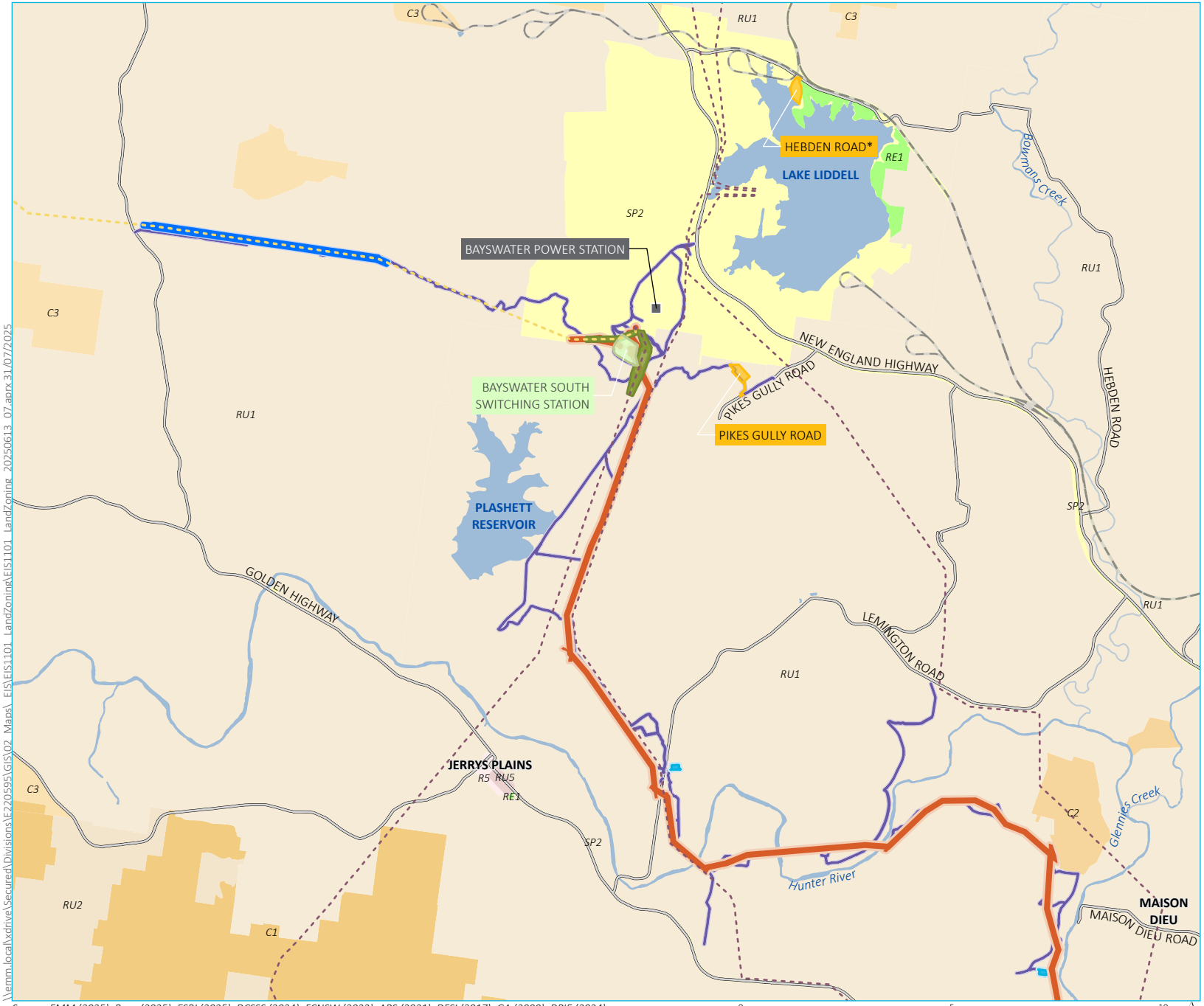
12.2.1 Land zoning

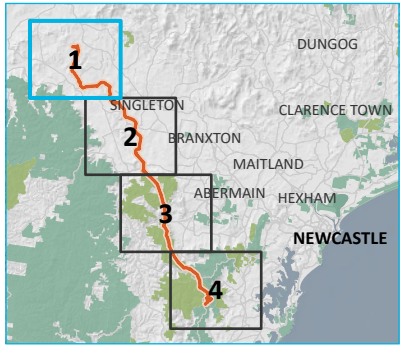
Land zoning (as identified in applicable LEPs) within the northern portion of the project impact area is mostly RU1 – Primary Production, with some of this land forming part of existing mining operations. Smaller areas in the northern portion of the project impact area associated with Bayswater Power Station are zoned as SP2 – Infrastructure, and the Singleton Military Area is zoned SP2 – Defence.

The central portion of the project impact area is mostly land zoned RU3 – Forestry (associated with the Pokolbin and Corrabare State forests) and RU2 – Rural Landscape (associated with rural residential areas at Cedar Creek and Millfield).

The southern portion of the project impact area contains a mix of land zoning, with areas zoned RU3 – Forestry, C1 – National Parks, C2 – Environmental Conservation and C3 – Environmental Management. In addition, areas of RU2 – Rural Landscape are also present near Martinsville and Cooranbong. The Eraring Power Station is zoned SP2 – Infrastructure.

Land zoning throughout the project impact area is outlined in Figure 12.1.





KEY

- C1 National Parks and Nature Reserves
- C2 Environmental Conservation/ Management
- C3 Environmental Management
- R5 Large Lot Residential
- RE1 Public Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- RU5 Village
- SP2 Infrastructure

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

Land zoning within and surrounding the project impact area
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.1

EMM
creating opportunities

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

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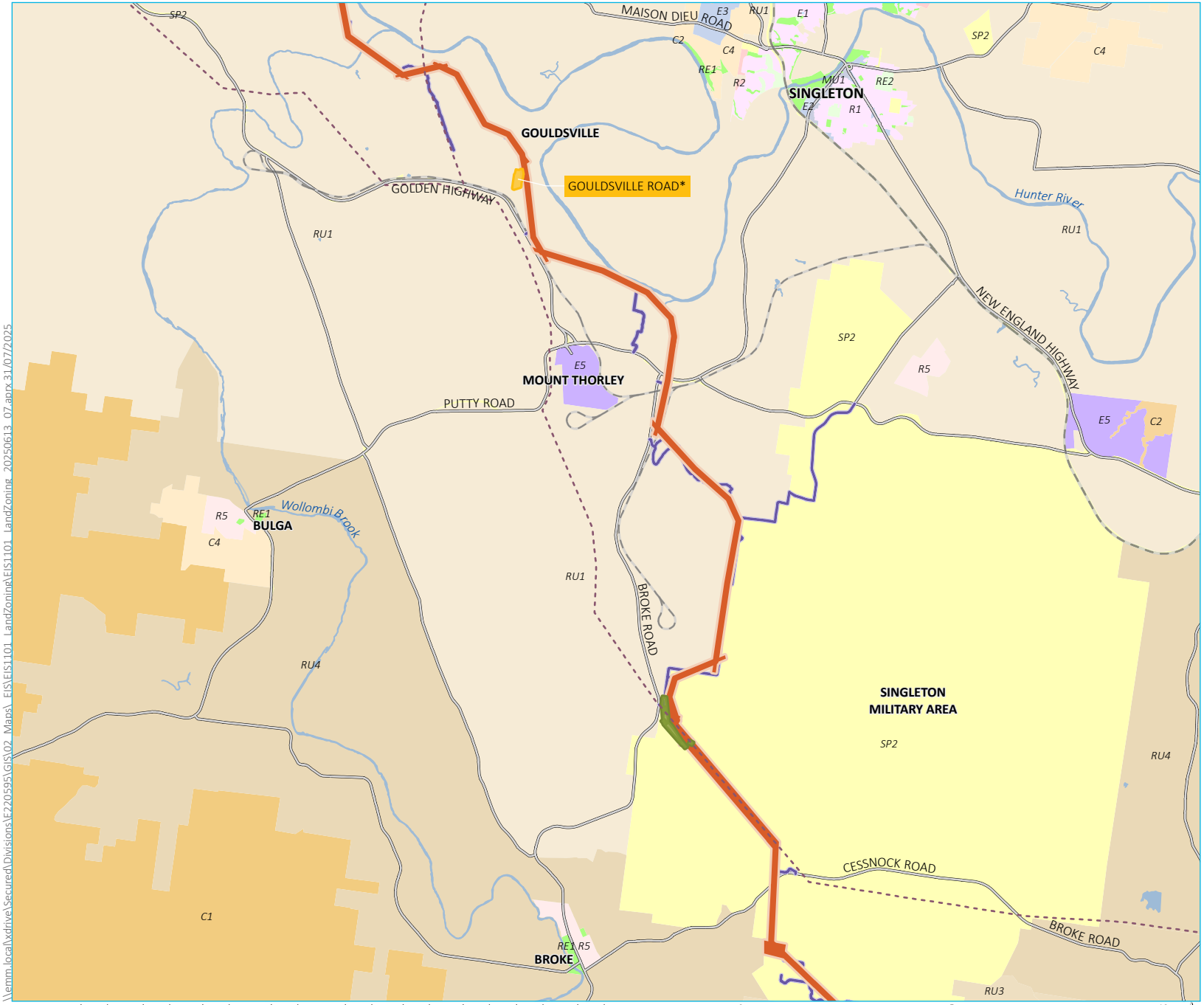

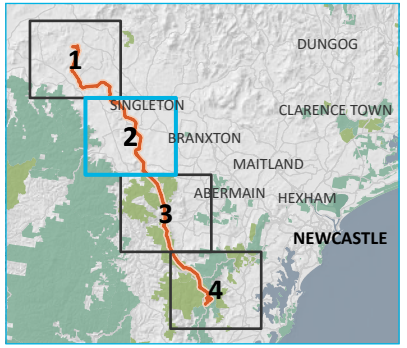

KEY

- C1 National Parks and Nature Reserves
- C2 Environmental Conservation/ Management
- C4 Environmental Living
- E1 Local Centre
- E2 Commercial Centre
- E3 Productivity Support
- E5 Heavy Industrial
- MU1 Mixed Use
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU3 Forestry
- RU4 Primary Production Small Lots
- SP2 Infrastructure

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

Land zoning within and surrounding the project impact area
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.1

EMM
creating opportunities

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

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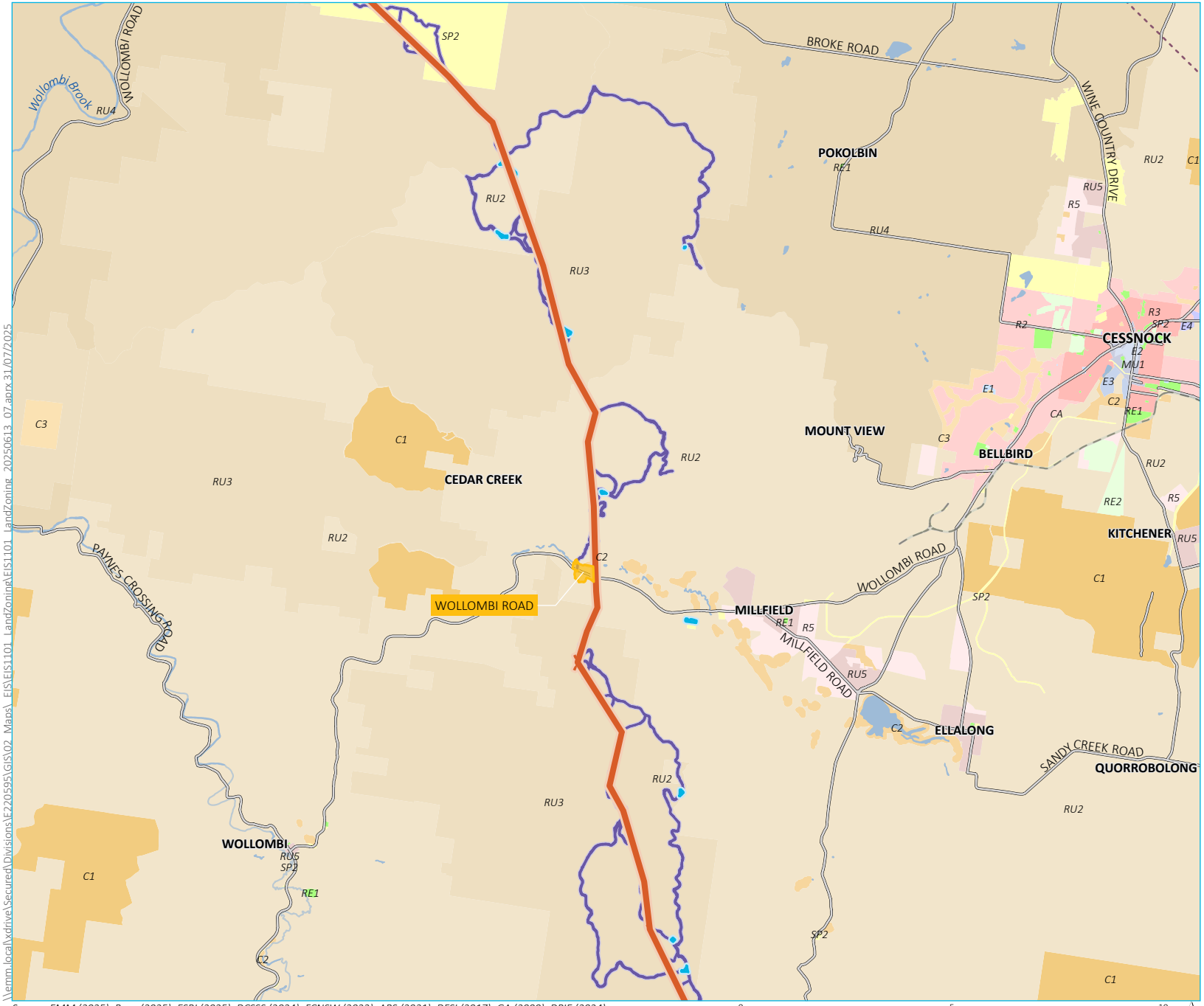

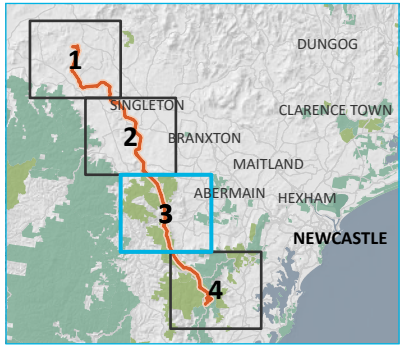

KEY

- C1 National Parks and Nature Reserves
- C2 Environmental Conservation/ Management
- C3 Environmental Management
- E1 Local Centre
- E2 Commercial Centre
- E3 Productivity Support
- E4 General Industrial
- MU1 Mixed Use
- R2 Low Density Residential
- R3 Medium Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- RU3 Forestry
- RU4 Primary Production Small Lots
- RU5 Village
- SP2 Infrastructure

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

Land zoning within and surrounding the project impact area
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.1

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

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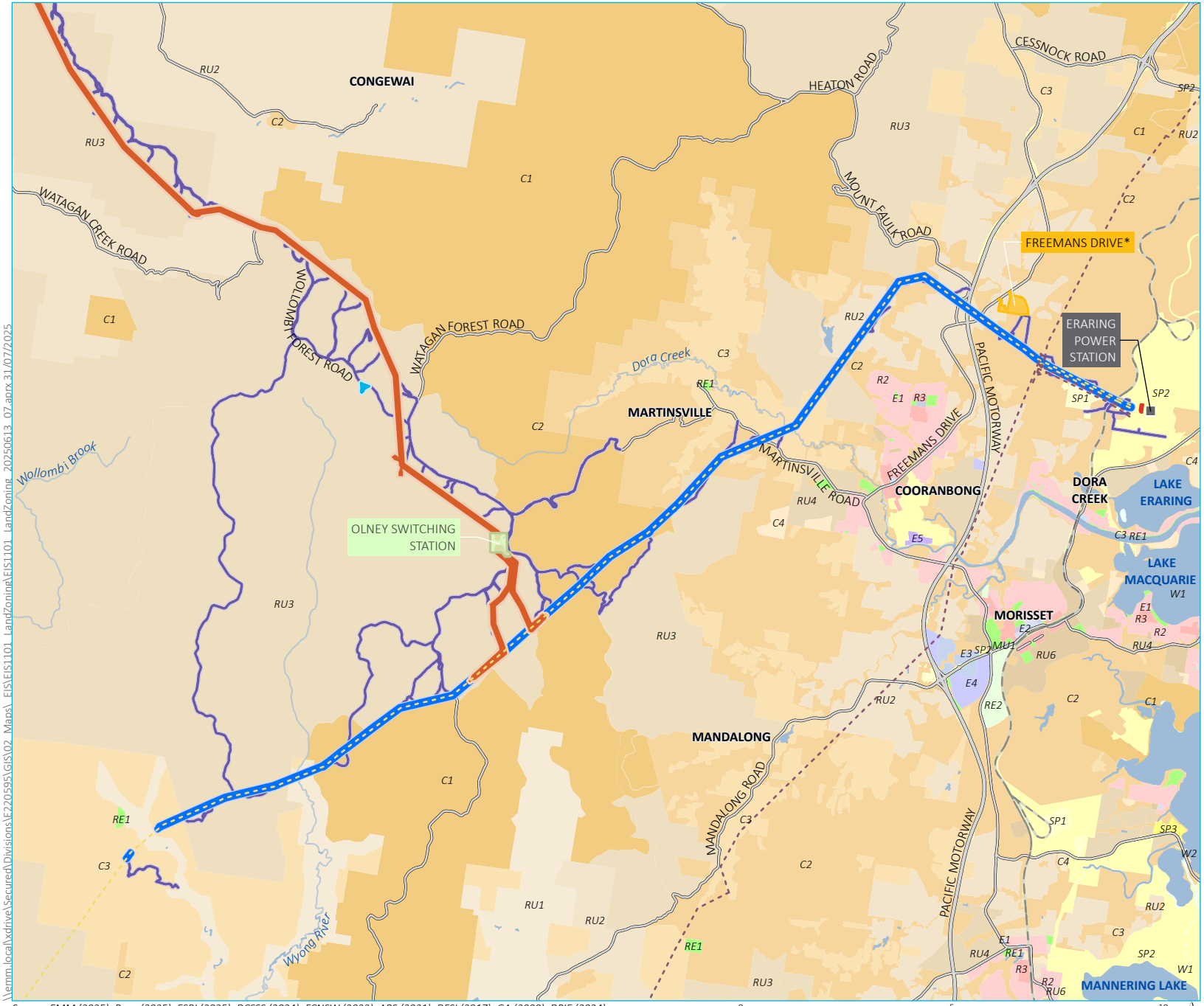
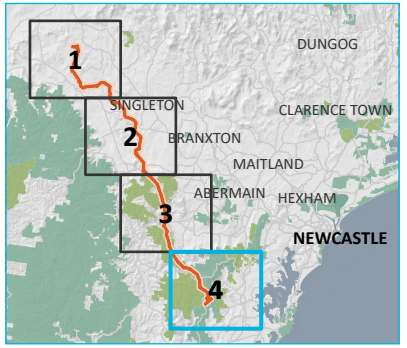
creating opportunities





KEY

- C1 National Parks and Nature Reserves
- C2 Environmental Conservation/ Management
- C3 Environmental Management
- C4 Environmental Living
- E1 Local Centre
- E2 Commercial Centre
- E3 Productivity Support
- E4 General Industrial
- E5 Heavy Industrial
- MU1 Mixed Use
- R2 Low Density Residential
- R3 Medium Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- RU3 Forestry
- RU4 Primary Production Small Lots
- RU6 Transition
- SP1 Special Activities
- SP2 Infrastructure
- SP3 Tourist
- W1 Natural Waterways
- W2 Recreational Waterways

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

Land zoning within and surrounding the project impact area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.1

EMM
creating opportunities

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

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12.2.2 Land use

The primary mapped land use within the project impact area is production native forestry, which makes up around 29.1% of the project impact area. Other major land uses include grazing native vegetation and grazing modified pastures. The total mapped area of agricultural land use is around 874 hectares or 37% of the project impact area. It is noted, however, that around 76% of the mapped agricultural land use (667 hectares) also functions as buffer land to mining operations or is owned by mining or energy companies and leased for agricultural purposes.

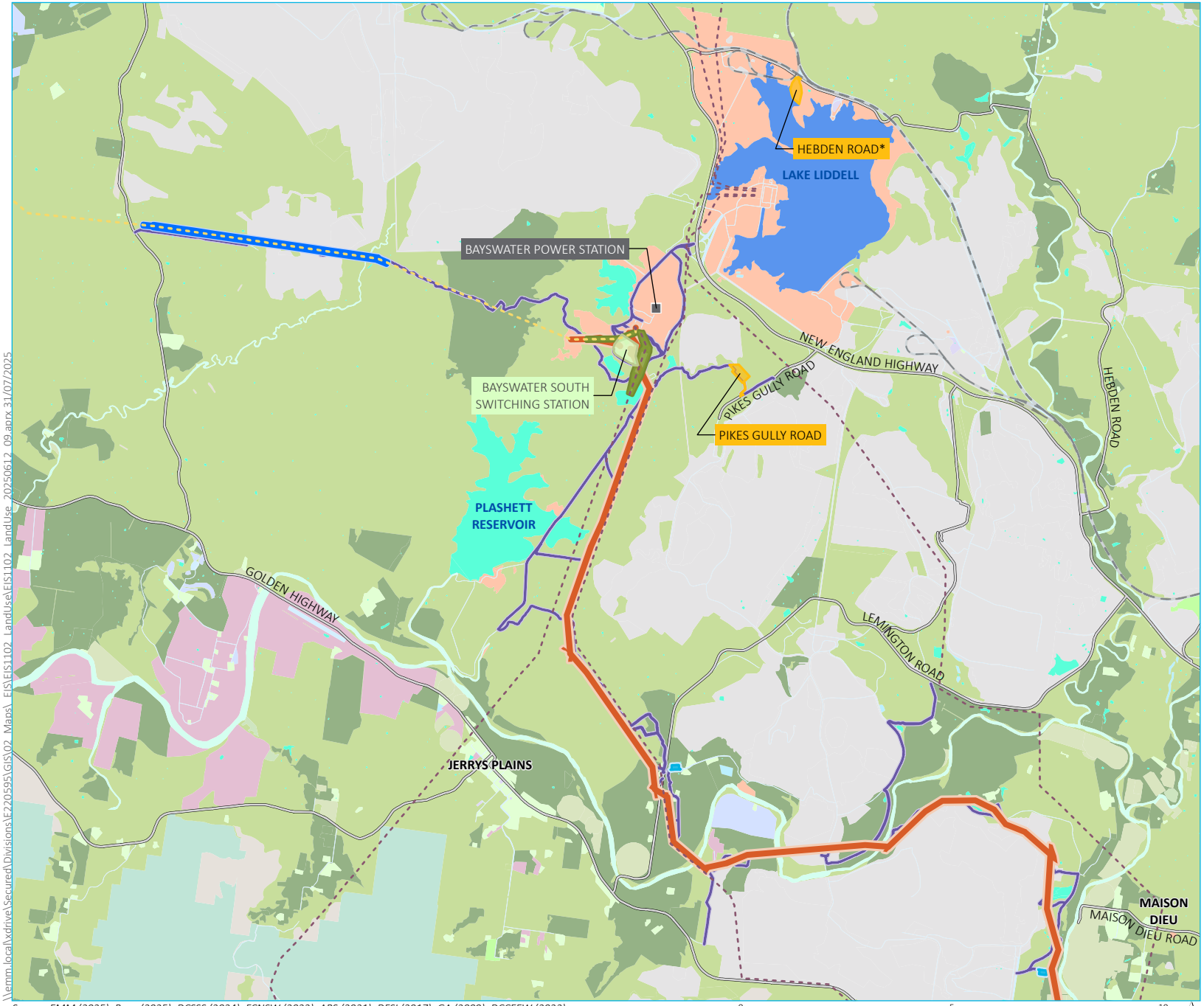
Land use within the project impact area is outlined in Table 12.1 and Figure 12.2.

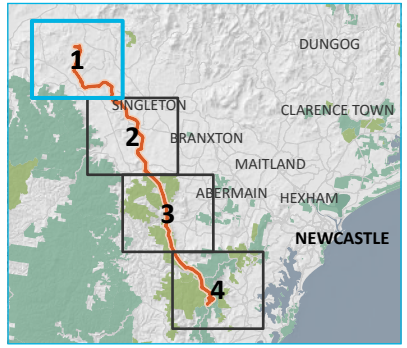
Table 12.1 Land use within the project impact area

Land use	Area within the project impact area (ha)	Proportion of project impact area (%)
Production native forestry	685	29.1
Grazing native vegetation	557	23.7
Grazing modified pastures	258	11.0
Other minimal use[1]	199	8.4
Utilities	128	5.4
Transport and communication	114	4.9
Services	108	4.6
Mining	97	4.1
Nature conservation	60	2.6
Grazing irrigated modified pastures	57	2.4
Plantation forests	43	1.8
Residential and farm infrastructure	27	1.1
River	9	<1
Reservoir/dam	7	<1
Other[2]	2	<1

1 'Other minimal use' refers to areas of land that are largely unused (in the context of the main use) but may have ancillary uses (e.g. there may be terrain features which make use difficult or prohibitive). This may also include Defence land, stock routes, residual native cover or land under rehabilitation or restoration.

2 'Other' includes cropping, perennial horticulture, lakes, manufacturing and industrial, and marsh/wetland.





KEY

Regionally mapped land use

- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 3.6.0 Land in transition
- 4.2.0 Grazing irrigated modified pastures
- 4.4.0 Irrigated perennial horticulture
- 5.2.0 Intensive animal production
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 6.1.0 Lake
- 6.2.0 Reservoir/dam
- 6.3.0 River

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

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Source: EMM (2025); Beca (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); DCCEEW (2023)

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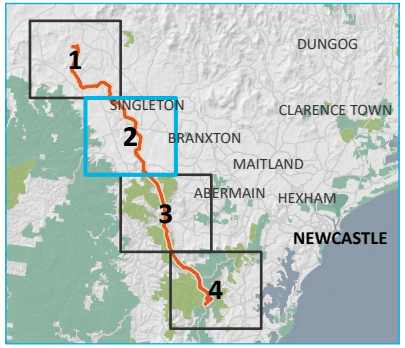
Land use within the project impact area Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.2

EMM
creating opportunities



KEY

Regionally mapped land use

- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 2.2.0 Production native forests
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 3.5.0 Seasonal horticulture
- 3.6.0 Land in transition
- 4.2.0 Grazing irrigated modified pastures
- 4.3.0 Irrigated cropping
- 4.4.0 Irrigated perennial horticulture
- 4.5.0 Irrigated seasonal horticulture
- 5.1.0 Intensive horticulture
- 5.2.0 Intensive animal production
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 5.9.0 Waste treatment and disposal
- 6.2.0 Reservoir/dam
- 6.3.0 River
- 6.5.0 Marsh/wetland

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

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Source: EMM (2025); Beca (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); DCCEEW (2023)

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Land use within the project impact area Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.2

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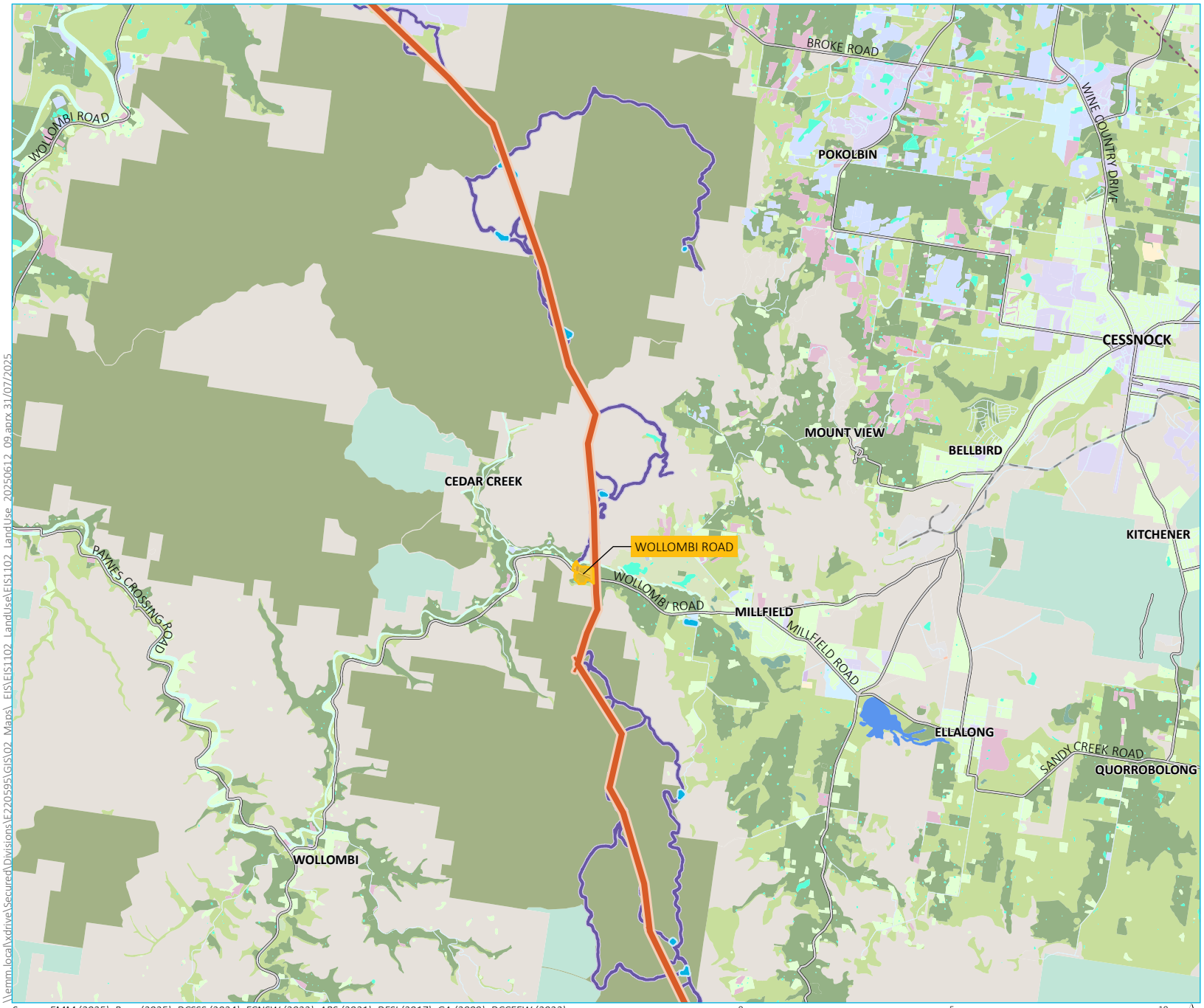
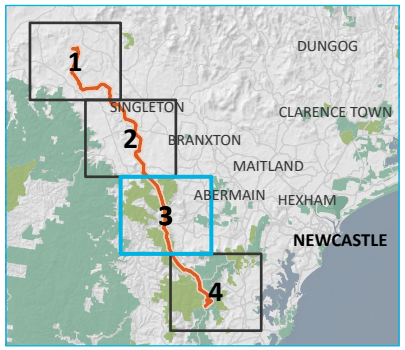
creating opportunities





KEY

Regionally mapped land use

- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 2.2.0 Production native forests
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 3.5.0 Seasonal horticulture
- 3.6.0 Land in transition
- 4.2.0 Grazing irrigated modified pastures
- 4.4.0 Irrigated perennial horticulture
- 5.2.0 Intensive animal production
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 5.9.0 Waste treatment and disposal
- 6.1.0 Lake
- 6.2.0 Reservoir/dam
- 6.3.0 River
- 6.4.0 Channel/aqueduct
- 6.5.0 Marsh/wetland

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

Source: EMM (2025); Beca (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); DCCEEW (2023)

0 5 10 km

GDA2020 MGA Zone 56

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Land use within the project impact area Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.2

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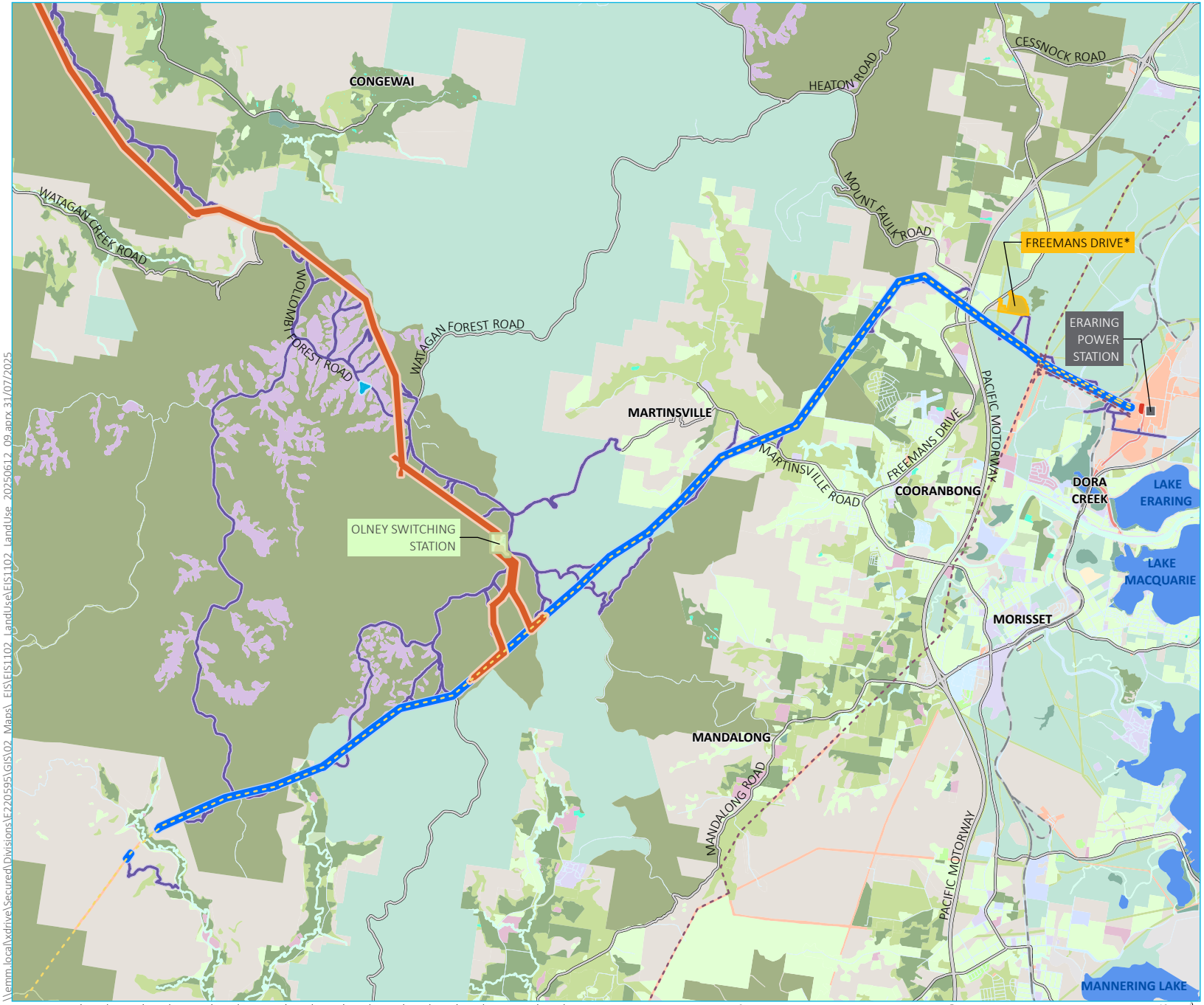

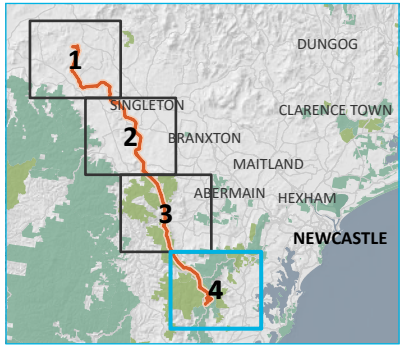

KEY

Regionally mapped land use

- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 2.2.0 Production native forests
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- 3.4.0 Perennial horticulture
- 3.6.0 Land in transition
- 4.2.0 Grazing irrigated modified pastures
- 5.1.0 Intensive horticulture
- 5.2.0 Intensive animal production
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 5.9.0 Waste treatment and disposal
- 6.1.0 Lake
- 6.2.0 Reservoir/dam
- 6.3.0 River
- 6.4.0 Channel/aqueduct
- 6.5.0 Marsh/wetland

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

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Source: EMM (2025); Beca (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009); DCCEEW (2023)

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Land use within the project impact area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 12.2

EMM
creating opportunities

12.2.3 Property

Land tenure

Land tenure within the project impact area includes areas of freehold land, State forests, mining lands, land managed by NSW National Parks and Wildlife Service (NPWS), as well as land owned by councils, the NSW Government and the Australian Government.

Around 910 hectares or 38.7% of the project impact area consists of freehold land under the ownership of mining or energy companies. Around 826 hectares or 35.1% of the project impact area is owned by the NSW Government, with 770 hectares of this owned or managed by the Forestry Corporation of NSW (FCNSW).

Freehold land under the ownership of private individuals or companies makes up 300 hectares or 12.8% of the project impact area.

Land tenure throughout the project impact area is detailed further in Table 12.2.

Table 12.2 Land tenure within the project impact area

Ownership	Area		Parcels of land	Landholdings
	Hectares	% of project impact area		
Freehold – mining and energy	910	38.7	188	11
NSW Government[1]	826	35.1	N/A	1
Australian Government	245	10.4	25	1
Freehold – private individuals	180	7.7	146	110
Freehold – private companies	120	5.1	20	15
Local government[2]	35	1.4	52	4
Crown land	35	1.5	24	1

[1] Includes all State forests, National parks and land owned by State government authorities.

[2] Includes council public roads and land owned by the local government authority.

As is outlined in Table 12.2, a total of 125 private freehold landholdings (one or more parcels of land under the same ownership) are located within the project impact area. Private freehold landholdings (individual or company) within the project impact area includes landholdings:

- in the northern portion of the project impact area adjacent to existing mining operations
- landlocked within, and to the east of Pokolbin State Forest
- between Pokolbin State Forest and Corrabare State Forest to the west of Millfield
- to the east of Corrabare State Forest
- between the northern and southern areas of Watagan State Forest

- between Olney State Forest and the M1 Pacific Motorway, where the project impact area includes existing transmission line upgrades within an existing Transgrid easement (see *section 12.2.10)*.

Around 188 parcels (consisting of 11 landholdings) are owned by mining companies or related to energy infrastructure. Most of these areas are associated with 8 mining operations - Mt Arthur Coal Mine, Maxwell Underground Mine, Hunter Valley Operations (HVO), Mount Thorley Warkworth, Bulga Coal Mine and Centennial Coal, or associated with the Bayswater and Eraring power stations (AGL, Transgrid, Eraring Energy). Some land in the northern portion of the project impact area is owned by adjacent mining complexes, however, this land is privately leased for agricultural purposes.

Native title

A search of the National Native Title Tribunal on 11 November 2024 identified no known native title claims under the *Native Title Act 1993* (Commonwealth) or any Indigenous Land Use Agreements relevant to the project impact area.

12.2.4 Agriculture

Agricultural land within the project impact area covers around 874 hectares, representing 37% of the project impact area. This includes around 817 hectares of dryland agricultural areas and 57 hectares of irrigated agricultural land. As described in *Technical Report 5 – Agriculture impact assessment*, most of the grazing land is on mid to lower slope landscapes and rehabilitated mining land, with smaller areas on highly fertile alluvial soils adjacent to the Hunter River in the northern portion of the project impact area. Rehabilitated land which is not subject to disturbance within the mine owned lands is assumed to consist of beef cattle grazing enterprises, consistent with the surrounding locality as the dominant agricultural enterprise.

In NSW there are several methods to assess land capability for agricultural purposes. As outlined in *Technical Report 5 – Agriculture impact* assessment, the primary method used as part of the EIS is the *Land and Soil Capability Assessment Scheme* (OEH 2012) (referred to as the LSC scheme), which uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards. The LSC scheme establishes 8 classes, with Class 1 representing land capable of sustaining the most intensive land uses (such as irrigation and cropping), and Class 8 representing land that can only sustain very low intensity land uses (such as nature conservation).

Most of the project impact area (76%) is characterised as being of very-low to moderate-low capability land. Only a small proportion of the project impact area is considered high (8%) or moderate (11%) capability land. The highest quality land for agriculture is generally located in the northern portion of the project impact area within the alluvial landscapes near the Hunter River.

In addition to the LSC scheme, the NSW Government has mapped biophysical strategic agricultural land (BSAL) as a way of assessing land capability for agricultural purposes. BSAL is land with a rare combination of natural resources which are highly suitable for agriculture. There is an extent of 213 hectares of mapped BSAL within the project impact area, which occurs in general association with alluvial soil landscapes long the Hunter River in the northern portion of the project impact area.

Further information on the agricultural land capability, agricultural enterprises and productivity within the project impact area and LGAs is included in *Chapter 13 (Agriculture)* and *Technical Report 5 – Agriculture impact assessment*.

12.2.5 State forests

As outlined in *section 12.2.2*, production native forestry is the dominant land use throughout the project impact area, especially in the central and southern portions. The project impact area includes around 764 hectares of land across 4 State forests, which are managed by the FCNSW.

FCNSW use a classification system (Forest Management Zones 1-8) to identify how State forests are managed in NSW. A description of the land uses within the State forests that intersect with the HTP are detailed in Table 12.3.

Table 12.3 Description of State forests that intersect with the project

State forest	Description
Pokolbin State Forest	Pokolbin State Forest covers around 14,000 ha in the central portion of the project impact area. It borders the Singleton Military Area to the north and private landholdings around Wollombi Road to the south. Two large private landholdings are located within its central portion, with access to the properties being via Broken Back Trail. Pokolbin State Forest forms part of the hardwood forest division and mostly consists of General Management (Zone 4) and Harvest Exclusion (Zone 3a). Smaller areas of Special Protection (Zone 1 – Visual Aesthetics and Zone 3B - Flora) are located in the northeastern portion, including and to the east of Broken Back Road. There are currently no harvest plans available for the Pokolbin State Forest. The project impact area mostly intersects General Management (Zone 3) with smaller patches identified as Harvesting Exclusion (Zone 3a).
Corrabare State Forest	Corrabare State Forest covers around 5000 hectares and is located between Watagan State Forest and the Corrabare North Flora Reserve in the central portion of the project impact area. It forms part of the hardwood forest division and mostly consists of General Management (Zone 4) and Harvest Exclusion (Zone 3a – Flora). There are currently no harvest plans available for the Corrabare State Forest. The project impact area mostly intersects General Management (Zone 2) and small areas identified as Harvesting Exclusion (Zone 3a), typically associated with creeks and gullies.
Watagan State Forest	Watagan State Forest covers around 3230 hectares in the southern portion of the project impact area and is located between Corrabare State Forest to the north and Olney State Forest to the south. It forms the northern extent of a line of State forests (including Olney State Forest) with well-established recreational facilities. The northern portion of the Watagan State Forest mostly consists of General Management (Zone 4), Harvest Exclusion (Zone 3a) and Special Management (Zone 2 - Flora). A small area of Special Prescription (Zone 3B – Tourism/Recreation) located along Langans Road and Cabans Road. The southern portion of the Watagan State Forest contains large areas of Hardwood plantation (Zone 5) currently under active harvest. The project impact area mostly intersects General Management (Zone 2) and Hardwood plantation (Zone 5).

State forest	Description
Olney State Forest	Olney State Forest is located immediately south of Watagan State Forest and covers around 17,500 ha. It mostly consists of area under General Management (Zone 4), however also features several harvest areas and plantation forests (Hardwood Plantations - Zone 5), free picnic and camping areas, and walking trails (Special Protection – Zone 3B), and areas zoned for non-forestry use (Zone 7). Small areas of Special management (Zone 2 – Wildlife) are located along some creeks and gullies. The project impact area mostly intersects General Management (Zone 4) with smaller areas of Special Management (Zone 2) typically associated with creeks and gullies. At the southern extent of the Onley State Forest the project impact area intersects areas of Non-Forestry (Zone 7), associated with the easement for the existing Transmission line 5A1/ 5A2 (see Table 12.6)

12.2.6 Mining and exploration

The project impact area includes areas covered by mining leases, mining lease applications and mining exploration licences. These leases and licences allow the holder to undertake mining, exploration or prospecting for minerals and petroleum within a specified area. Most of these leases and licences are in the northern portion of the project impact area, with smaller areas in the central and southern portions of the project impact area.

Mine operations and mining leases

Five coal mining complexes are located within the northern portion of the project impact area. These mining complexes include Mount Arthur Coal, Maxwell Underground Coal Mine, HVO, Mount Thorley Warkworth, and Bulga Coal Mine. Mining leases, associated with these mining complexes, make up around 360 hectares of the project impact area. Operations at these mining complexes generally include:

- active surface pits
- current and historical underground mine workings
- haulage and access roads
- materials loading and transport infrastructure (including conveyors and rail infrastructure)
- water management systems
- administration, workshops and storage areas
- rehabilitation and biodiversity offset areas.

Land owned by these mining operators, that is not part of the mining lease areas, makes up around 670 hectares of the project impact area. Mining complexes and mining leases within the project impact area are detailed in Table 12.4.

Table 12.4 Mining complexes and mining leases within and surrounding the project impact area

Mining complex	Description of mine operation	Mine owned land within the project area (ha)	Mine leases within the project impact area
Mount Arthur Coal Mine	Mount Arthur Coal Mine is an open cut coal mine located to the northwest of the Bayswater Power Station. Mining operations commenced in 2002, consisting of northern and southern open cut areas. The mining complex is approved to operate until 2026; however BHP has submitted a modification application to extend the life of the mine until 2030, which is currently under assessment. The project impact area intersects the Mount Arthur Coal Mine in an east-west direction within the existing Transgrid transmission line easement.	52	ML1358, ML1593 (52 ha)
Maxwell Underground Coal Mine	The Maxwell Underground Coal Mine is located to the west of Bayswater Power Station, and to the south and east of the Mount Authur Coal Mine. The mine site consists of 2 areas – Maxwell Underground to the south, and Maxwell Infrastructure to the north, with a transport and services corridor linking the 2 areas. The mine has operational approval until 2047. The project impact area intersects the Maxwell Underground Coal Mine in an east-west direction across the transport and services corridor within the existing Transgrid transmission line easement.	1	ML1820 (<1 ha)
Hunter Valley Operations	The HVO mining complex consists of 2 open cut coal mine operations (HVO North and HVO South) located between the Golden Highway and the New England Highway west of Singleton. HVO North and HVO South are separated by the Hunter River. HVO North has operational approval until 2030 and HVO South has operational approval until 2025, however HVO is currently seeking planning approval for the HVO Open Cut Coal Continuation Project, which would seek to extend the operations at HVO North until 2045 and at HVO South until 2050. The project impact area crosses between HVO North and HVO South adjacent to the Hunter River and Wollombi Brook.	422	ML1705, ML1706, CCL755, ML1840, ML1841, ML1682, ML714, CCL714, CL359, CL360, CML4, ML1634, ML1324 (200 ha)

Mining complex	Description of mine operation	Mine owned land within the project area (ha)	Mine leases within the project impact area
Mount Thorley Warkworth	The Mount Thorley Warkworth mining complex consists of 2 open cut coal mines located west of the Golden Highway. These coal mines have been in operation since 1981 and have operational approval until 2037. The project impact area intersects Mount Thorley Warkworth in a north-south direction and crosses the mine lease area between the Golden Highway and the Hunter River.	53	CCL753 (36 ha)
Bulga Coal Mine	Bulga Coal Mine is an open cut coal mining operation located on Broke Road to the south of the Mount Thorley Warkworth mining complex. It consists of 4 pits and associated mining and transportation facilities. The mining complex has been in operation since 1982. Previous underground mining at Bulga Coal Mine ceased in 2018, with only open cut mining remaining with operational approval through to 2039. The project impact area intersects the Bulga Coal Mine in a north-south direction to the east of the mine pit areas between Broke Road and the Singleton Military Area.	143	ML1717, CL224, ML1547 (70 ha)
Centennial Coal/ Newstan	The southern portion of the project impact area crosses land owned by Centennial Coal, near the Eraring Power Station. Centennial Coal operates the Mandalong Coal Mine to the south, as well as the former Newstan coal operation to the north (currently in a care and maintenance stage). Centennial Coal also own and operate the Cooranbong Entry Site Coal Stockpile. This stockpile is located immediately to the south of the project impact area (east of Eraring Power Station) and is the subject of a modification currently under regulatory assessment. The Centennial Coal/Newstan mining leases extend beyond Centennial Coal/Newstan owned land into Crown land, land owned by the NSW State Government (including road and rail corridors) and privately owned land. The project impact area intersects the mine lease area in an east-west direction within the existing Transgrid transmission line easement.	32	CCL746, CCL762, ML1793 (42 ha)

Mining complex	Description of mine operation	Mine owned land within the project area (ha)	Mine leases within the project impact area
Others	Other mine lease holders within the project impact area include the following underground mining operators: • Ashton Underground Mine – White Mining (NSW) Pty Ltd • Austar Underground Coal Mine (Closed) – Austar Coal Mine Pty Ltd • Cumnock Underground Mine – Cumnock Management Pty Ltd. The project impact area intersects areas of these mine leases in the northern and central portions of the project impact area in areas associated with project upgrades to public roads and intersection as well as project access tracks. This land is owned predominately by Ravensworth Operations with the balance within public road corridors or privately owned.	2	ML1623, ML1533, CCL775, CCL752, ML1669 (3 ha)

Mineral exploration licences

The project impact area includes extensive areas covered by exploration licences and mining leases. These leases and licences allow the holder to undertake mining, exploration or prospecting for minerals and petroleum within a specified area. A summary of all mineral exploration leases and licences within the project impact area is provided in Table 12.5.

Table 12.5 Mineral exploration leases and licences within the project impact area

Licence number(s)	Licence type	Holder	Year of expiry	Location
EL6705	Exploration licence	Bloomfield Collieries Pty Ltd	2025	Lemington
EL6812	Exploration licence	Dellworth Pty Ltd	2028	Muswellbrook
EL9639	Exploration licence	Strategic Rare Earths Pty Ltd	2026	Muswellbrook
EL4918	Exploration Licence	White Mining (NSW) Pty Ltd	2027	Muswellbrook
EL9592	Exploration licence	Hunter Valley Geothermal Energy Pty Ltd	2028	Howick
AUTH72	Exploration authorisation	Coal & Allied Operations Pty Ltd; Anotero Pty Ltd	2027	Lemington
EL5417, EL8821, EL5291, EL8175, EL5606	Exploration licence	Coal & Allied Operations Pty Ltd; Anotero Pty Ltd	2024-2030	Lemington
AL34, AL33	Assessment lease	Coal & Allied Operations Pty Ltd; Anotero Pty Ltd	2026	Maison Dieu
EL9639	Exploration licence	Strategic Rare Earths Pty Ltd	2026	Muswellbrook
EL9460	Exploration licence	Mining and Energy Union	2028	Warkworth
AUTH444	Exploration authorisation	Wambo Coal Pty Ltd; Mining and Energy Union	2027	Jerrys Plains
EL5461	Exploration licence	Saxonvale Coal Pty Ltd; Nippon Steel Australia Pty Ltd	2026	Broke
EL7579, EL6123	Exploration licence	Monash Coal Pty Ltd	2025	Broke
EL4443	Exploration Licence	Centennial Mandalong Pty Ltd	2025	Cooranbong

Mine subsidence

Mine subsidence is a risk in areas subject to underground coal mining, as the land above can sink and fill the voided mine drifts causing tilts and strains on the ground surface. In areas where coal extraction has taken place, subsidence generally occurs within a relatively short time after extraction. The project impact area contains 2 mine subsidence districts, where there are potential subsidence risks from historical or current mining activities. These include:

- the Patrick Plains Mine Subsidence District, present within northern portion of the project impact area around Putty Road to the eastern boundary of the HVO mining complex
- the West Lake Mine Subsidence District, present within the southern portion of the project impact area between the Pacific Motorway and the Eraring Power Station.

Chapter 5 (Statutory context) provides details on approvals under the Coal Mine Subsidence Compensation Act 2017.

12.2.7 Commonwealth land

The Singleton Military Area is owned by the Australian Government and is located around 8 kilometres from Mount Thorley in the Singleton LGA. Around 245 hectares (1.8% of its total 13,500 hectares) is located within the project impact area. The Singleton Military Area consists of 2 areas:

- Lone Pine Barracks (located to the north of Broke Road)
- Singleton Training Area (which extends from Broke Road to the south beyond Cessnock Road to the northern boundary of the Pokolbin State Forest).

The Singleton Military Area includes Australian Department of Defence training infrastructure, remnant woodlands, grasslands and some rehabilitated areas of vegetation. Existing double circuit 330 kV transmission lines extend in an east to west direction across the Singleton Military Area parallel to Cessnock Road, before extending in a northwest direction towards Bulga Coal Mine.

12.2.8 National parks and other conservation land managed by NSW NPWS

The project impact area includes around 93 hectares of land managed by NSW NPWS, including the Corrabare North Flora Reserve and the Jilliby State Conservation Area. The project impact area does not impact the Corrabare South Flora Reserve or the Watagans National Park.

Corrabare North Flora Reserve is located in the southern portion of the project impact area. It covers an area of around 774 hectares and is located at the northern end of the Corrabare State Forest. The landscape of the flora reserve consists of rocky outcrops and caves as well as intermittent streams. Flora reserves were established under the *Forestry Act 2012* and remain State forest estate, however the management of the Corrabare North Flora Reserve is the responsibility of the NSW NPWS.

The Jilliby State Conservation Area was established in 2003 and covers an area of around 12,159 hectares. Located on the western edge of the Watagan Mountains, these areas contain diverse forest and several threatened flora species, and provide habitat for 16 listed threatened species including populations of endangered Brush Tailed Rock Wallaby, Yellow Bellied Glider, Giant Barred Frog and the Stuttering Frog. In addition to the natural values, these areas also contain significant

scenic values, significant Aboriginal cultural heritage sites and places, and areas of recreation and tourism (NPWS 2010).

12.2.9 Crown land

The project impact area includes around 35 hectares of Crown land, and less than 2 hectares of land designated as travelling stock reserve (TSR). TSRs are a network of land parcels established more than 150 years ago to allow livestock to move to and from markets. They are commonly managed by the local land services (LLS) under the *Local Land Services Act 2013* and can be either linear or associated with public road or Crown land lots. While TSRs are less frequently utilised for their original purpose, they remain important in landscape connectivity, cultural heritage, emergency management, recreation and for biodiversity conservation.

Most of the Crown land is in the southern portion of the project impact area between the Pacific Motorway and the Eraring Power Station. The remaining areas of Crown land and TSRs are associated with Crown roads and watercourses, including the Hunter River, Congewai Creek and Wollombi Brook.

In NSW, the *Aboriginal Land Rights Act 1983* provides a process through which Aboriginal Land Councils may claim Crown land. The project impact area does not contain any areas of Crown land which are subject to any undetermined Aboriginal land rights claims.

12.2.10 Infrastructure and utilities

Transport infrastructure

The State roads within and surrounding the project impact area are the Golden Highway and the M1 Pacific Motorway. The Golden Highway would be crossed by the project and would also be used to access construction work areas. Upgrades are proposed to the existing 500 kV transmission line that crosses the M1 Pacific Motorway in Cooranbong (near the proposed Freemans Drive construction support site). Smaller regional and local roads are located throughout the project impact area, which would provide access to the construction work areas as well as links to nearby towns and properties.

The northern portion of the project impact area crosses the Whittingham to Mount Thorley rail line (at 2 locations) managed by the Australian Rail Track Corporation (ARTC). This rail line provides coal transport from the Mount Thorley Warkworth mining complex and the Bulga Coal Mine.

The project impact area also crosses rail infrastructure, including the Sydney to Newcastle rail line (which supports both passenger and freight transport) in the southern portion managed by Transport for NSW.

Further detail on the transport network within and surrounding the project impact area is provided in *Chapter 11 (Traffic and transport)*.

Power generation

The Bayswater Power Station is located at the northern end of the HTP corridor. This is a coal-fired power station owned and operated by AGL. The power station site contains 4 132-metre-high cooling towers, generators, as well as associated infrastructure including the Bayswater substation, transmission line infrastructure, and dam and wastewater facilities. The project impact area includes

around 195 hectares of land owned by AGL associated with the Bayswater Power Station. A portion of this area is occupied by existing energy transmission infrastructure, with the remaining areas forming a buffer to the power station, some of which is leased for agricultural activities (grazing). The Bayswater Power Station is scheduled to close between 2030 and 2033, in line with AGL's *Climate Transition Action Plan* (AGL 2022).

The Eraring Power Station, owned and operated by Origin Energy, is located east of the southern portion of the project impact area and consists of coal-fired and diesel generating units. The project impact area includes around 8.5 hectares of land associated with the Eraring Power Station. Most of this is occupied by existing energy transmission infrastructure including the Eraring substation, as well as transmission line easements and an access road. Eraring Power Station is scheduled to cease operations in 2027.

Electrical infrastructure

Existing electrical infrastructure within the project impact area is summarised in Table 12.6.

Table 12.6 Electrical infrastructure within the project impact area

Electrical infrastructure	Asset owner	Description
Transmission line 5A3	Transgrid	500 kV transmission line that extends from Bayswater Power Station to the Mt Piper substation
Transmission line 5A4	Transgrid	500 kV transmission line that extends from Bayswater Power Station to the Wollar substation
Bayswater substation	Transgrid	Substation at the Bayswater Power Station
Transmission line 31	Transgrid	330 kV transmission line that extends from the Bayswater substation to the Regentville substation
Transmission line 32	Transgrid	330 kV transmission line that extends from the Bayswater substation to the Sydney West substation
Transmission line 81	Transgrid	330 kV transmission line that extends from the Liddell substation to the Newcastle substation
Transmission line 82	Transgrid	330 kV transmission line that extends from the Liddell substation to the Tomago substation (Tomago aluminium smelter)
Transmission line 5A1/ 5A2	Transgrid	Twin 500 kV transmission lines that extend from the Eraring substation to the Kemps Creek substation
Eraring substation	Origin	Substation at the Eraring Power Station
Other transmission lines	Ausgrid/mining operations	Other lower voltage lines including (but not limited to): • 132 kV transmission line that extends from the Redbank substation to the Rothbury substation • 132 kV transmission line that extends from the Singleton substation to the Mitchell substation • Mining transmission assets

Pipeline infrastructure

The Sydney to Newcastle gas pipeline is located adjacent to the M1 Pacific Motorway in the southern portion of the project impact area (within an existing Transgrid transmission easement). The project impact area intersects this gas pipeline where the existing Transgrid transmission easement (line 5A1/5A2) crosses the M1 Pacific Motorway.

12.3 Potential impacts – construction

12.3.1 Land use changes

The project would result in changes to the use of land within the project impact area. The construction and operation of the project would have similar types of property and land use impacts, however in most cases the spatial extent and intensity of impacts would be greater during construction.

The construction impact area comprises a total of around 2351 hectares and includes all land required to support the construction of the project.

At the start of construction, the current land use within the construction impact area may be disrupted, either permanently in locations where permanent infrastructure is being constructed (e.g. switching stations, and transmission towers) or temporarily while construction activities take place (e.g. at construction support sites, laydowns and access tracks). Construction impacts would be temporary and most existing land uses would resume at the conclusion of construction, subject to restrictions for safety and operational reasons. It is noted that construction of the project may occur in stages, and not all areas would be impacted for the entire duration of construction.

The impacts to land use because of different project elements during the construction phase is further outlined in Table 12.7. It is noted the total areas of impact exceeds the overall construction impact area due to overlap in some project elements, such as access tracks within the HTP corridor.

The location of project elements (including the HTP corridor) has been refined based on engagement with landowners and stakeholders to minimise land use conflicts and impacts on people and the environment.

Chapter 3 (Alternatives and options) of the EIS provides details on the selection of the preferred HTP corridor, as well as the selection and refinements to the location of key project elements. Additional details on community and stakeholder engagement are described in *Chapter 6 (Engagement).*

Table 12.7 Construction phase land use impacts of different project elements

Project element	Area of impact (ha)	Construction land use impacts
HTP corridor, including new transmission line, towers and stringing sites	1700	Construction of the project would require the temporary exclusion of the existing land as construction work progresses through the HTP corridor. Land use within the HTP corridor would change from the existing land use (as described in *section 12.2.2*) to a construction site. It is noted that construction of the project would be staged, meaning land use changes would not occur across the entire HTP corridor at the same time. While most of the HTP corridor would be temporarily impacted, the exception would be the land required for project elements such as new transmission towers or where new access roads are constructed. At these locations, the change in land use to electrical infrastructure or roadways would become permanent (operational impacts are further discussed in *section 12.4.1*).
Access tracks – new	102	To facilitate construction of the project, new access tracks would be constructed. This would typically include earthworks, grading, drainage, and the construction of watercourse crossings. It may also involve some vegetation clearing or trimming. New access tracks would be required temporarily to support construction of the project. Permanent use of these access tracks may be required by the network operator (in consultation with landowners) for inspection and maintenance works in the transmission easement and switching stations.
Access roads and tracks – upgrades (including intersections)	296	Existing access tracks typically consist of unsealed property access tracks of varying conditions. These access tracks are anticipated to require more substantial work to allow their use during construction compared with existing conditions. Work would include earthworks, grading or resurfacing, widening or realignment, drainage works and upgrades to watercourse crossings, where required. Vegetation clearing may be required for widening work or where vegetation may be considered a roadside hazard. Upgraded access tracks would be required temporarily to support construction however can be restored to their previous conditions if requested by the landowner and the former land use can resume. Permanent use of these access tracks may be required by the network operator for inspection and maintenance works in the transmission easement and switching stations. Upgrades to public roads would be permanent.

Project element	Area of impact (ha)	Construction land use impacts
Access tracks – minor works	61	To facilitate construction of the project, the use of existing access tracks would be prioritised to minimise impacts from the construction of new tracks. This would include well-established unsealed forest tracks maintained by FCNSW or unsealed property access tracks, generally suitable for heavy vehicles. Some existing access tracks may be subject to maintenance activities or minor upgrades within the construction impact area, such as resurfacing or grading, or drainage work, as well as minor vegetation pruning or trimming. There would be no change to the existing land use where minor works on existing access tracks are required. There may be some temporary disruption to the use of these areas during construction, however these would be managed in consultation with landowners. On completion of construction the previous land use can resume.
Construction support sites	70	Five construction support sites (3 with temporary worker accommodation) would be established to support the construction of the project. There would be a temporary change in land use at these sites during construction. Land used for construction support sites, including temporary worker accommodation, would be returned to existing land uses on completion of construction, in accordance with conditions of approval and any agreements with landowners.
Laydown areas	16	Laydown areas would be established to allow for flexibility in construction and to minimise the need for vehicle movements to and from the construction support sites. Laydown areas would act as temporary staging, storage, and complex plant/equipment setup areas. They would also act as traffic control nodes during construction. Most of the laydown areas would be within the HTP corridor, however at some locations, laydown areas would be located adjacent to the HTP corridor or access roads. At these locations, there would be a temporary change in land use form the existing use to a construction ancillary site. On completion of construction these sites would be returned to their existing land use in accordance with conditions of approval and any agreements with landowners.
Substation upgrades	<1	To enable connection into the existing electricity supply system, upgrades to the existing Bayswater and Eraring substations would be required. However, given the works at these locations are consistent with the existing land use there would be no change in land use during construction and operation of the HTP.

Project element	Area of impact (ha)	Construction land use impacts
Switching stations	47	The new transmission line would connect into the electricity grid at 2 new 500 kV switching stations – the Bayswater South switching station and the Olney switching station. Bayswater South switching station would be located around 400 m southwest of the existing substation at Bayswater Power Station on land owned by AGL. Given the area currently supports energy infrastructure, the proposed new switching station would not represent a change in land use, temporarily or permanently. The Olney switching station would be located within the Olney State Forest. Construction of the switching stations would involve the installation of a 500 kV switchyard and supporting electrical components. Land use changes at this site would be permanent, with land use changing State forest to electrical infrastructure.
Adjustments and upgrades to existing transmission lines	327	Adjustments to the location of several 330 kV and 500 kV lines currently operated by Transgrid, as well as other lower voltage lines such as those operated by Ausgrid and mining infrastructure asset holders would be required to enable the construction of the project. These works are consistent with the existing land use therefore there would be no change in land use during construction and operation of the HTP

12.3.2 Property impacts

Construction of the project would require temporary access or acquisition of land within the construction impact area as follows:

- a temporary construction lease on freehold land to facilitate construction of the transmission line and towers
- temporary lease to facilitate access road/track upgrades and ancillary facilities on freehold land
- temporary construction lease through the Pokolbin, Corrabare, Watagan and Olney State forests, as well as the Corrabare North Flora Reserve
- temporary construction lease in the Singleton Military Area
- temporary lease of freehold land for the construction, operation and decommissioning of construction support sites at Hebden Road, Pikes Gully Road and Freemans Drive
- some permanent acquisition of freehold land to facilitate construction of permanent infrastructure. Acquisitions would be carried out in consultation with the landowner and in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*, and preferably by negotiated agreement. Impacts to private landowners are addressed in *Chapter 14 (Social)* and *Technical Report 6 - Social impact assessment*.
- temporary construction lease on freehold land for access to the HTP corridor during construction.

Construction of the project may require adjustments to property infrastructure (such as agricultural sheds, fencing and gates) or the reconfiguration of cropping lands where precision farming operations with permanent wheel tracks are undertaken. Any adjustments to fences, dams, access tracks or other property infrastructure required for the project would be undertaken in consultation with the landowner at no cost to the landowner, and would be managed through property management plans (see *section 12.5*). Property management plans would also address access requirements, any seasonal or operational restrictions and biosecurity measures.

12.3.3 Agriculture

The project has been refined based on engagement with landowners to minimise impacts on agriculture (see *Chapter 6 (Engagement)*).

Construction of the project would impact around 874 hectares of land mapped for agricultural land use. Most of this land is used for grazing purposes, with a small area of cropping lands anticipated to be impacted. Areas of BSAL within the construction impact area also have the potential to be impacted during construction activities, due to construction of the HTP corridor, construction of access tracks, and adjustments and upgrades to existing transmission lines. The temporary removal of agricultural land over around 874 hectares during construction represents around 0.4% of the total land used for agriculture in surrounding LGAs.

Construction of the project, including land requirements, would have a range of potential impacts on agricultural areas at different stages of construction and in different areas. Impacts would depend on the intensity of construction activities required and the construction activities being undertaken at any given time.

Land that is not permanently required for the operation of the project and has not been acquired for the construction of the project would be returned to its former use once construction activities have finished, in accordance with conditions of approval and any relevant property management plans. The continuation of existing land uses could occur in these areas, subject to some restrictions for safety and operational reasons.

Further details on the impacts of the construction of the project on agriculture are included in *Chapter 13 (Agriculture)* and *Technical Report 5 – Agriculture impact assessment*.

12.3.4 State forests

Construction of the project would impact around 764 hectares of State forest land. This would include:

- around 115 hectares within Pokolbin State Forest
- around 162 hectares within Corrabare State Forest
- around 236 hectares within Watagan State Forest
- around 251 hectares within the Olney State Forest.

Construction of the project would result in temporary impacts to State forests however on completion of construction, only the transmission line easement, new access tracks and the Olney switching station would be permanent, while the remainder of the construction impact area would return to its previous land use (see operational impacts *in section 12.4.4)*.

A breakdown of construction impacts within each of the State forests is provided in Table 12.8. The HTP corridor and location of project elements has been developed in consultation with FCNSW to avoid and minimize impacts on biodiversity, Aboriginal cultural heritage as well as impacts to active and future forestry operations (see *Chapter 6 (Engagement)*).

Table 12.8 Construction impacts within State forests

Project element	Construction impact areas within State Forests (hectares)			
	Pokolbin State Forest	Corrabare State Forest	Watagan State Forest	Olney State Forest
HTP Corridor	87	126	187	134
HTP Corridor – stringing site	2	2	6	22
Access road/track – new	6	10	5	4
Access road/track – upgrade	27	32	50	44
Access road/track – minor work	0	<1	<1	8
Construction support site	0	0	0	0
Laydown area	2	<1	1	2
Switching station	0	0	0	20
Adjustments/upgrades to existing transmission lines	0	0	0	60
Percentage of State forest impacted by construction of HTP	0.9	3.3	7.2	1.4

Construction of the project as described in *Chapter 4 (Project description)* would require vegetation clearing, with the level of physical disturbance and vegetation clearing requirements dependent on the project element. Where vegetation clearing is required within State forests, it is assumed that merchantable timber resources located within the construction impact area would be lost during construction. However, ongoing discussions are being held with FCNSW regarding opportunities for timber to be suitably harvested during construction for the commercial market.

The anticipated economic impacts of the construction of the project on forestry land uses are discussed in *Chapter 22 (Other matters)* and *Technical Report 19 – Economic impact assessment*. Consideration of impacts to biodiversity within the State forests from construction activities is included in *Chapter 8 (Biodiversity)* and *Technical Report 1 – Biodiversity development assessment report*.

A summary of consultation with FCNSW is outlined in *Chapter 6 (Engagement)*. FCNSW would continue to be consulted on construction methodologies and activities as part of continued design development, and prior to and during construction activities.

12.3.5 Mining and exploration

Mining operations

The HTP corridor has been developed in consultation with mine operators to avoid or minimise interactions with active mining areas and therefore minimising disruptions to mining operations during construction of the project (see *Chapter 3 (Alternatives and options)*).

Notwithstanding, the construction of transmission line towers, access roads, as well as activities such as the stringing of transmission lines may result in some temporary short-term disruption to some ancillary mining operations. These would be managed in consultation with mine operators to minimise any temporary impacts.

Impacts on mining complexes during construction of the project are further outlined in Table 12.9.

Table 12.9 Impacts on mining complexes from construction

Mining complex	Land use impacts during construction
Mount Arthur Coal Mine	The construction impact area includes around 52 ha of land within the mine lease areas for Mt Arthur Coal Mine. The temporary impacts are mostly associated with upgrades to the existing Transgrid transmission lines 5A3/5A4 which extend in an east-west direction within the ML1358 within the existing Transgrid transmission line easement. A small area within ML1593, associated with upgrades to existing access tracks, would also be temporarily impacted by the construction of the project. This area is outside the existing transmission line easement.
Maxwell Underground Coal Mine	The construction impact area includes less than one ha of land within the mine lease area for the Maxwell Underground Coal Mine. Similar to the Mt Arthur Coal Mine, the impacts are within the existing easement for the Transgrid transmission lines 5A3/5A4 which extend in an east-west direction through a small section of ML1820. The impacts at this location are limited to temporary access track upgrades only.
Hunter Valley Operations	The construction impact area includes around 422 hectares of land within the HVO mining complex, with around 200 ha of this being within HVO mining lease areas (ML1705, ML1706, CCL755, ML1840, ML1841, ML1682, ML714, CCL714, CL359, CL360, CML4, ML1634, ML1324). Most of the impacts from the construction of the project within the HVO mining complex would be associated with the construction of the HTP corridor and new and upgraded access tracks. Potential impacts would include: • approval conditions associated with the Hunter River Palaeochannel • future extraction areas and future infrastructure associated with the HVO continuation project • management of rehabilitation objectives, including those associated with tailings facilities.
Mount Thorley Warkworth	The construction impact area includes around 53 hectares of mine owned land associated with Mount Thorley Warkworth, with around 36 hectares of this being land within the Mount Thorley Warkworth mine lease area (CCL753). It is noted that most of the directly impacted areas are currently leased for agricultural purposes. The exception is a small area impacted by the proposed upgrade of the Golden Highway/Gouldsville Road intersection (see *Chapter 11 (Traffic and transport*)).

Mining complex	Land use impacts during construction
Bulga Coal Mine	The construction impact area includes around 143 hectares of mine owned land associated with the Bulga Coal Mine, with around 70 hectares of this being land within mine lease areas (ML1717, CL224, ML1547). The area of impact extends along the eastern boundary of the Singleton Military Area adjacent to mine water infrastructure, before extending northeast towards Broke Road and then to the north intersecting Putty Road.
Centennial Coal	The construction impact area includes around 32 hectares of land owned by Centennial Coal. The construction impact area includes around 42 hectares of mine lease area for Centennial Newstan and Centennial Mandalong (CCL746, CCL762, ML1793). However, most of this area is the existing Transgrid easement (associated with transmission line 5A1/5A2) and areas of leased open space currently used for agricultural purposes. As such these areas do not contain any operating mine infrastructure.

A summary of consultation with mine operators is outlined in *Chapter 6 (Engagement).* Mine operators and mine lease holders would continue to be consulted on construction methodologies and activities as part of continued design development, to explore all opportunities to minimise disruptions to mining operations.

Mineral exploration

The project would limit exploration activities within the construction impact area, and in some cases the immediate surrounding area due to safety requirements. Restrictions and limits to exploration activities would extend to both ground-based exploration (small scale drilling) as well as exploration undertaken via airborne survey methods, which use low flying helicopters or light aircraft (flying between 25 and 80 metres above the ground) with ground penetrating radar (NSW Government 2024). Given the size of the exploration licence areas (around 9400 hectares) relative to the construction impact area and the temporary nature of construction activities, these impacts are expected to be minor.

It is likely that exploration activities would be able to proceed adjacent to the construction impact area, or in another nearby part of the exploration license area. As such, a minor temporary impact may occur should an exploration license holder wish to undertake mining exploration activities within the construction impact area during construction.

The Department of Regional NSW – Mining, Exploration and Geoscience (MEG) and holders of exploration licenses have been contacted and provided information on the project and its potential interaction with mapped licence areas. EnergyCo responded to queries received and will continue to consult with MEG and licence holders during detailed design so that all opportunities to minimise impacts to exploration activities are considered.

Mine subsidence

Earthworks, including bored piling, would be undertaken to enable construction of the transmission line towers within the Patrick Plains and West Lake Mine district mine subsidence districts. Due to the location of the project and nature of the construction activities, approval is required from Subsidence Advisory NSW (SANSW) under section 22 of the *Coal Mine Subsidence Compensation Act 2017.*

Initial screening has identified areas where construction of the project has the potential to experience mining related effects, and where specific design considerations and appropriate construction methods may be required. Consultation with the Subsidence Advisory NSW has been undertaken as part of the design development and will continue throughout detailed design and construction planning.

12.3.6 Commonwealth land

The construction impact area includes around 245 hectares of land within the Singleton Military Area. This would include the HTP corridor and the associated construction of towers and stringing activities, as well as smaller areas required for the adjustment to the existing Transgrid 330 kV transmission line. The construction impact area also includes some new and upgraded access tracks within the Singleton Military Area. Impacts during construction would be temporary, except for land required for permanent project elements such as transmission towers.

The Department of Defence have been consulted during design development (see *Chapter 3 (Alternatives and Options)* and *Chapter 6 (Engagement)*) to identify a suitable route through the Singleton Military Area with consideration given to the potential impacts of the route on ongoing land use, existing infrastructure and services, as well as the environment and heritage.

12.3.7 Conservation land managed by NSW National Parks and Wildlife Service

The project has been designed to minimise impacts on biodiversity and conservation land managed by NPWS (see *Chapter 3 (Alternatives and options)*). Construction of the project would directly impact:

- around 30 hectares of the Corrabare North Flora Reserve, mostly associated with the construction of the HTP corridor
- around 55 hectares of the Jilliby State Conservation Area, mostly associated with adjustments and upgrades to existing Transgrid transmission lines, and access tracks
- around 8 hectares of other NPWS vested lands, associated with access track upgrades, and upgrades to existing transmission lines.

This would mean that around 3.9% of the Corrabare North Flora Reserve and around 0.5% of the Jilliby State Conservation Area, would be impacted by the construction of the project.

As described in *section 12.3.4,* construction of the project would require vegetation clearing, with the level of physical disturbance and vegetation clearing requirements dependent on the project element. As such given most of the construction impacts within Jilliby State Conservation Area would take place in the existing Transgrid transmission easement, impacts are expected to be minimal.

Within the Corrabare North Flora Reserve, most impacts are associated with the construction of the transmission lines and towers, which would involve vegetation clearing in the transmission line easement as described in *Chapter 8 (Biodiversity)* and *Technical Report 1 – Biodiversity development assessment report*.

A summary of consultation with NPWS is outlined in *Chapter 6 (Engagement)*. NPWS would continue to be consulted on construction methodologies and activities as part of continued design development, and prior to and during construction activities.

12.3.8 Crown land

Construction of the project would directly impact around 35 hectares of Crown land, as well as less than 2 hectares of land designated as a TSR. Impacts to TSRs are discussed further in *Chapter 13 (Agriculture)*.

Most of the Crown land impacted by construction would be in the southern portion of the project impact area, consisting of 5 parcels of land between the Pacific Motorway and Eraring Power Station. This part of the construction impact area is largely within the existing Transgrid transmission easement (transmission line 5A1/5A2), with some smaller areas associated with upgrades to existing access tracks. Given the proposed construction activities are consistent with the existing use of the land (i.e. transmission easement and access tracks) there would be no change to the existing land use during construction. During physical works there may be temporary access restrictions to the land for safety reasons. On completion of construction, existing access to this crown would return.

12.3.9 Infrastructure and utilities

Transport infrastructure

The construction impact area intersects several roads and rail lines including the Golden Highway, M1 Pacific Motorway, Sydney to Newcastle rail line and the Whittingham to Mount Thorley rail line.

All construction activities associated with new and upgraded transmission lines would be located outside of the existing transport corridors which would minimise impacts on road and rail operations.

During stringing of the new transmission line over roads, temporary traffic control would typically be required as a safety precaution, with specific arrangements to be confirmed in consultation with the relevant road authority and subject to the requirements of a road occupancy licence. Stringing activities over the Whittingham to Mount Thorley rail line (operated by ARTC) would be undertaken during rail maintenance periods or during rail possessions (periods during which rail lines are not in use) in consultation with each operator. As such, no disruptions to rail services are anticipated during construction of the project.

Upgrades on existing transmission lines (Line 5A1 and Line 5A2) would occur in existing easements which cross over the M1 Pacific Motorway and the Sydney to Newcastle rail line in Cooranbong. Stringing methodologies over these assets would be confirmed during detailed design. It is likely that traffic management would be required during stringing activities over the Pacific Motorway and a rail possession would be required to carry out stringing over the Sydney to Newcastle rail line

The construction impact area includes locations where road upgrades are required to cater for the construction vehicles associated with the HTP. During construction of these works, some travel disruption may be experienced due to potential lane closures and/or reduced speed limits and temporary traffic control. In most cases these works would be undertaken within the existing road corridor with no additional land required. In some instances, small areas of land acquisition is required to accommodate the required upgrade works. In these cases, there would be minor changes to existing land use at these properties.

The impacts of the project on the road and rail network, during construction is further addressed in *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport impact assessment.*

Power generation

Construction of the project would not impact land use and the operations at Bayswater or Eraring power stations.

Electrical infrastructure

The electrical infrastructure within the construction impact area is outlined in *Chapter 4 (Project description)*. Construction of the project would require the adjustment and upgrade of existing transmission lines (see *section 12.2.10*).

Given the land currently hosts electrical infrastructure the works required during construction are consistent with those expected in these locations, and there would be no impact on the existing land use during construction.

All adjustment and upgrade activities would be undertaken in consultation with individual asset owners. Where adjustments or relocations to electrical infrastructure are required, short-term disruptions to these assets may occur during this work and affected property owners would be notified in advance of any disruptions in service.

Other utilities

The Sydney to Newcastle gas pipeline is in an easement immediately to the east of the Pacific Motorway. No ground disturbance activities are proposed for this area as part of the construction of the project. Consultation with Jemena Gas Networks (NSW) would be undertaken during detailed design and construction planning.

12.4 Potential impacts – operation

12.4.1 Land use changes

Operation of the project would result in permanent changes to the existing land use to include electrical infrastructure where switching stations and transmission line towers are located. For land within the HTP corridor, the final operational easement would be around 70 metres wide, extending for around 110 kilometres.

Within the easement, where permanent infrastructure is not located, some existing land use could continue, in accordance with EnergyCo's *Living and working near easements fact sheet* (EnergyCo 2022). The use of easements would be communicated and discussed with landowners and would also need to consider the requirement for ongoing maintenance and emergency management to ensure safe operation of the transmission infrastructure.

The operation impact area would cover around 1261 hectares and would include:

- 777 hectares for the transmission line easement
- 29 hectares for the Bayswater South and Olney switching stations
- 249 hectares for access tracks
- 262 hectares associated with adjustments and upgrades to existing transmission lines.

There is some overlap in project elements, such as access tracks in instances where they are located within the permanent transmission line easement, so the breakdown does not sum to 1261 hectares.

12.4.2 Property impacts

Operation of the project would require permanent alterations to property tenure and ownership. This would include both easement acquisition for the transmission easement, as well as land acquisition for permanent electrical infrastructure such as new switching stations.

Permanent easements registered on land titles would provide a legal 'proprietary right' for operators to operate and maintain project infrastructure and other assets. These would be obtained either by agreement or by compulsory acquisition in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*.

The establishment of easements would take place within:

- Crown land, in accordance with the NSW *Crown Land Management Act 2016*
- Pokolbin, Corrabare (including Corrabare North Flora Reserve), Watagan and Olney State forests.
- Singleton Military Area would be established by agreement with Department of Defence
- privately owned lands as well as land owned by mining operators and energy generators.

To enable access to the HTP transmission line during operations, land access for the network operator would rely on existing access gates, driveways, access tracks or as otherwise agreed with landowners. The exception to this is off easement access tracks which would impact 2 private freehold properties, one mining freehold property and land owned by the NSW Government.

Impacts to tenure and ownership as a result of the operation of the project are further outlined in Table 12.10.

Table 12.10 Tenure and ownership impacts

Project infrastructure	Current ownership	Permanent property impact	Number of landowners impacted
HTP transmission line easement and access tracks[1]	Freehold (private)	New easements would be established by agreement, where possible. Where agreement cannot be reached with the landowner, compulsory acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991.*	16 (7 whole of property acquisitions)
	Freehold (mining and energy generation)[2]	New easements would be established by agreement, where possible. Where agreement cannot be reached with the landowner, compulsory acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991.*	7
	Crown land	Formal easement application.	1
	NSW Government	New easement established with FCNSW and NPWS.	2
	Australian Government	New easement established within the Singleton Military Area.	1
Bayswater South switching station	AGL Macquarie	The land required for the Bayswater South switching station would be acquired from AGL (including the required asset protection zone (APZ)).	1
Existing Bayswater substation	Electrical Transmission Ministerial Holding Corporation	There would be no change to the tenure or property impact of the existing Bayswater substation. The substation would continue to operate and support the operation of the HTP.	1
Olney switching station	NSW Government	The land required for the Olney switching station (around 14ha) would be acquired from FCNSW (including the required APZ).	1
Existing Eraring substation	Electrical Transmission Ministerial Holding Corporation	There would be no change to the tenure or property impact of the existing Eraring substation. The substation would continue to operate and support the operation of the HTP.	1

Project infrastructure	Current ownership	Permanent property impact	Number of landowners impacted
Upgraded Eraring substation	Eraring Energy/Origin Energy	Prior to the commencement of construction, the land required for the upgrade at the Eraring substation would be acquired from Origin Energy.	1

1: includes off easement access tracks to facilitate access to the HTP corridor, which would impact 2 freehold (private landowners) as well as 1 mining operator and land owned by the NSW State Government.

2: for impacted land within mining leases, compulsory acquisition does not apply. In accordance with section 82 of the Mining Act 1992, agreements would be reached with mining operators.

Permitted activities within easements would depend on the nature or scale of the activity, as well as proximity to the transmission line and towers. The following activities would generally be permitted within the transmission easements, however, may be subject to certain restrictions for safety and operational reasons as outlined in the EnergyCo *Living and working near easements fact sheet* (EnergyCo 2022):

- agriculture and grazing
- landscaping and paving
- drainage installation
- water and sewage infrastructure
- movement of vehicles and machinery and parking of light vehicles.

Access to the transmission easement would be via access tracks that would be established during construction and retained for operational purposes.

12.4.3 Agriculture

Permanent removal of agricultural land is primarily anticipated to be experienced in non-irrigated lands used for meat cattle grazing, occurring over 176 hectares or 14% of the operation impact area, with permanent removal of the irrigated land hosting more highly sensitive agricultural operations such as dairying occurring over 13 hectares or 1% of the operation impact area. The permanent removal of agricultural land over around 189 ha during operation represents around 15% of the operation impact area, and 0.1% of the total land used for agriculture in the project region.

These areas are considered conservative as not all agricultural land within the transmission easement would be affected by permanent infrastructure and operational requirements. Grazing operations would be able to continue in areas under the transmission lines and around permanent structures, subject to restrictions such as the height of farm machinery and exclusion zones around transmission towers (in compliance with EnergyCo's Living and working near easements factsheet (EnergyCo 2022)).

Further discussion (including an assessment of the operational impacts of the project on agricultural productivity, operations and biosecurity are included in *Chapter 13 (Agriculture)* and *Technical Report 5 – Agriculture impact assessment*.

12.4.4 State forests

Operation of the project would include a permanent transmission line easement through Pokolbin, Corrabare, Watagan and Olney state forests, which will affect the productivity potential within these areas of the State forests. This would impact around:

- 45 hectares of land within the Pokolbin State Forest
- 65 hectares of land within the Corrabare State Forest
- 95 hectares of land within the Watagan State Forest
- 97 hectares of land within the Olney State Forest.

Discussions are being held with FCNSW to ascertain locations where land within the transmission easement may continue to support operational requirements of the State forests.

In addition, the acquisition of land for the Olney Switching Station would permanently remove a further 14 hectares of land within the Olney State Forest. A further 10 hectares of land in these state forests would be permanently removed for the establishment of new permanent access tracks.

The transmission line easement through State forest land would affect 0.32% of Pokolbin State Forest, 1.3% of Corrabare State Forest, and 2.94% of Watagan State Forest. The acquisition of land for Olney switching station would affect 0.55% of Olney State Forest. As such, the project is not anticipated to have a significant impact on forestry operations across the wider State forest area.

The anticipated economic impacts of the operation of the project on forestry land uses are further discussed in *Chapter 22 (Other matters)* and *Technical Report 19 – Economic impact assessment.*

12.4.5 Mining and exploration

Mining operations

A new transmission line easement would be established though mine owned lands, some of which include mine lease areas. The interface between the operation of the project and future mining operations would be managed by agreement between the network operator and the mining operators.

The operation impact area would include around 690 hectares of land owned by mine operators, of which around 350 hectares intersects mine lease areas. The HTP corridor has been selected in close consultation with mine operators to avoid/minimise impacts to existing and future mining operations from the project.

Mineral exploration

Once operational, the project may affect future exploration activities in areas directly below and immediately adjacent to the transmission line easement and project infrastructure due to safety, structural, operational, or engineering limitations. As such if mineral deposits were discovered within these exploration lease areas, and these deposits were of commercial viability, the development of these mineral resources would need to consider the location of project infrastructure and operational requirements.

12.4.6 Commonwealth land

Operation of the new transmission easement would impact around 85 hectares of land within the Singleton Military Area, with an additional 25 hectares of access tracks that would be required on an infrequent basis for maintenance activities. The creation of a permanent easement would alter the way in which the land within the easement can be used, placing restrictions on the type of activity that can be safely carried out by the Department of Defence during operation of the project.

The operation and maintenance requirements of the project and how future Department of Defence activities would coexist would be managed through the terms of the agreement between the network operator and the Australian Department of Defence. This would also consider Transgrid's easement guidelines and requirements for the flying of uncrewed aerial vehicles near Transgrid infrastructure.

12.4.7 Conservation land managed by NSW National Parks and Wildlife Service

The operation impact area would include around 52 hectares of the Jilliby State Conservation Area. This includes around 48 hectares of land within the existing 500 kV transmission line easement (lines 5A1/5A2) and around 8 hectares of land associated with access tracks, noting some of these are also located within the existing transmission easement. There would be no permanent impact within the Jilliby State Conservation Area as the proposed works within the existing 500 kV transmission easement would be operated and maintained in accordance with existing practices.

Operation of the project would result in a permanent transmission line easement through the Corrabare North Flora Reserve, affecting around 13 hectares. In addition, a new permanent access track (around 1.5 hectares), established during construction would provide ongoing access to the transmission line easement for maintenance activities.

The operation of the project would result in changes to land use within 1.9% of the Corrabare North Flora Reserve. As such, permanent impacts are anticipated to be minor and localised within Corrabare North Flora Reserve.

12.4.8 Crown land

Operation of the project would affect around 22 hectares of Crown land and less than 2 hectares of land designated as TSRs. Most of the Crown land required for operation is in the southern portion of the project (around 16 hectares) and is within existing transmission line easements or existing access tracks. All operational activities at this location would take place in the existing easement or existing access track, as such there would be no change to the existing land use (electrical infrastructure).

The remaining areas of impacted Crown land are associated with Crown roads and watercourses (including the Hunter River, Congewai Creek and Wollombi Brook) and are spread across the operation impact area. Engagement with Local Land Services would continue to be undertaken during detailed design to confirm any permanent impacts to TSRs. Impacts to TSRs are discussed further in *Chapter 13 (Agriculture)*.

12.4.9 Infrastructure and utilities

During operation, impacts to transport infrastructure would be limited to maintenance of the transmission line and switching station infrastructure, which would be carried out infrequently. The impacts of the project on the road and rail network, and property access during operation is further assessed in *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport impact assessment.*

The operation of the project is not anticipated to negatively impact existing electrical infrastructure within the operation impact area. The project would contribute to increased transmission capacity within the National Electricity Market and would allow for increased electricity supply from renewable energy in NSW alongside existing electrical infrastructure. The benefits of the project to existing electrical infrastructure within NSW is further discussed in *Chapter 2 (Strategic context)*.

The operation of the project would not impact existing pipeline infrastructure.

12.5 Mitigation and management

Mitigation and management measures proposed to avoid or minimise impacts to land use and property during construction of the project are listed in Table 12.11.

Table 12.11 Proposed mitigation and management measures - land use and property

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
LP1	Direct land use impacts	The design will continue to be refined to minimise potential impacts on existing land use and properties as far as practicable.	Detailed design	All locations
LP2	Property impacts	Property management plans will be developed for directly impacted properties in consultation with the landowner. The property management plans will outline the protocols that will be implemented to address landowner concerns during construction. This will include: • the process for rectification of any damage to property infrastructure caused by construction • the process for rehabilitation and stabilisation of disturbed areas following completion of construction • details of any access tracks or other infrastructure provided for temporary construction activities that are to be retained and not restored to the preexisting condition (where requested by the landowner prior to the completion of construction) • pre-condition assessments to determine the existing condition of assets, infrastructure, utilities that are impacted by construction activity • measures to minimise disruption to agricultural or other practices during construction, including identification of: – existing grazing and cropping activities and farm infrastructure arrangements (e.g. fences, access tracks) within the project impact area – any required adjustments to existing agricultural activities during construction, including adjustments to fencing or access tracks or adjustments to grazing or cropping activities as a result of the location of permanent infrastructure within agricultural land. This would be informed by ongoing consultation with landowners – noise intensive activities during construction that would overlap with sensitive periods of the livestock production cycle (e.g. lambing or calving) – vehicle movements and other construction activities in the vicinity of livestock – the need for the movement of livestock away from potential stressors created during construction activities • any fencing and gate requirements • specific biosecurity controls • contact details for the person who will liaise with landowners to provide direct avenues of enquiry for information and issues management.	Detailed design Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
LP3	Impacts to utilities and services	The location of all services and utilities within the construction impact area will be confirmed during detailed design, and any required protection or relocation works will be designed in consultation with utility providers and landowners.	Detailed design Construction	All locations
LP4	Indirect impacts on State forests	To minimise impacts to State forests and State forest operations (including recreational uses), the FCNSW will be consulted on construction methodologies and activities as part of continued design development, and prior to and during construction activities.	Detailed design Construction	Olney State Forest Watagan State Forest Corrabare State Forest Pokolbin State Forest Corrabare North Flora Reserve
LP5	Indirect impacts on NPWS estate	To minimise disruption to the NPWS estate, EnergyCo will consult with NPWS on construction methodologies and activities as part of continued design development and prior to and during construction activities.	Detailed design Construction	Jilliby State Conservation Area Corrabare North Flora Reserve
LP6	Impacts to mine operations	To minimise disruption to mining activities, mine operators will be consulted on construction methodologies and activities as part of continued design development and prior to and during construction activities. This will include consultation relating to: • any adjustments to existing mining-related infrastructure (including fences, tracks, mine roads and access tracks) • the timing and location of construction works, especially where there are some restrictions on vehicle or construction equipment movements • the timing and location of construction works which have the potential to impact mine operations, such as the stringing of transmission lines over existing mine infrastructure or active mining areas.	Detailed design Construction	Mining complexes

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
LP7	Impacts to mine exploration and risks from mine subsidence	To minimise disruption to mining exploration activities, the Department of Regional NSW – Mining, Exploration and Geoscience, and holders of exploration licenses will continue to be consulted as part of ongoing design development prior to and during construction. Additionally, to manage risks associated with mine subsidence, the Department of Regional NSW – Mining, Exploration and Geoscience, will continue to be consulted as part of detailed design and throughout construction.	Detailed design Construction	Mine exploration lease areas Mine subsidence districts
LP8	Impacts to energy generation or electrical transmission infrastructure	To minimise disruption to energy generators, owners of transmission infrastructure will be consulted on construction methodologies and activities as part of continued design development and prior to and during construction activities.	Detailed design Construction	Bayswater substation Eraring substation Existing transmission infrastructure
LP9	Impacts to road and rail transport corridors	To minimise disruption to road and rail corridors and operations during construction activities (stringing) impacting the M1 Pacific Motorway, and rail corridors, TfNSW and ARTC will be consulted on construction methodologies and activities as part of continued design development and prior to and during construction activities.	Detailed design Construction	Stringing locations
LP10	Land disturbance	Disturbed areas will be stabilised and appropriately reinstated back to pre-construction condition where practical, or as agreed in consultation with the relevant landowner and documented in property management plans.	Construction	All locations

12.6 Summary and conclusion

The project would result in changes to the use of land within the project impact area. The impacts of the project during construction would be temporary, and most existing land uses would be able to recommence at the conclusion of construction, subject to restrictions for safety and operational reasons. It is noted that construction of the project may occur in stages, and not all areas would be impacted for the entire duration of construction. Construction of the project would require temporary agreements or acquisition of interests in land within the construction impact area.

Land use changes during operation would be reduced in comparison to construction. For instance, within the transmission line easement, where permanent infrastructure is not located, some existing land use could continue, subject to some restrictions on activities and the need for ongoing maintenance and emergency management to ensure safe operation of the transmission infrastructure.

Operation of the project would require permanent alterations to property tenure and ownership. This would include transmission line easements and land acquisition for new switching stations. The acquisition of all property would be carried out in consultation with the relevant landowner and in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991* and preferably resolved by a negotiated agreement.

Agriculture

13

13 Agriculture

This chapter provides an overview of the existing environment as it relates to agriculture, an assessment of potential impacts of the Hunter Transmission Project (HTP, 'the project') on agriculture and identifies mitigation and management measures to be adopted to minimise and manage these potential impacts.

An agriculture impact assessment has been prepared for the project and is provided in *Technical Report 5 – Agriculture impact assessment*. *Technical Report 9 – Soils and land impact assessment* has also been prepared, which considers the potential impact of the project on land capability. The Planning Secretary's environmental assessment requirements (SEARs) as they relate to the assessment of agriculture and where in this environmental impact statement (EIS) these have been addressed are summarised in *Appendix A (Assessment requirements compliance)*.

13.1 Assessment approach

13.1.1 Legislation, policies, plans and guidelines

The potential impacts to agriculture as a result of the project were assessed with consideration of the following legislation and policies:

- *NSW Biosecurity Act 2015*
- *NSW Local Land Services Act 2013*
- *State Environmental Planning Policy (Primary Production) 2021*
- the *Land and Soil Capability Assessment Scheme* (Office of Environment and Heritage (OEH) 2012).

13.1.2 Study area

The study area for the agricultural impact assessment includes the project impact area and the local government areas (LGAs) of Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie.

13.1.3 Assessment methodology

The methodology for assessing the potential impacts to agriculture from the project involved:

- a desktop review of available agricultural resource information for the study area, including publicly available data such as:
  - available regional land use mapping

  - Australian agricultural census data, including agricultural enterprises land use and commodity values
  - publicly available agricultural analysis at a LGA and New South Wales (NSW) level
  - the Land and Soil Capability Assessment Scheme (OEH 2012) (LSC scheme)
  - strategic regional land use plans which identify areas of biophysical strategic agricultural land (BSAL)
- visual inspection of select agricultural lands within the project impact area on 20 December 2024 to supplement the findings of the desktop review. Visual inspections were from public viewpoints only, due to land access restrictions at the time of assessment
- agricultural productivity modelling for the project impact area, including through the application of the NSW Department of Primary Industries (DPI) gross margin budgets to the project impact area
- landowner interviews to obtain information on the agricultural enterprises at properties throughout the project impact area, as well as the views of landowners on the potential impacts of the project
- describing the existing agricultural environment within the project impact area and the wider study area, including existing agricultural land uses, agricultural enterprises, agricultural productivity and land capability
- assessment of the nature, duration and consequences of potential construction and operational impacts on agriculture within the study area as a result of the construction and operation of the project
- identifying mitigation and management measures that minimise potential impacts of the project on agriculture.

13.2 Existing environment

The project impact area is located across the Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie LGAs. Around 98% of agricultural lands that intersect the project impact area are in the Singleton LGA. This section presents the existing agricultural environment within the project impact area and within the setting of the Hunter region. However, an emphasis has been placed on the Singelton LGA, as this is where most agricultural activities that intersect the project impact area occur.

13.2.1 Agricultural land use

The variety of landscapes and climates in the study area supports a diverse range of agricultural industries, all of which place a high value on the region's reliable water supply. The milder temperatures and year-round rainfall, which provide reliable pasture production, combined with low transport distances and ready access to grain and the major markets, means that agriculture in study area has a significant competitive advantage.

According to regional land use mapping, agricultural land occurs over 874 hectares or 37% of the project impact area. Of this, 817 hectares is considered dryland agriculture, while 57 hectares is

considered irrigated land. Agricultural land use on mining lands is generally integrated with surrounding land uses. Rehabilitated land not subject to disturbance within the mine owned lands are assumed to consist of beef cattle grazing enterprises, consistent with the surrounding locality.

Most of the Singleton LGA has been cleared for agricultural uses, with the main land use being beef cattle grazing. Rotational grazing of moderate stocking rates over large areas is a standard management practice for the area. Extensive clearing of native vegetation for the purpose of agricultural land use has also occurred in the Cessnock and Muswellbrook LGAs, and to a more limited extent in the Central Coast and Lake Macquarie LGAs.

Agricultural land use areas and farm sizes vary greatly across the study area. The Central Coast and Lake Macquarie LGAs are highly fragmented and are the focus of rapidly expanding urban and industrial developments, with agricultural operations covering a relatively small area. The Cessnock, Singleton and Muswellbrook LGAs remain largely rural. According to the most recent agricultural census data of 2020-2021, the area of land mainly used for agricultural purposes in the Singleton LGA is 82,274 hectares, while the area of land mainly used for agricultural purposes in the study area is 220,756 hectares (ABS 2022a). A breakdown of these agricultural land uses within the Singleton LGA (which includes the majority of agricultural land within the project impact area), and the study area is presented in Table 13.1. This shows that livestock grazing is the dominant agricultural land use within both the Singleton LGA (91%) and the study area (93%).

Table 13.1 Agricultural land use within Singleton LGA and study area (ABS 2022b)

Agricultural land use	Singleton LGA		Study area	
	ha	%	ha	%
Livestock grazing	75,235	91	205,241	93
Cropping	3718	5	9559	4
Forestry	2106	3	3601	2
Other	1215	1	2354	1

13.2.2 Regional agricultural enterprise

Beef cattle are an established and dominant agricultural industry in the Hunter Region. Factors which support cattle grazing and the region's beef industry include the suitability of the climate and landscapes, availability of service suppliers, proximity to infrastructure and markets, and good international and domestic market prospects for farmers.

In addition to beef cattle, the Muswellbrook, Singleton and Cessnock LGAs are known for supporting internationally renowned viticultural and equine breeding industries and their closely associated support industries. For the Central Coast and Lake Macquarie LGAs, poultry, nurseries, nuts and vegetable farming are more common.

Gross value is a measure of the size or net wealth generated by the local economy and can be measured by industry and enterprise. The gross value of agriculture for the Singleton LGA was estimated as $48,382,626 in 2021, while the gross value of agriculture for the study area is estimated as $312,685,865 (ABS, 2022b).

Table 13.2 outlines the gross value of different agricultural sectors within the Singleton LGA and the study area.

Table 13.2 Gross value of agriculture in the Singleton LGA and study area

Agricultural enterprise	Singleton LGA		Study area	
	$	%	$	%
Livestock slaughter	**23,070,038**	**48**	**126,214,553**	**41**
Cattle and calves	19,546,121	40	45,795,792	15
Poultry	3,225,397	7	79,341,792	25
Sheep and lambs	277,057	<1	951,439	<1
Pigs	12,491	<1	39,019	<1
Other	8971	<1	86,510	<1
Livestock products	**16,717,939**	**35**	**97,733,157**	**31**
Milk	11,558,135	24	25,931,935	8
Eggs	4,919,007	10	71,082,226	23
Wool	240,798	<1	718,996	<1
Cropping	**8,594,649**	**18**	**88,738,155**	**28**
Hay	4,673,002	10	10,504,595	3
Vegetables	1,450,662	3	23,919,282	8
Fruit and nuts - grapes	1,210,870	3	2,743,587	<1
Nurseries, cut flowers or cultivated turf	696,109	1	42,697,776	14
Broadacre crops	499,349	1	1,470,792	<1
Fruit and nuts (excluding grapes)	64,658	<1	7,402,123	2

The data from the latest agricultural census highlights the dominance of beef cattle grazing as the leading agricultural enterprise for the Singleton LGA, not just in terms of area of land used but also in terms of estimated gross value generated. For the study area, the data highlights a more diversified agricultural industry, including highly intensified enterprises such as poultry and specialised agriculture enterprises such as nurseries, cut flowers or cultivated turf.

13.2.3 Agricultural productivity

Agricultural productivity is subject to long term climate and rainfall variables, as well as changes in economic, social and policy frameworks, often at a scale well beyond the project impact area. The NSW DPI (2024) Gross Margin Budgets for Livestock can be used to provide a broad estimation of the productivity of the land for grazing within the project impact area. Using this, the productivity of agricultural land within the project impact area has been estimated as $317,863 per annum,

consisting of $47,207 per annum from irrigated lands, and $270,656 per annum from dryland grazing lands.

The related economic activity arising from agricultural enterprises in the project impact area is referred to as the secondary productivity. This includes a range of upstream and downstream employment associated with agricultural production in the study area, including:

- agronomy services
- input providers (e.g. chemicals, fertilisers)
- machinery sales and mechanical support
- feed and livestock transport
- production marketing
- fencing, harvest and other contractors.

Considering these sources of employment across the study area and the associated agricultural activity in the project impact area, the estimated value to the broader economy from this agricultural activity in the project impact area is $881,843 per year.

13.2.4 Agricultural land capability

In NSW, there are a number of methods to assess land capability for agricultural purposes. The primary method used in this assessment is the *Land and Soil Capability Assessment Scheme* (OEH, 2012) (referred to as the LSC scheme), which uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards. The LSC scheme establishes 8 classes, with Class 1 representing land capable of sustaining the most intensive land uses (such as irrigation and cropping), and Class 8 representing land that can only sustain very low intensity land uses (such as nature conservation). Detailed descriptions of the LSC classes are included in *Technical Report 9 – Soils and land assessment*.

The majority of the project impact area (76%) is characterised as being of very-low to moderate-low capability land. Only a small proportion of the project impact area is considered high (8%) or moderate (11%) capability land. The highest quality land within the project impact area (LSC class 3) is generally located in the northern extent of the project impact area on alluvial soils associated with the Hunter River. LSC classes within the project impact area are outlined in Table 13.3 and Figure 13.1.

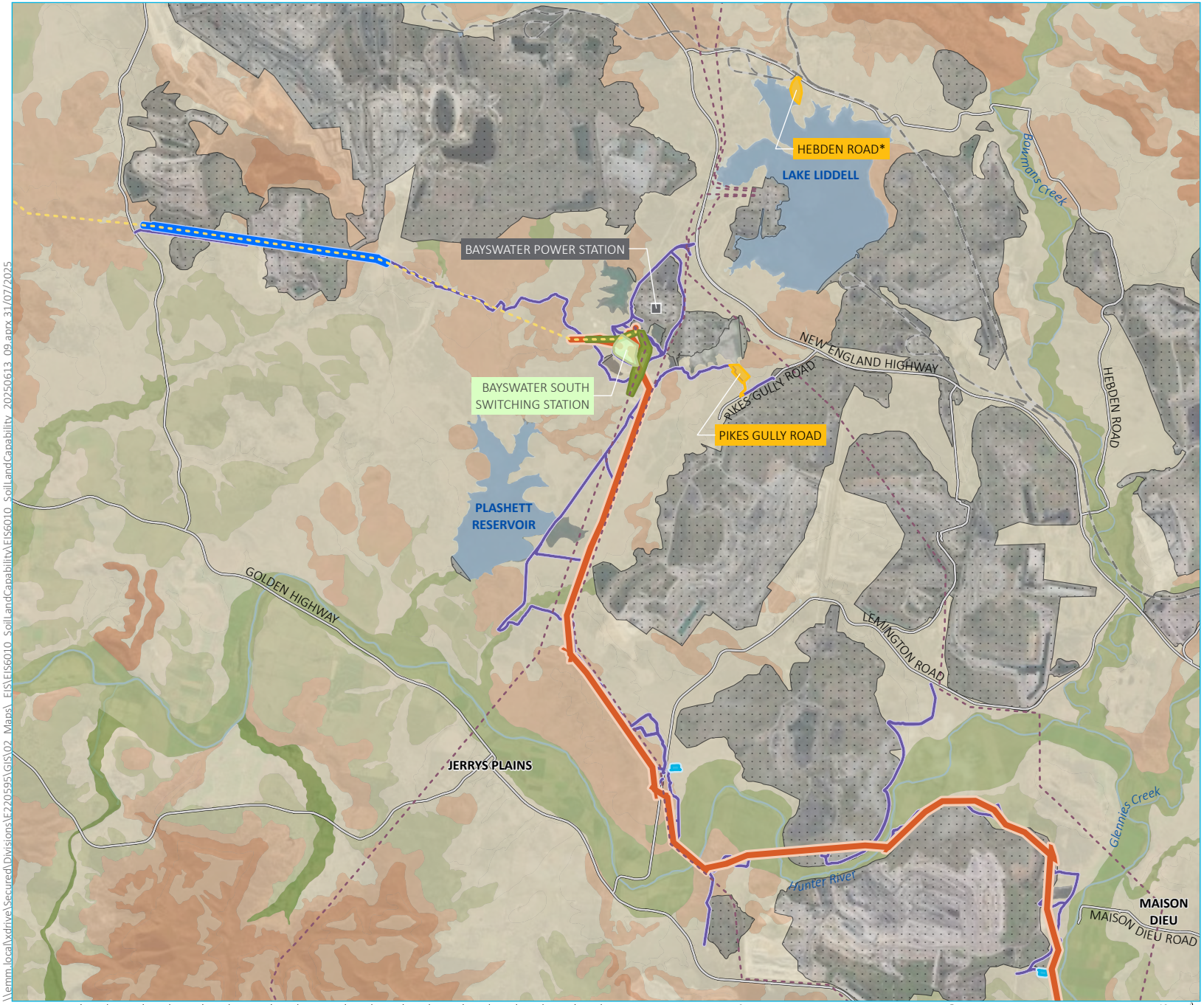
Table 13.3 LSC classes within the project impact area

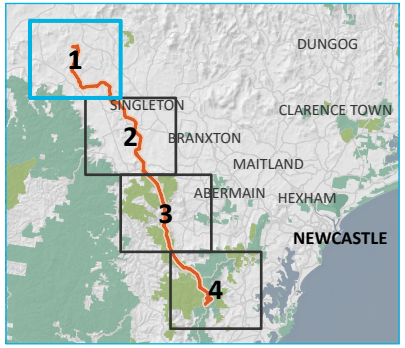
LSC class	LSC description	Project impact area	
		ha	%
3	**High capability land** Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.	182	8

LSC class	LSC description	Project impact area	
		ha	%
4	**Moderate capability land** Land has moderate to high limitations for high-impact land uses and would restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.	259	11
5	**Moderate–low capability land** Land has high limitations for high-impact land uses and would largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.	635	27
6	**Low capability land** Land has very high limitations for high-impact land uses, meaning land use is restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.	491	21
7	**Very low capability land** Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations are not managed. There should be minimal disturbance of native vegetation.	658	28
Unknown LSC	Expected to range between LSC class 4 to 7.	126	5

In addition to the LSC scheme, the NSW Government has mapped BSAL as a way of assessing land capability for agricultural purposes. BSAL is land with a rare combination of natural resources which are highly suitable for agriculture. These lands have high quality landforms, soil and water resources which are naturally capable of sustaining high levels of productivity and require minimal management practices to maintain this high quality.

There is 213 hectares of mapped BSAL within the project impact area (representing 9% of the project impact area), which occurs in general association with alluvial soil landscapes long the Hunter River in the northern extent of the HTP corridor. BSAL mapping within the project impact area is included in Figure 13.2.





KEY

Land and soil capability
- 2- Very high capability land
- 3- High capability land
- 4- Moderate capability land
- 5- Moderate-low capability land
- 6- Low capability land
- 7- Very low capability land
- No data

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

Land and soil capability
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 13.1

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

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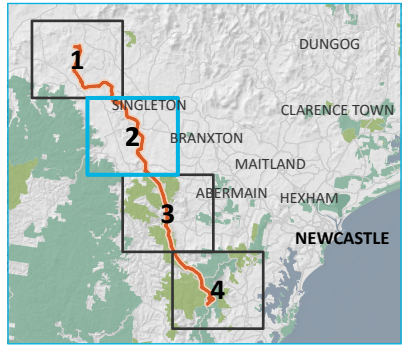
creating opportunities



KEY

Land and soil capability

- 3- High capability land
- 4- Moderate capability land
- 5- Moderate-low capability land
- 6- Low capability land
- 7- Very low capability land
- No data

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

Land and soil capability
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 13.1

creating opportunities

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

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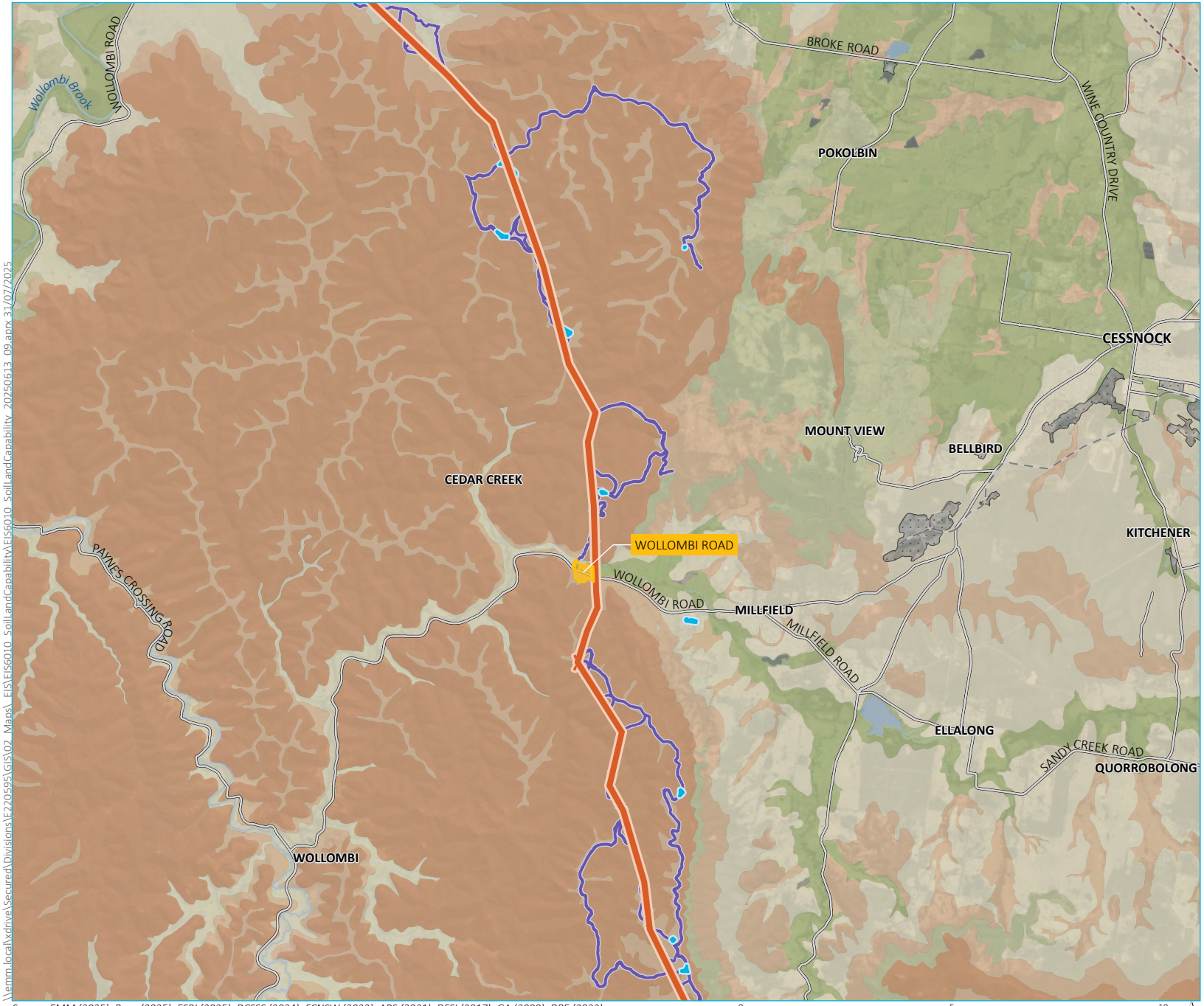

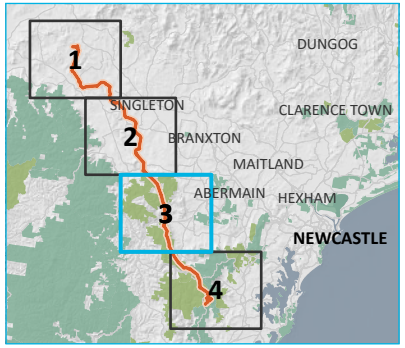

KEY

Land and soil capability

- 3- High capability land
- 4- Moderate capability land
- 5- Moderate-low capability land
- 6- Low capability land
- 7- Very low capability land
- No data

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

Land and soil capability
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 13.1

EMM
creating opportunities

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

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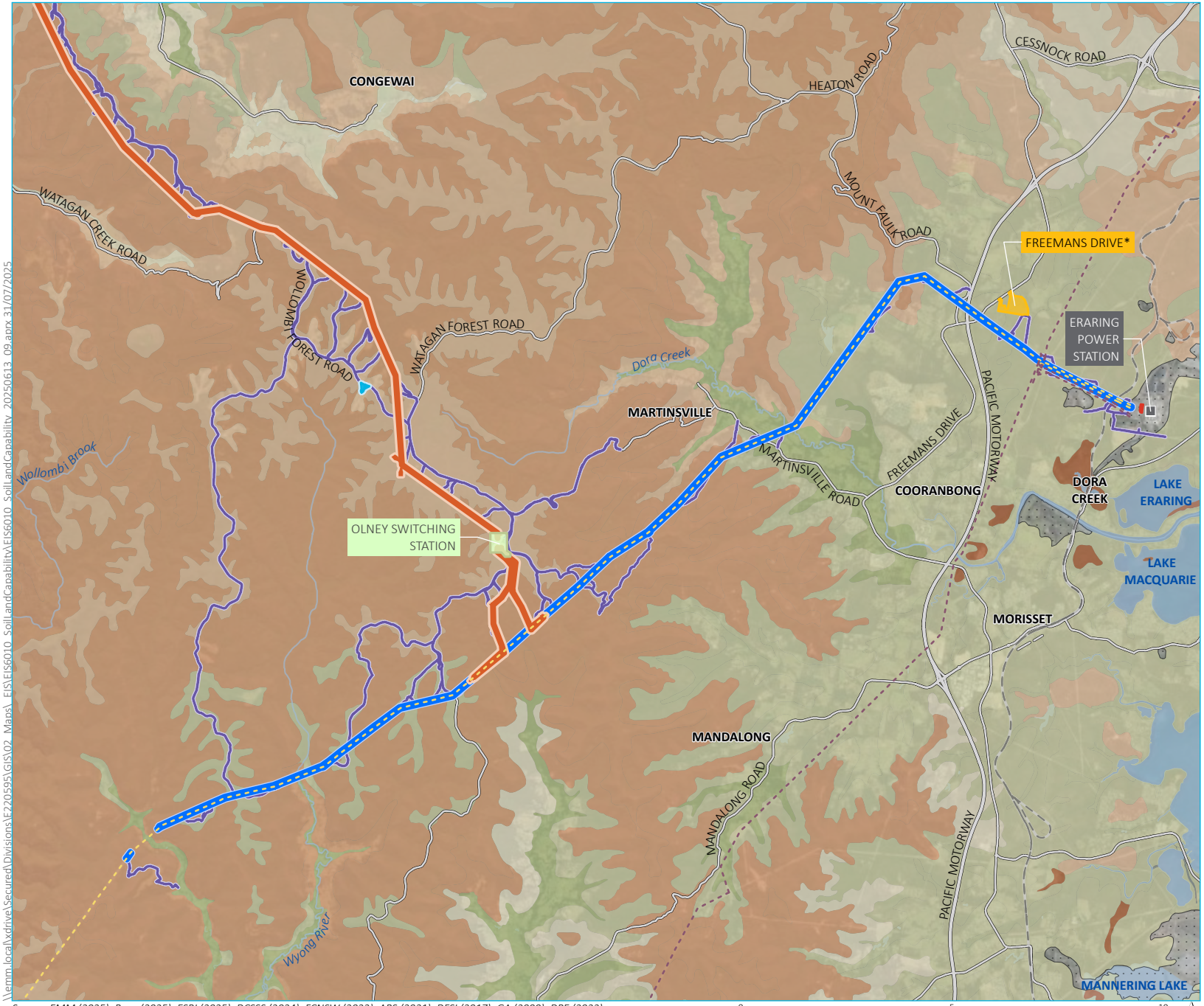

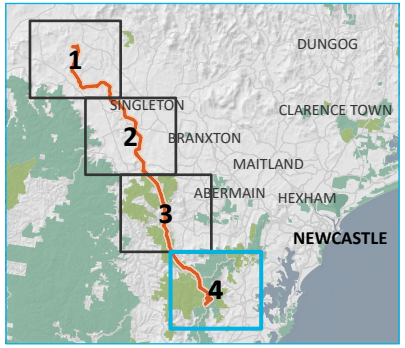

KEY

Land and soil capability
- 3- High capability land
- 4- Moderate capability land
- 5- Moderate-low capability land
- 6- Low capability land
- 7- Very low capability land
- 8- Extremely low capability land
- No data

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

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

0 5 10 km

GDA2020 MGA Zone 56

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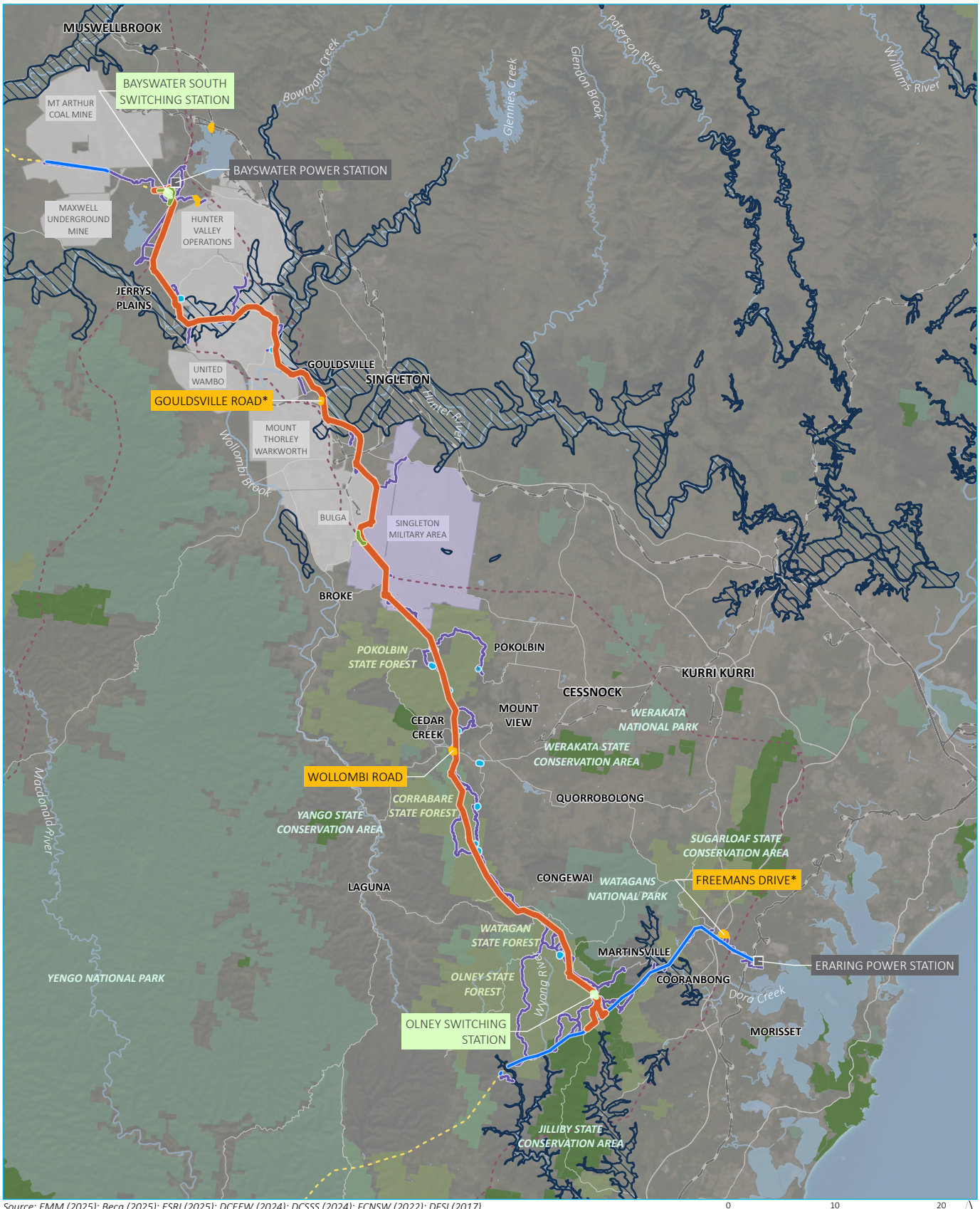
Land and soil capability
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 13.1

EMM
creating opportunities



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

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KEY

- Biophysical Strategic Agricultural Land

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

BSAL within the project impact area

Hunter Transmission Project
Environmental Impact Statement
Figure 13.2

EMM
creating opportunities

13.2.5 Travelling stock reserves

Travelling stock reserves (TSRs) are parcels of Crown land which are reserved for moving or grazing livestock. Small parcels of land designated as TSRs are located within the project impact area in Warkworth and Gouldsville (including near the proposed Gouldsville Road construction support site). These parcels make up less than 2 hectares of the project impact area. Other small parcels of TSRs are located in the study area, including around Hebden, Singleton and Branxton.

13.3 Potential impacts – construction

As discussed in *Chapter 12 (Land use and property)*, the project would require the use of land (including land currently used for agricultural purposes) both temporarily for construction, and then permanently for operation in areas where permanent infrastructure is proposed.

13.3.1 Loss of agricultural land

Agricultural land within the construction impact area would be subject to varying levels of disturbance. In areas where earthworks, excavations and landform modifications are necessary for construction, there would be a temporary, broad restriction on access for agricultural activities. In areas which would not be subject to direct surface disturbances, agricultural activity can continue during most periods of the construction program, subject to the timing and location of planned construction activities. As such, the extent of land being removed from agricultural production during construction would vary depending on the project feature and location, as is outlined in Table 13.4.

Table 13.4 Loss of agricultural land during construction of different project features

Project feature	Agricultural land intersecting project feature (ha)	Loss of agricultural land
HTP corridor	814	The HTP corridor would be around 140 m wide. It would include potential agricultural impacts associated with vegetation clearing, construction of the transmission towers, and stringing and laydown activities. Not all of the 140 m wide corridor would be impacted, but the corridor has been assessed for impacts to allow for flexibility in the detailed design such as through micro-siting of the transmission towers to avoid and minimise environmental impacts as far as practicable. The land required for transmission lines would be secured by way of easements, which would restrict agricultural uses during construction activities. However, disturbance within the HTP corridor would generally be localised and temporary during the construction of transmission towers and during stringing and laydown activities (that is, the entire HTP corridor would not be subject to construction disturbances at any one time). Due to the dispersed nature of the infrastructure proposed and transient manner in which transmission lines are constructed, the scale and intensity of construction activities would vary within the HTP corridor. In this regard, the area between transmission towers would not be affected to the same degree as the area around each tower. As such, agricultural land uses, such as grazing of livestock, cropping, irrigation and the planting or cultivation of trees or shrubs may continue where transmission lines are proposed to be constructed, subject to the timing and location of planned construction activities. Therefore, during construction, it is unlikely that agriculture production would be impacted across the entire corridor.

Project feature	Agricultural land intersecting project feature (ha)	Loss of agricultural land
Switching stations	23	Agricultural land where the Bayswater South switching station is proposed would be permanently acquired and agricultural production would cease across the site. The Olney switching station is located in land currently used for forestry activities. Impacts to land use associated with the Olney switching station are addressed in *Chapter 12 (Land use and property)*. The existing substations are not located on land currently used for agriculture, meaning works at these sites would not impact agricultural land uses.
Construction support sites and laydown areas	52	Agricultural production would cease across the entirety of the proposed construction support sites which are located on existing agricultural land (including Pikes Gully Road, Gouldsville Road, Wollombi Road and Freemans Drive construction support sites) and at laydown areas located on existing agricultural land both within and outside of the HTP corridor. These would be rehabilitated to prior land uses following construction, meaning agricultural activity would be able to continue following the use of these sites during construction.
Access roads and tracks	93	Agricultural production would cease during the construction of new access tracks and during the upgrade of existing access tracks and roads. The permanent use of access tracks for operation would be infrequent and require less area for smaller vehicles and therefore agricultural practices could resume.

The impacts to agricultural land within the construction impact area but outside of the operation impact area are expected to be temporary and minimal, with agricultural land use to return following construction. During construction, there would be no direct or indirect impacts to agricultural land use or production outside of the construction impact area, with the implementation of mitigation measures (see *section 13.5*).

A conservative overview of the agricultural land potentially impacted by construction is presented in Table 13.5. Impacts are anticipated to be primarily experienced in non-irrigated land used for beef cattle grazing, occurring over 817 hectares or 35% of the construction impact area. Impacts to irrigated lands used for more highly sensitive agricultural operations such as dairy farming would occur over 57 hectares or 2% of the construction impact area. The temporary removal of agricultural land over around 874 hectares during construction represents around 0.4% of the total land used for agriculture in the study area.

Table 13.5 Land temporarily removed from agricultural production during construction

Land use	Construction impact	
	ha	% of the construction impact area
Dryland	817	35

Irrigated	57	2

These areas are considered conservative as disturbance is not anticipated to occur across the entire HTP corridor at any one time, as noted in Table 13.4. Mitigation measures outlined in *section 13.5*, such as the preparation of property management plans, would be implemented to reduce the construction impacts on land used for agriculture and agriculture production.

13.3.2 Agricultural productivity impacts

The estimated impact of the construction of the project on the productivity of agricultural land based on the change in land during construction is estimated at around $404,738 per year. This represents around 0.1% of the gross value of agriculture in the study area. The estimated impact of construction on secondary productivity of agricultural land (i.e. related economic activity arising from agricultural activity within the construction impact area) based on the change in land use during construction is estimated at around $881,843 per year.

Based on a 2.5-year construction period, primary productivity impacts as a result of the project are estimated at around $1 million, and secondary productivity impacts are estimated at around $2.2 million. These values may be considered conservative as construction activities associated with the transmission line, including transmission tower construction, transmission line stringing and vehicle and machinery movements along access tracks, would be intermittent and would not occur for the full construction duration at any one location.

13.3.3 Impacts to agricultural operations

For dryland grazing agricultural land, it is unlikely that construction activities would substantially restrict movements of landowners, agricultural workers, their livestock or equipment within or through the construction impact area. It is possible that some movement would be affected temporarily due to restricted access to the construction impact area. However, these restrictions would generally be short in duration, localised and would be undertaken in consultation with relevant landowners.

Restrictions in movements are more likely to occur in irrigated areas than grazing areas due to the higher intensity of land use in these areas. Usual cultivation, crop establishment and spray travel patterns would need to be adjusted to avoid the construction of transmission towers and ancillary work in the HTP corridor. Usual methods of using wide farming equipment would need to be modified to avoid collisions during construction. The impacts of the transmission towers on irrigation infrastructure, weed control and cropping under transmission lines would commence during construction and continue into the operation of the project.

Restrictions on aerial agriculture operations (such as aerial spreading of fertilisers and aerial spraying) may be required during the construction of transmission towers in agricultural areas. The impacts would commence during construction and continue into the operation of the project. Other construction activities are likely to have minimal impact on aerial agriculture operations. Impacts to aerial agriculture operations are further discussed in *section 21.1*.

Impacts to TSRs during construction would be limited to restrictions in the movement of livestock within the transmission corridor. However, given the isolated nature of these parcels of land, it is likely that they are no longer being used for the movement of livestock. Engagement with NSW

Local Land Services would be carried out during detailed design to confirm construction impacts to TSRs.

Mitigation and management measures outlined in *section 13.5* will be implemented to reduce the impacts of the project on agricultural productivity and operations. In addition, property management plans for impacted landowners would be implemented to address landowner concerns about the impacts of construction activities on individual properties. Property management plans would include measures to minimise disruption to agricultural operations during construction, including any required adjustments to existing agriculture operations, such as adjustments to grazing or cropping activities because of infrastructure within agricultural land. This would be informed by consultation with landowners to understand agricultural activity and requirements at individual properties. Further detail on property management plans is included in *Chapter 12 (Land use and property)*.

13.3.4 Impacts to land and soil capability

Temporary impacts on land and soil capability would occur within the construction impact area. Construction of the transmission line and towers and access tracks would occur across the full range of LSC classes located within the construction impact area (LSC class 3 to 7), while construction of switching stations and the establishment of construction support sites would occur on LSC class 5 and 6 land.

LSC classes 1 to 3 are considered important agricultural land. No LSC class 1 or 2 land would be impacted by the construction of the project. However, the project would result in the temporary impact to 182 hectares of LSC class 3 land. Project elements impacting LSC class 3 land during construction include the transmission line and towers, access tracks, and adjustments to existing transmission lines. Following construction, areas impacted by construction activities would be regraded (where required) and capped with soil. Soil would be respread over disturbed areas and rehabilitated with either native vegetation or pasture for grazing, depending on the intended final land use. This strategy, to be developed in consultation with landowners and prepared to meet good soil management practices, would facilitate the rehabilitation of disturbed areas to their former LSC class.

Temporary impacts on BSAL would occur within the construction impact area (213 hectares), noting that this is conservative as a significant portion of disturbance within the HTP corridor would be temporary and minor. In addition to the HTP corridor, project elements that interface with BSAL include access tracks and a small extent of adjustment to existing transmission line, where impacts are expected to be low. Following construction, disturbed areas within mapped BSAL areas would be suitably rehabilitated. This strategy, to be developed in consultation with landowners and prepared to meet good soil management practices, would facilitate the return of areas of the construction impact area outside of the operation impact area to BSAL.

13.3.5 Biosecurity

There is a risk that animal diseases, plant diseases, feral pests and weeds could be introduced or spread during construction of the project. A biosecurity breach of this nature is likely to increase costs and decrease income of agricultural enterprises. Depending on the biosecurity matter, impacts on both costs and income could be short to long term. Increased costs could include

expenses associated with monitoring pests, weeds or diseases and implementing control measures, while lost income could arise from reduced livestock, crop or pasture production and lower quality of produce.

Potential carriers of weed seeds, plant material and diseases include vehicles (especially tyres), machinery and personnel (clothing and footwear). These can transport biosecurity matter over relatively long distances. The biosecurity risks would generally be highest during construction due to earthworks and the greater frequency of machinery, vehicle and personnel movements.

Biosecurity controls and property management plans would be implemented to manage potential biosecurity risks to agricultural activity during construction. Property management plans would be informed by consultation with landowners to understand biosecurity risks at individual properties so that appropriate measures are in place to minimise potential impacts. Relatively low biosecurity risks are expected following the implementation of measures relevant to individual properties included in property management plans. Further detail on property management plans is included in *Chapter 12 (Land use and property)* and biosecurity risks are also discussed in *Chapter 8 (Biodiversity)*.

13.4 Potential impacts – operation

13.4.1 Loss of agricultural land

Impacts within the operation impact area would include the permanent removal of soils and agricultural land in the transmission line easement where transmission towers and access tracks are proposed. This represents only a portion of the overall 70-metre-wide operational easement. Restriction to agricultural land use would generally not occur within the remainder of the transmission line easement throughout operation, except for minor, localised restrictions associated with maintenance works as required. Livestock grazing, cropping, irrigation and the planting or cultivation of trees or shrubs could continue in the transmission line easement, subject to the timing and location of operation and maintenance activities. Outside of the transmission line easement, agricultural land would, however, be permanently removed from the entire footprint of the Bayswater South switching station and permanent access tracks during operation.

During operation, there would be no direct or indirect impacts to agricultural land use and production within the study area, subject to the implementation of all relevant mitigation measures (see *section 13.5*).

A conservative overview of the areas of the potential operational impact for agricultural land is presented in Table 13.6. Permanent removal of agricultural land is primarily anticipated to be experienced in non-irrigated lands used for beef cattle grazing, occurring over 176 hectares or 14% of the operation impact area. Permanent removal of irrigated lands hosting more highly sensitive agricultural operations such as dairy farming would occur over 13 hectares or 1% of the operation impact area.

Table 13.6 Land permanently removed from agricultural production during operation

Land use	Operational impact	
	ha	% of the operation impact area
Dryland	176	14
Irrigated	13	1

These areas are considered conservative as permanent removal of agricultural land is not anticipated to occur across the entire operational transmission line easement, with grazing and cropping operations able to continue in areas such as under transmission lines and around permanent structures, subject to restrictions such as the height of farm machinery and exclusion zones around transmission towers.

13.4.2 Agricultural productivity impacts

The estimated impact of the operation of the project on the productivity of agricultural land based on the change in land during operation is estimated at around $88,937 per year. This represents around 0.03% of the gross value of agriculture in the study area. The estimated impact of the operation of the project on secondary productivity of agricultural land (i.e. related economic activity arising from agricultural activity within the operation impact area) based on the change in land during operation is estimated at around $193,776 per year.

Although a small proportion of agricultural land would be permanently removed for the operation of switching stations and permanent access tracks these values are be considered conservative as, permanent removal of agricultural land is not anticipated to occur across the entire operation impact area. For instance, grazing operations are anticipated to continue on large sections of the easement under transmission lines and around permanent structures.

13.4.3 Impacts to agricultural operations

Permanent infrastructure

Permanent infrastructure such as transmission towers or other infrastructure on irrigated agricultural land has the potential to disrupt normal on-ground operations within the operation impact area over the long term. Around 13 hectares of irrigated land would be permanently impacted by operation of the project. Disruption to current farming practices and property layouts through the creation of obstructions can lead to parts of the affected farms being isolated, inefficiently operated and unable to be put to their best economic use.

Despite the above, the overall impact of the permanent infrastructure of the project on agricultural operations would be minor due to the relatively small areas directly affected (due to irrigated areas accounting for only 2% of the operation impact area), and the ability to continue current operations throughout a large portion of the transmission line easement during operation. Impacts to individual properties would be managed through property management plans to be developed in consultation with landowners (see *Chapter 12 (Land use and property)*). Permanent impacts to agricultural operations are included in the compensation calculations under the NSW *Land Acquisition (Just Terms Compensation) Act 1991.*

Electric fencing

Overhead transmission lines also impact on the operation of electric fencing. Electric fencing must be located at least 25 metres from transmission towers and be connected to the ground for safety reasons (EnergyCo 2022). Australian Standard AS/NZS 3014:2003 states that electric fence crossings with overhead power lines must be avoided wherever possible. When a crossing cannot be avoided, it must be made underneath the transmission line and as close to right angles as possible to it.

These requirements would potentially restrict the siting of electric fences and may require the realignment of some fences. This would be agreed with the landowners and would be unlikely to result in major impacts on the operation of grazing enterprises or the movement of livestock. Impacts to the siting of electric fencing would be managed through individual property management plans to be developed in consultation with landowners (see *Chapter 12 (Land use and property)*).

Cropping areas

Usual cultivation, crop establishment and spraying travel patterns would be required to be adjusted to avoid permanent infrastructure, and care would need to be taken to avoid collisions when using wide farming equipment. The degree of disruption would depend on the location of transmission towers relative to fences and other objects in some instances. Transmission towers are incompatible with irrigation spray booms, which would require alternative applications. Machinery, including irrigation pumps and equipment, would be subject to height restrictions within the transmission line easement, and would be operated outside the centreline of the transmission line easement.

The exact location of permanent project elements would influence the amount of cropping land permanently affected. If project elements are located close to other objects (such as fences, trees, buildings or farm dams) the land between the 2 objects has the potential to become inaccessible to cropping equipment. For example, a transmission tower located 10 metres from a fence may prevent cultivation, seeding and spraying in that gap if cropping equipment used is wider than 10 metres.

Micro-siting of the transmission line easement and transmission towers would seek to minimise constraints on cropping areas where possible.

Aerial operations

The efficiency and effectiveness of aerial agriculture operations can decline as application procedures are amended to compensate for the presence of transmission infrastructure. Transmission towers and transmission lines are a potential hazard for low level aviation activities, and these must be considered in planning a safe aerial application program. The direction of flight, release heights and run lengths may have to be adjusted to maintain safe operations. This can lead to parts of paddocks near infrastructure elements being less effectively treated due to increased release heights, or some areas not able to be treated safely at all. Efficiency of the aerial agricultural operations may decrease and become more time consuming. In most instances, areas unable to be treated with aerial agriculture could be treated by on-ground applications, however this would be less efficient and more costly in most cases.

Impacts to aerial agricultural activities are further discussed in *section 21.1*. Consultation would be carried out with landholders throughout detailed design to understand if aerial agricultural

operations take place in the vicinity of the project and to determine if compensation would be required.

Travelling stock reserves

Operation of the project would impact less than 2 hectares of TSRs, which would include small, isolated parcels of land near Warkworth and Gouldsville. These parcels of land would overlap with the proposed transmission line easement and transmission towers, however given the isolated nature of these parcels of land, it is likely that they are no longer being used for their original intent (i.e. the movement of livestock). Engagement with NSW Local Land Services would be carried out during detailed design to confirm operational impacts to TSRs.

Impacts to land and soil capability

Impacts to land and soil capability for permanent infrastructure, including transmission towers, permanent access tracks and switching stations, would occur during construction. Remaining areas within the operation impact area, including large portions of the transmission line easement, would not be subject to further impacts to land and soil capability during operation, except for where maintenance activities are required to disturb additional land. These impacts from maintenance activities are anticipated to be minor and localised.

Similarly, impacts to BSAL for permanent infrastructure, including transmission towers and permanent access tracks, would be realised during construction. Remaining areas within the operation impact area, including in the transmission line easement, would not be subject to further BSAL impacts during operation, with the exception of where maintenance activities are required to disturb additional land. As above, these impacts from maintenance activities on BSAL are anticipated to be minor and localised.

13.4.4 Biosecurity

Any activity during operation (such as inspections, maintenance and repairs) that requires access of personnel, vehicles or machinery to the transmission line easement poses a potential biosecurity risk to agricultural operations within and surrounding the operation impact area. The biosecurity risks and potential impacts in relation to construction are also applicable to the operation of the project. The major difference is that vehicle, machinery and personnel activity would be less intense and frequent during operation, and therefore the risk of weed, pest or disease spread would be much lower. During operation, the biosecurity protocols and procedures in the network operator's environmental management system will be implemented.

Operational biosecurity risks are also discussed in *Chapter 8 (Biodiversity)*.

13.5 Mitigation and management

13.5.1 Environmental management

Impacts to agricultural land will be managed in accordance with the mitigation measures in *section 13.5.2* as well as in line with the requirements of individual property management plans (see mitigation measure LP2 in *Chapter 12 (Land use and property)*). Property management plans would include measures to minimise disruption to agricultural or other practices during construction, including identification of:

- existing grazing and cropping activities and farm infrastructure arrangements (e.g. fences, access tracks) within the project impact area
- any required adjustments to existing agricultural activities during construction, including adjustments to fencing or access tracks or adjustments to grazing or cropping activities as a result of the location of permanent infrastructure within agricultural land. This would be informed by ongoing consultation with landowners
- noise intensive activities during construction that would overlap with sensitive periods of the livestock production cycle (e.g. lambing or calving)
- vehicle movements and other construction activities in the vicinity of livestock
- the need for the movement of livestock away from potential stressors created during construction activities.

13.5.2 Mitigation measures

Mitigation and management measures proposed to avoid or minimise impacts to agriculture during construction and operation of the project are listed in Table 13.7. This is to be read in conjunction with *Appendix E (Proposed mitigation measures)*.

Table 13.7 Proposed mitigation and management measures - agriculture

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AG1	Property restrictions	Ongoing consultation will be carried out with impacted agricultural landowners to better understand impacts to agricultural operations and to inform the support to be provided to the landowners. Support provided will include the development of alternative irrigation strategies where current irrigation activities are inhibited.	Detailed design Construction	All locations
AG2	Agricultural resource disturbance	During construction, disturbed areas will be stabilised and appropriately reinstated to their previous condition and use as soon as feasible and reasonable following the completion of construction. This will be carried out in consultation with the relevant landowner.	Construction	All locations
AG3	Biosecurity impacts during construction	On a regional level, any import of equipment or machinery, including from overseas, will follow the standard procurement safeguards and quarantine procedures as per the *Biosecurity Act 2015*. In addition, a biosecurity management plan will be prepared that includes detailed construction and operational risks and controls in relation to pests, weeds, and diseases applicable to the project. The biosecurity management plan will address: • weed management controls, including inspection and cleaning of vehicles, plant and equipment, and management of earthworks and clearing activities • development of specific controls where high biosecurity risks are identified (e.g. with respect to foot and mouth disease to control any risk of introduction of the pathogen because of project activities) • specific controls applicable to properties in consultation with landowners, which will be consistent with property biosecurity plans where they are in place. Agreed protocols will be documented in the biosecurity management plan • a monitoring program to track the effectiveness of the controls identified in the biosecurity management plan • consultation with the owners of organic certified properties to identify the specific risks and controls required to be implemented.	Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
		The biosecurity management plan will be prepared in consultation with landowners and relevant local council biosecurity officers in relation to the distribution of important weeds and the location of high biosecurity risk areas. In accordance with the requirements of the *Biosecurity Act 2015* and *Biosecurity Regulation 2017,* the relevant control authority will be notified if new infestations of State priority weeds started because of construction activities.		
AG4	Biosecurity impacts during operation	The biosecurity protocols and procedures captured under the network operator's environmental management system would be implemented along the transmission line easement, at substations and switching stations, and along access tracks during operation.	Operation	All locations

13.6 Summary and conclusion

Agriculture land within the project impact area covers 874 hectares, representing 37% of the overall project impact area. Of this, an estimated 817 hectares is dryland grazing land generally on mid to lower slope landscapes positions and rehabilitated mining land, while an estimated 57 hectares is irrigated land, generally occurring on highly fertile alluvial soils adjacent to the Hunter River.

Impacts to agriculture as a result of the construction and operation of the project are determined to be minor in the context of agriculture within the study area.

At the property level, restrictions and obstructions resulting from construction works and the permanent placement of project infrastructure would result in higher impacts to existing agricultural operations, especially those in irrigated areas. This is anticipated to include restrictions to:

- the movement of livestock
- areas available for cropping
- the use of irrigation and other large scale farm equipment
- placement and type of livestock fencing
- aerial applications and activity
- seeding/spraying activities.

Restrictions created by infrastructure may require site specific management and protocols. Individual (site specific) property management plans will be developed in consultation with each landowner to manage and minimise restrictions to agricultural operations as far as practical, as well as control the broader risks to agriculture at a local and regional level.

Social

14 Social

This chapter provides a summary of the social benefits and impacts of the Hunter Transmission Project (HTP, the project) and identifies appropriate mitigation, management and enhancement measures.

This chapter is based on a social impact assessment (SIA) provided in *Technical Report 6 – Social impact assessment*.

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to social impacts, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance)*.

14.1 Assessment approach

14.1.1 Legislation, policies, plans and guidelines

The SIA was carried out in accordance with the requirements of relevant legislation, policies and assessment guidelines, including:

- *Social Impact Assessment Guideline* (New South Wales (NSW) Department of Planning and Environment (DPE) 2023b) (SIA Guideline)
- *Undertaking Engagement Guidelines for State Significant Projects* (NSW Department of Planning, Housing and Infrastructure (DPHI 2024b))
- *Technical Supplement, Social Impact Assessment Guideline for State Significant Projects* (DPE 2023c)
- *Practice Note – Engaging with Aboriginal Communities, Social Impact Assessment Practice Notes* (DPE 2022i).

Preparation of the SIA was also guided and informed by the following regional and local plans and policies:

- regional plans including the *Hunter Regional Plan 2041* (DPE 2022j) and *Upper Hunter Strategic Regional Land Use Plan* (Department of Planning and Infrastructure (DPI) 2012)
- regional economic development strategies including *Hunter Regional Economic Development Strategy – 2023* (NSW Department of Regional NSW (Regional NSW 2023)) and *A 20-Year Economic Vision for Regional NSW* (IRNSW 2021)
- relevant community strategic plans and local strategic planning statements for the Muswellbrook, Singleton, Cessnock, Lake Macquarie and Central Coast local government areas (LGAs).

14.1.2 Assessment methodology

Overview

Key activities undertaken for the SIA in accordance with the SIA Guideline include:

- integrated analysis of existing socio-economic characteristics of the local and regional communities. Specifically, the social baseline assessment:
- defined and described the existing social characteristics prior to project development
- provided a foundation for analysing likely changes to the baseline environment and evaluating the significance of resulting impacts
- inclusive engagement and representation of a range of stakeholder views
- identification of impacts which are material (i.e. matter the most, and/or pose the greatest risk to those expected to be affected), and an assessment which is proportionate to the scope and scale of potential social impact
- assessment of social impact across the project life cycle, including the distributive equity of impacts and benefits
- integration of other EIS findings with relevance to social values and impacts
- assessment of social impacts and benefits with potential for a material effect on social values, including integration of EIS results with a bearing on the social environment
- significance assessment of identified social impacts and benefits, and justification of significance ratings
- consideration of potential social impacts including cumulative impacts
- development of adaptive management and monitoring strategies, and determination of the residual social risk.

Impact and benefit categories

The identification of the project's potential social impacts and benefits was undertaken through a combination of social research methods and analysis of findings to strengthen accuracy. The identification and assessment of impacts was undertaken with consideration of the impact categories outlined in the SIA Guideline. These categories consider the way a project has the potential to affect people and communities. The categories are outlined in Table 14.1.

Table 14.1 Social impact and benefit categories relevant to the project

way of life including how people live, how they get around, how they work, how they play, and how they interact each day

community including composition, cohesion, character, how the community functions, resilience, and people's sense of place

accessibility including how people access and use infrastructure, services and facilities, whether provided by a public, private, or not-for-profit organisation

culture both Aboriginal and non-Aboriginal, including shared beliefs, customs, practices, obligations, values and stories, and connections to Country, land, waterways, places and buildings

health and wellbeing including physical and mental health especially for people vulnerable to social exclusion or substantial change, psychological stress resulting from financial or other pressures, access to open space and effects on public health

surroundings including ecosystem services such as shade, pollution control, erosion control, public safety and security, access to and use of the natural and built environment, and aesthetic value and amenity

livelihoods including people's capacity to sustain themselves through employment or business

decision-making systems including the extent to which people can have a say in decisions that affect their lives, and have access to complaint, remedy and grievance mechanisms

Social risk assessment

The SIA adopted the social risk assessment matrix provided in the SIA Guideline and replicated in Table 14.2 to Table 14.4. The SIA applied this matrix to potential social impacts and benefits to understand:

- the likelihood of a social impact or benefit occurring
- the magnitude of the potential impact or benefit including considering the extent, duration, intensity, sensitivity and level of concern and/or interest in the potential impact or benefit
- significance level of impacts and benefits before mitigation/enhancement measures.

The SIA subsequently reapplied the matrix assuming the adoption of mitigation measures, to determine the residual significance level of impacts and benefits.

Table 14.2 Defining likelihood levels of social impacts and benefits

Likelihood level	Meaning
Almost certain	Definite or almost definitely expected (e.g. has happened on similar projects)
Likely	High probability
Possible	Medium probability
Unlikely	Low probability
Very unlikely	Improbable or remote probability

Table 14.3 Defining magnitude levels for social impacts and benefits

Magnitude level	Meaning
Transformational	Substantial change experienced in community wellbeing, livelihood, infrastructure, services, health, and/or heritage values; permanent displacement or addition of at least 20% of a community
Major	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area
Moderate	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people
Minor	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable
Minimal	Little noticeable change experienced by people in the locality

Table 14.4 Social impact and benefit significance matrix

Likelihood	Magnitude level				
	Minimal	Minor	Moderate	Major	Transformational
Almost certain	Low	Medium	High	Very high	Very high
Likely	Low	Medium	High	High	Very high
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Very unlikely	Low	Low	Low	Medium	Medium

14.1.3 Social locality (study area)

The social locality is the social and geographical areas of focus for the SIA. It considers:

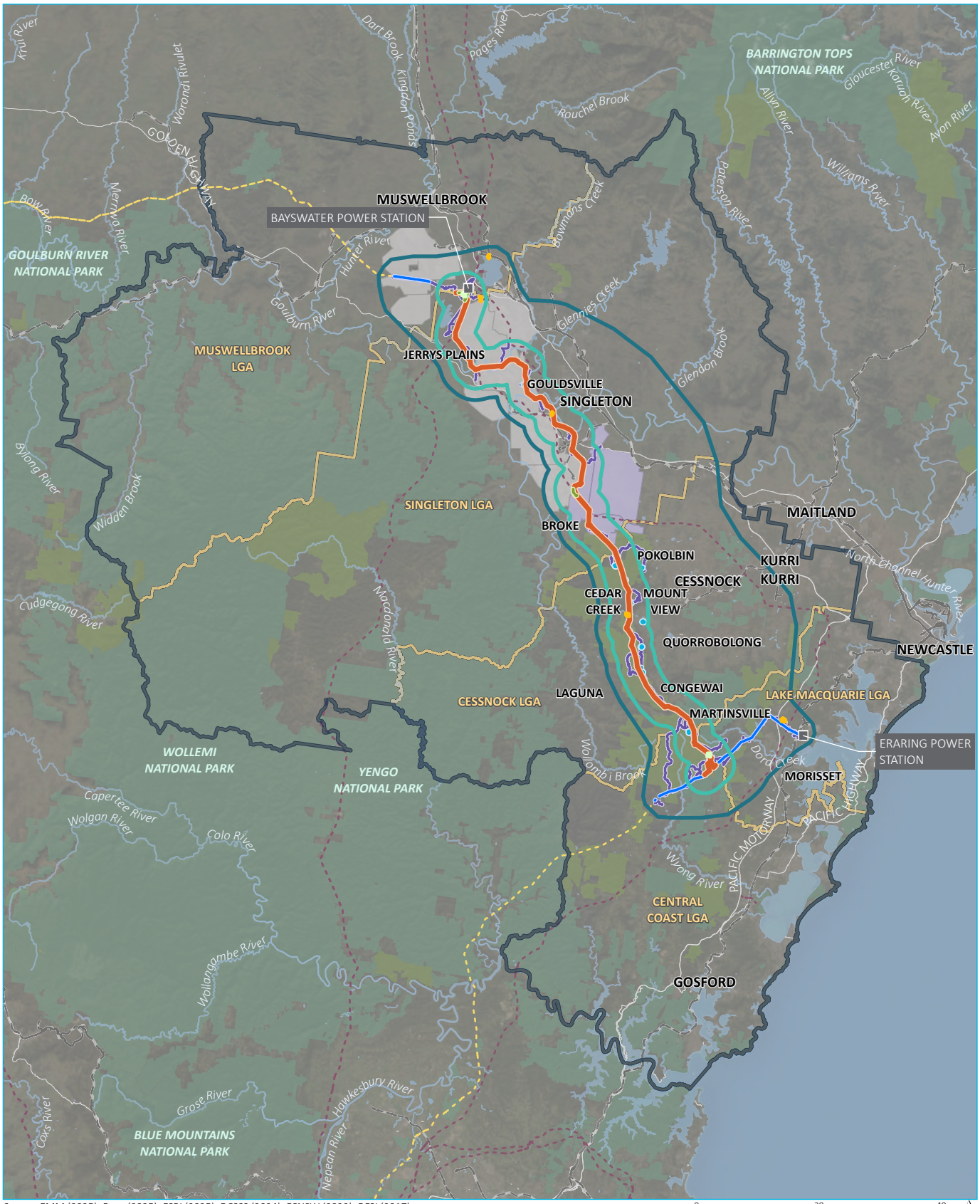
- the nature and scale of the project, including associated infrastructure
- the scope of potential social impacts throughout the project lifecycle
- the location and characteristics of potentially affected communities
- land use patterns, infrastructure, and urban/rural centres.

To define baseline characteristics, detailed demographic data has been collected with reference to applicable Australian Bureau of Statistic (ABS) statistical geographic areas. These statistical geographic areas provide a framework for demographic analysis, facilitating a thorough understanding of community characteristics and potential project impacts within the social locality.

Due to the complexity of impacts and benefits arising from the project, the social locality is defined at 3 levels as described below and shown in Figure 14.1:

- corridor – includes people within 1.5 kilometres either side of the 140-metre wide HTP corridor, switching stations and construction support sites. This area encompasses those people and communities most likely to experience direct impacts relating to amenity and visual impacts, land acquisition and land use, including changes to their sense of place and heritage
- local – includes people generally within 10 kilometres of the HTP corridor. It also encompasses surrounding townships and settlements. This broader area includes consideration of changes to the road network during construction and operation, workforce impacts and effects on social infrastructure, businesses and industry. Where construction support sites are located beyond the corridor (as defined above), the associated social impacts are considered in the context of local area impacts
- regional – covers the whole project and includes the corresponding LGAs of Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie. This accounts for regional level impacts such as employment and training opportunities, benefit sharing, procurement and supply chains, transport and traffic, cumulative impacts and broader intergenerational benefits. The key regional service centres of Newcastle and Maitland have also been included in the data analysis for regional context and benchmarking.

The social locality has also been defined with consideration to the specific social context of the project. This approach emphasises relationships and interactions among community members in addition to considering data available for pre-determined geographical boundaries. Key stakeholders include directly affected landowners, near neighbours (i.e. landowners not directly affected but within the corridor or landowners close to ancillary sites), community members, visitors and tourists, businesses, service and emergency providers, community organisations, vulnerable and marginalised groups, and Aboriginal groups who may be impacted by, or have an interest in, the HTP.



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

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KEY

- Corridor study area
- Local study area
- Regional social locality

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

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

Social locality

Hunter Transmission Project
Environmental Impact Statement
Figure 14.1

EMM
creating opportunities

14.2 Engagement

14.2.1 Overview

Potential social impacts identified in the Scoping Report's SIA Worksheet (see Appendix E of the Scoping Report) were further refined as part of the SIA. These refinements were based on the results of targeted SIA engagement carried out specifically as part of the SIA and the broader EIS engagement undertaken by the Energy Corporation of New South Wales (EnergyCo). Stakeholders were identified through an analysis process based on expected level of project impact and interest. Engagement followed a flexible iterative approach whereby additional stakeholders were consulted as the engagement progressed and the study team learned more about the communities of interest. Feedback received through these engagement activities was considered when identifying appropriate mitigation measures to avoid, minimise and manage the potential social impacts and enhance the potential social benefits identified as part of the SIA (see *section 14.6*).

14.2.2 Social impact assessment engagement

Targeted SIA engagement was carried out between December 2024 and March 2025 and sought to gain in-depth insights into key socio-economic issues from the perspective of key stakeholders likely to experience project impacts and benefits. Engagement activities informing the SIA included semi-structured interviews, meetings, emails and an online survey. Additional information considered in the SIA included written correspondence, private impact submissions, legal correspondence, and meeting records and field notes from engagement with Traditional Custodians as part of the Aboriginal heritage assessment (see *Chapter 9 (Aboriginal heritage)*).

In total, 92 in-person, online and phone interviews were conducted specific to the SIA, with the following key stakeholder groups:

- directly affected landowners (acquisition affected, total and/or partial as well as landowners affected by temporary construction leases)
- near neighbours
- Aboriginal stakeholders
- State government (including the Forestry Corporation of NSW and the State Member for Cessnock)
- local government
- business and industry
- community and special interest groups.

The online survey was used to invite feedback about the project and to collect data to inform the SIA. The survey was distributed to the Regional Reference Group (RRG) members and directly affected landowners, some of whom were unable or preferred not to participate in SIA interviews. The survey was also distributed to the project's stakeholder database of around 900 people. A total of 104 responses to the online survey were received between December 2024 and early March 2025. Outcomes of the SIA online survey are detailed, along with the online survey questions, in *Appendix E (Community survey report)* of *Technical Report 6 – Social impact assessment*.

Key themes and findings emerging from the SIA engagement are summarised in Table 14.5 with more detailed information on the SIA engagement key themes and findings provided in *Technical Report 6 – Social impact assessment*.

Table 14.5 Summary of key themes and findings of SIA engagement

Key theme	Findings
Engagement approach and activities	• Perceived poor quality of the early engagement program and planning/EIS process • High levels of project awareness in directly impacted areas, but low levels of awareness across the broader community • Good levels of project awareness within key stakeholder groups such as government and elected officials • Most landowners expressed a nuanced understanding of the project's drivers, including an understanding and acceptance that large projects need to happen to ensure future energy security, but expressed frustrations at the way in which the planning processes and engagement have been undertaken to date • Belief amongst some stakeholders that the SIA and EIS is a 'tick box' effort and that the SIA process is being rushed through • Perception by some stakeholders of a lack of empathy and respect towards rural livelihoods and lifestyles, and lack of transparency and disclosure • Requests to adopt a more sensitive, transparent and human-focussed engagement approach
Mental health and well being	• Directly affected landowners reported feeling high levels of stress, anxiety and burn-out, primarily due to the way the engagement and acquisition process have been carried out • Several vulnerable individuals directly affected by land acquisition requested the engagement approaches be tailored and more empathetic to account for their needs and minimise mental health pressures • Wildlife carer community reported experiencing stress in anticipation of the impacts to wildlife and increase in demand for rescue/caring roles they are likely to be required to undertake
Traffic and access	• Concerns for the suitability of the road network in the region to handle construction traffic. Numerous participants raised concerns about existing safety issues along Pokolbin Mountains Road • Views that roads require upgrades before construction starts and are expected to be left in the same or a better state after construction is complete. Local government emphasised that they are not able to fund road improvements • Concerns that traffic volume, congestion and delays could negatively impact the tourism trade in the Hunter Valley winery region (e.g. Pokolbin area)

Key theme	Findings
Business and livelihoods	• Concerns regarding the potential impact of construction activities on land management practices affecting operation, productivity and income • Businesses and farmers requested more detailed information regarding construction activities and timeframes to enable them to plan for potential temporary construction impacts they may face • Business representatives were hopeful of securing supply opportunities but indicated that more information and support is needed to understand how to do this
Project employment, procurement and training	• Acknowledgement from some stakeholders that the project would bring jobs and business opportunities, but this would take time, and the community and businesses do not fully understand the specifics and extent of this • Concern regarding labour force competition due to existing mining operations and renewable projects in the area. While businesses view themselves as adaptable, they require ongoing engagement from the project to understand how they can benefit from supply and procurement opportunities
Intergenerational properties	• Properties impacted by full acquisition (7 in total) have been owned, farmed and managed by families for generations, making the acquisition process stressful for them, and an impact that cannot be compensated for financially
Environmental values	• High proportion of stakeholders expressed concern regarding the anticipated impacts of the project on the natural environment, predominantly habitat and biodiversity loss. Stakeholders in the central and southern sections of the project in particular expressed values around the preservation of the natural environment • Many stakeholders recognise and broadly support the energy transition, but do not support the level of biodiversity impact on the Watagan State Forest to achieve this
Aboriginal cultural heritage	• Traditional Owners place value on the cultural landscapes in the vicinity of Lizard Rock, Mount Sugarloaf, Mount Yengo, Mount Warrawolong and Martinsville • Aboriginal representatives conveyed that the ridgelines of the Watagan State Forest are culturally significant and expressing concern of the impacts on cultural landscape values • Aboriginal Focus Groups (see *Chapter 9 (Aboriginal heritage)*), expressed diverse views and shifting sentiment towards the project, with more supportive sentiment featuring more recently • Some Traditional Owners reported a sense of hopelessness and lack of control over decision making processes. However, it was noted that the relationships between Traditional Owners and the project have improved over time

Key theme	Findings
Volunteer services	• Concerns within volunteer organisations that the project would increase demand on services which they are not currently set up to service • Concerns for the stress levels within volunteer originations, particularly the wildlife carer community, due to anticipated fauna casualties

14.2.3 Project engagement

Key issues raised during community and stakeholder engagement for the project, that are relevant to the SIA included:

- strategic context
- project justification and alternatives
- design and route selection
- community engagement process
- land use and property
- environmental impacts (including biodiversity, traffic and access, landscape and visual, cultural heritage and cumulative impacts)
- social and economic impacts.

Further detail about the engagement activities carried out and feedback received is provided in *Chapter 6 (Engagement)* and *Appendix D (Community engagement outcomes)*.

Engagement activities for the project are ongoing and will continue during and after the exhibition of the EIS to ensure that the community and other relevant stakeholders receive comprehensive updates about the project and have the opportunity to provide feedback.

14.3 Existing environment

This section provides a summary of the detailed baseline assessment carried out for the SIA. The baseline assessment:

- defines and describes the existing social characteristics and community values prior to project development
- provides a foundation for analysing potential changes to the baseline environment and quantifying the significance of resulting social impacts.

A summary of the key social characteristics and community values of the social localities relevant to the SIA is provided in Table 14.6.

A detailed analysis of existing socio-economic characteristics across the project's social locality benchmarked to the Hunter Valley Region (including Newcastle) and New South Wales (NSW) is provided in *Chapter 5 (Existing environment)* of *Technical Report 6 – Social impact assessment*.

Table 14.6 Summary of social characteristics and community values in the social locality

Social characteristic	Summary
Traditional ownership and settlement patterns	• Traditional Custodians include Wonnarua, Awabakal, and Darkinjung peoples • Settlement across the regional social locality reflects diverse historical, economic, and geographic influences. These range from rural and resource-based communities to urban growth corridors and emerging residential hubs. Across the regional social locality population density is highest in the south, aligning with NSW urban growth trends. The central and northern sections of the regional social locality retain rural character, with land-use patterns shaped by mining, tourism and agriculture
Transport and connectivity	• At the regional scale, transport infrastructure supports broader economic activities including the Pacific Motorway, Golden Highway, New England Highway, and Hunter Valley Coal Rail Network • Public transport options are limited, restricting mobility for youth and elderly residents, particularly within the corridor social locality • Community concerns highlight poor road conditions, safety issues on Pokolbin Mountains Road and Broke Road, and the need for better road maintenance to support regional growth
Population	• In 2021, there were 543 people residing within the corridor social locality, 75,513 in the local social locality and 665,007 in the regional social locality • Population growth in the corridor social locality increased 18.3% between 2016 to 2021, well above the 8.1% NSW average • Population growth in the local social locality, increased 16.2% between 2016 and 2021, significantly exceeding the NSW average, and strongly influenced by the southern section of the local social locality which recorded 21.5% growth over the 5-year period
Population characteristics	• The corridor social locality comprises a predominantly working-age population of 15 to 54 years (62.4%). Older people (65+ years) and children aged under 15 years represent 17% and 20% respectively of the population mix in the corridor social locality • Age distribution varies across the local social locality, with a younger population profile in the Singleton and Muswellbrook LGA portions of the local social locality (21.8%) contrasting with a higher proportion of older people in the southern section of the local social locality (26.4%)
Aboriginal and Torres Strait Islander people	• The local social locality has a higher representation of Aboriginal and Torres Strait Islander people of 8.7% (central section 10.7%, northern section 10.4% and southern section 5.1%) compared to NSW (3.4%)

Social characteristic	Summary
Socio economic indicators	• Households in rental stress (spending over 30% of income on rent) are prevalent in Cessnock urban centres and locality (UCL) (43%) and Millfield statistical area level (SAL) (50%); these areas are more vulnerable to economic shifts • Socio-economic disadvantage rankings (SEIFA) indicate Muswellbrook and Cessnock are among the most disadvantaged areas in NSW • Cessnock UCL and Muswellbrook UCL report higher proportions of single-parent families (27.3% and 21.3%, respectively) compared to the NSW average (15.8%) • Social housing is prevalent in Cessnock UCL (14.8%), as well as Singleton UCL (21.3%), indicating a concentration of lower-income residents
Health	• The local and regional social localities have higher proportions of individuals with at least one long-term health condition, notably Muswellbrook LGA (31.6%) and Cessnock LGA (35.3%) compared to NSW (27%)
Voluntary work	• Volunteerism rates in the social locality reflect strong social capital. Nearby regional communities such as Cooranbong SAL and Martinsville SAL reported notably higher volunteerism rates of 18.7% and 27.2% and Singleton LGA achieved a volunteerism rate of 14.7% compared to NSW (13%)
Labour force	• The northern section of the corridor social locality reported a labour force participation rate of 41.1%, while participation in the central corridor social locality was notably lower with a participation rate of 25.1%, reflective of the ageing population, with many residents likely to have retired from the labour force • Labour force participation varies significantly across the local social locality (northern section 62.5%, central section 49.1%, and southern section 52.6%), as does unemployment: – unemployment in the northern section was 4.7% and youth unemployment 10.2% – higher unemployment was recorded in the central section at 6.2% and youth unemployment at 11.8% – in the southern section, the unemployment rate was 4.6% and youth unemployment at 9.8%
Local business and industry	• Within the local social locality, mining is the dominant industry of employment, accounting for 22.8% of workers. Retail trade and accommodation and food services are the next highest employing industries at 8.4% and 7.3% respectively • In 2023 there was a total of 47,364 businesses in the regional social locality, with 26,266 businesses in the Central Coast LGA hosting the primary share, followed by 14,276 businesses in Lake Macquarie LGA. A further 3416, 2298 and 1108 businesses were registered in the Cessnock, Singleton and Muswellbrook LGAs, respectively

Social characteristic	Summary
Tourism	• Economic-based tourism: supports a significant share of local employment, ranging from 3.6% in Muswellbrook and 13.9% in Cessnock LGA. In Singleton LGA, an estimated 739 jobs or 4% of total employment, are supported by tourism • Nature-based tourism: all LGAs within the regional social locality capitalise on nature-based tourism linked to walking trails, National parks and State forests, and prominent waterbodies • Wine and agri-based tourism: viticulture is a major drawcard in Singleton, Muswellbrook and Cessnock with internationally recognised wine production and wine tourism experiences
Housing and accommodation	• In the local social locality, the northern section has 12,782 private dwellings and an occupancy rate consistent with the NSW average (90.4%). The central section has less stock with 10,150 private dwellings and a below average occupancy rate (88.7%). The southern section of the local social locality also has a relatively small housing stock with 6907 private dwellings, but an above-average 91.6% occupancy rate, suggesting strong demand relative to supply • This variation in demand and supply is also evident across nearby regional communities of Singleton (with 5698 dwellings and a high occupancy rate of 93.1%) compared to Muswellbrook (with 4675 dwellings and a lower 88.7% occupancy). Cessnock UCL had the largest housing stock of all nearby regional communities (8936 private dwellings) and a strong 91.5% occupancy rate • In November 2024, rental vacancy rates indicated very limited supply and options available, with less than 20 properties available in Muswellbrook, Singleton and Broke while Cooranbong and Martinsville recorded less than 10. The Cessnock and Millfield postcode area, with more rental stock on market, advertised 43 properties (SQM Research 2024)
Social infrastructure	• The education and training profile for the social localities shows varying levels of access and participation across education levels with higher attendance at Technical and Further Education (TAFE) institutions and lower university attendance compared to the NSW average. This suggests a reliance on vocational training pathways over academic university degrees • The local social locality has been identified as facing challenges in terms of local-level access to health professionals and services, with notable gaps within the central and southern sections • There is limited emergency response infrastructure in the northern regional social locality, with only 2 ambulance stations, 2 fire services and 3 police stations supporting Singleton and Muswellbrook LGAs. The central regional social locality has moderate emergency service availability with additional coverage from Cessnock. The southern regional social locality is comparatively better equipped, with 12 ambulance stations, 6 police stations and 17 fire services and facilities across the combined LGAs of Central Coast and Lake Macquarie

Social characteristic	Summary
Community values	• Community values within the project's social locality were identified by local stakeholders through engagement activities and a review of relevant community strategic plans and other relevant plans and strategies. Overall, the social locality is characterised by diverse communities but with common value placed on connection to place, heritage and the natural environment. These values are rooted in the region's history, economic drivers, natural environment, and cultural heritage

14.4 Potential impacts – construction

Potential social benefits and social impacts that may arise during construction of the project are summarised in Table 14.7 and Table 14.8 respectively, including the significance rating before and after the application of mitigation measures. Table 14.7 and Table 14.8 should be read in conjunction with Table 14.11 in *section 14.6*. Further detail is provided in *Technical Report 6 – Social impact assessment*.

Potential cumulative social benefits and impacts arising during construction are summarised in *Chapter 23 (Cumulative impacts)* and considered in detail in *Technical Report 6 – Social impact assessment*.

Potential benefits and impacts have been identified in accordance with SIA Guideline principles, with the benefit and impact evaluations demonstrating a fair and impartial appraisal in line with SIA Guideline definitions for likelihood, magnitude and resultant significance (see *section 14.1.2)*.

Table 14.7 Potential social benefits during construction

Social impact category	Benefit	Extent (social locality)	Benefit before enhancement	Relevant mitigation measure	Benefit after enhancement
Community	**Enhanced community services through community benefit investments** EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter-Central Coast region. The project's construction represents a significant opportunity to deliver meaningful, long-term improvements to community infrastructure and services. Characteristics of the program, its delivery and key initiatives will be refined through stakeholder, community, and regulator engagement during detailed design. The program will have a governance framework that underpins the allocation and management of funds and will ensure benefits are shared with the local communities hosting the renewable energy infrastructure, including the HTP, that will enable the renewable energy transition. If implemented effectively, the program could enhance local service provision and community connectivity and offset some negative project impacts. However, the significance level of this potential benefit could not be assessed at the time of writing as details on the nature of the program are currently unknown. Permanent improvement works proposed to local roads as part of the project will enhance community services across the	Corridor	Program not currently defined	-	Program not currently defined
		Local	Program not currently defined	-	Program not currently defined
		Regional	Program not currently defined	-	Program not currently defined

Social impact category	Benefit	Extent (social locality)	Benefit before enhancement	Relevant mitigation measure	Benefit after enhancement
	social localities (see *Chapter 4 (Project description)* and *Chapter 11 (Traffic and transport)*).				
Livelihoods	**Broad financial benefits through benefit sharing initiatives**	Corridor	High	-	High
	EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter-Central Coast region.	Local	Unknown	-	Unknown
	The project's construction represents a significant opportunity to deliver meaningful, long-term improvements to community infrastructure and services. Characteristics of the program, its delivery and key initiatives will be refined through stakeholder, community, and regulator engagement during project development and detailed design. The program will have a governance framework that underpins the allocation and management of funds and will ensure benefits are shared with the local communities hosting the renewable energy infrastructure, including the Hunter Transmission Project, that will enable the renewable energy transition. These initiatives are expected to result in a high social benefit to the livelihoods and sustainability of communities affected by the project.	Regional	Unknown	-	Unknown

Social impact category	Benefit	Extent (social locality)	Benefit before enhancement	Relevant mitigation measure	Benefit after enhancement
Livelihoods	**Generation of employment and training opportunities for local and regional community** The project presents an opportunity to enhance regional employment and workforce participation, leading to greater prosperity. Project benefits include employment of up to 830 personnel at peak construction, and the potential to stimulate growth in existing businesses and the establishment of new businesses, fostering economic diversification.	Corridor	Medium	S01 Social impact management plan	High
		Local	Medium	S05 Local business and employment strategy	High
		Regional	Medium	S06 Industry and Aboriginal participation plan	High
Livelihoods	**Increased regional business opportunities contributing to economic prosperity**	Corridor	Medium	S01 Social impact management plan	High
	The increase in workers and construction activity is expected to positively boost demand for local goods and services, benefitting retail, hospitality and supply chain businesses.	Local	Medium	S05 Local business and employment strategy	High
	Key economic benefits associated with the project's construction includes larger, construction-related contractual opportunities (majority of direct benefits) and increased ancillary spending in local and regional businesses including food services and transport, retail, health care and other social services (flow-on spend).	Regional	Medium	S06 Industry and Aboriginal participation plan	High

Table 14.8 Potential social impacts during construction

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Decision making systems	**Perceived lack of ability to influence project and government decision-making processes** Participants in SIA interviews, as well as the broader community survey, expressed views describing a perceived lack of empathy and respect for rural livelihoods and values. These sentiments have been heightened by stressors such as uncertainty over easement widths, tower placements, and the acquisition process and timeframes. Similar themes were echoed by broader community participants, with several noting low awareness of the project outside directly affected areas, and a desire for more accessible information and locally tailored engagement approaches.	Corridor	High	S01 Social impact management plan S02 Community communication strategy S03 Complaints management system S04 Landowner engagement strategy	Medium
	Consultation input to the project's SIA, together with the project's broader EIS consultation process, has helped to inform EnergyCo's adaptive management throughout the project's planning phase. However, the perceived lack of agency and transparency in decision-making has the potential to continue to affect social dynamics and potentially erode social licence among directly affected landowners during construction.	Local	Medium	S01 Social impact management plan S02 Community communication strategy S03 Complaints management system	Low
		Regional	Negligible	-	Negligible

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Decision making systems	**Legacy impacts of project engagement affecting enduring relationships, confidence and participation of Traditional Owners** The sentiment toward the project has been shaped by legacy concerns among Traditional Owners regarding their limited involvement in early corridor selection decisions, compounding past expressed experiences of limited representation in the planning of State significant infrastructure (SSI) in NSW. These longstanding issues are highly likely to have contributed to initial low levels of confidence that the project's Registered Aboriginal Parties (RAPs) and other Traditional Owners have carried into their engagement with the project. Concerns of relevance to the SIA include: • procedural clarity and ongoing disputes regarding who speaks for Country • risks that Aboriginal involvement and commitments could be diminished during post-approval and construction • concern that cultural values would be diminished across the project's lifecycle, without strong Traditional Owner and associated governance roles.	Corridor	Medium	S01 Social impact management plan S02 Community communication strategy AH01 Aboriginal cultural heritage management plan (see *Chapter 9 (Aboriginal heritage)*)	Low
		Local	Medium		Low
		Regional	Low		Negligible

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Way of life	**Land use changes due to land acquisition for the project** Concerns raised by directly affected landowners included loss of access to agricultural land during construction, biosecurity concerns, and increased stress and uncertainty regarding land management during construction and operation. Construction activities would result in a negative social impact for directly affected landowners in the corridor social locality due to both temporary and future permanent land use changes.	Corridor	High	S02 Community communication strategy S04 Landowner engagement strategy, including property management plans (see LP2 in *Chapter 12 (Land use and property)*)	Medium
	By contrast, broader negative impacts on the local and regional social localities are more dispersed and of generally lower intensity, however, these social localities remain vulnerable to cumulative impacts (see *Chapter 23 (Cumulative impacts)*).	Local	Medium		Low
		Regional	Low	-	Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Way of life	**Loss of property and relocation of landowners** Whole of property acquisitions for the project would directly impact 7 private landowners. All 7 landowners requested a whole of property acquisition over an easement or partial acquisition. It is EnergyCo's strong preference to reach negotiated agreements with the 7 affected landowners.	Corridor (directly affected, full acquisition)	Very high	S01 Social impact management plan S04 Landowner engagement strategy	High
	While the number of full acquisitions is relatively small in the context of the 110-km HTP corridor, the personal and social significance of property acquisition and relocation for affected landowners remains substantial. During SIA consultation, directly affected landowners raised stress linked to the acquisition land valuation and the uncertainty of relocation processes as well as challenges perceived and experienced by landowners looking to secure like-for-life replacement properties.	Corridor (directly affected, partial or easement acquisition)	High	S04 Landowner engagement strategy, including property management plans (see LP2 in *Chapter 12 (Land use and property)*)	Medium
	Loss of property and relocation may disrupt existing employment and schooling arrangements, as well as residents' prior involvement in established neighbour and community networks. The emotional and logistical impacts of full acquisition would persist throughout detailed design and construction and may be compounded by relocation stress, particularly in a constrained property and housing market.	Local	Low	-	Low
		Regional	Low	-	Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Way of life	**Loss of residential amenity** While temporary in nature, the project's effect on local residential amenity is expected to result in the following social impacts within the corridor social locality, and key local social localities where co-located construction support sites and temporary accommodation facilities are proposed. Identified social impacts include: • disruptions to quiet enjoyment of properties and place (with temporary noise, dust and visual intrusion) particularly for residences in the immediate vicinity of the HTP corridor and construction support sites • temporary increases in frustration and/or stress levels due to disruptions to access during construction, and/or changed environmental qualities affecting perceptions of quality of life. The potential loss of residential amenity may exacerbate the existing health or wellbeing conditions for a number of landowners/neighbours with known health or mobility vulnerabilities.	Corridor	High	S02 Community communication strategy S03 Complaints management system LV1–LV4 landscape and visual mitigation measures (see *Chapter 10 (Landscape and visual)*) NV1 Construction noise and vibration management plan (see *Chapter 16 (Noise and vibration)*) AQ1–AQ3 air quality mitigation measures (see *Chapter 22 (Other matters)*)	Medium
		Local	High	TT1 Traffic management plan (see *Chapter 11 (Traffic and transport)*)	Medium
		Regional	Low	-	Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Community	**Workforce presence affecting perceptions of safety and community cohesion** The project is anticipated to have a temporary but noticeable effect on community dynamics in the corridor and local social localities, particularly for residents and businesses in proximity to the project's construction support sites and workforce accommodation facilities. Increased presence of workers and construction activities could contribute to: • visible increase in traffic volumes particularly on local road networks, and the introduction of additional work sites associated with road and intersection upgrades • perceived and/or actual changes to individual residents' sense of privacy with project workers and machinery operating near homes • perceived and/or actual changes to rural character and associated local values, particularly near to construction support sites and accommodation facility locations. These impacts are expected to vary by location, based on the scale of workforce concentration, proximity to sensitive community uses, and the degree of separation between worker accommodation and local communities.	Corridor	Medium	S02 Community communication strategy S03 Complaints management system S05 Local business and employment strategy S06 Industry and Aboriginal participation plan S07 Temporary worker accommodation management plan(s)	Medium
		Local	Medium		Medium
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Community	**Perceived unequal distribution of project benefits creating conflict and strains on community relationships** Stakeholders consulted acknowledged and accepted the energy transition. However, those stakeholders also held the view that directly impacted stakeholders – particularly landowners hosting transmission infrastructure or directly affected by construction activities – bore a disproportionate impact without clear, tangible benefits identified for their community. EnergyCo is committed to compensating affected landowners via the *Land Acquisition (Just Terms Compensation) Act 1991* and implementing the Strategic Benefit Payments for landowners hosting project infrastructure. Notwithstanding, the SIA assessed the significance of this impact as medium for the corridor and local social localities based on evidence of existing levels of community concern, perceived lack of clarity, and the risk of perceived division in benefit sharing.	Corridor	Medium	S02 Community communication strategy	Medium
		Local	Medium		Low
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Accessibility	**Changed access arrangements for emergency services** The project's construction may temporarily affect access to emergency services along and near the project impact area. This would arise from localised road closures and traffic controls, increased construction traffic, including heavy vehicles on narrow rural roads and physical constraints on emergency access due to construction activities exacerbated by the narrowness, steepness, and varied condition of some local roads. There is a risk that without mitigation, emergency services – inclusive of ambulance, police, and fire and rescue services – could experience delays responding to critical incidents. The potential for this impact is considered in the context of feedback received during SIA consultation from emergency service stakeholders who identified existing access and response time issues for regional and remote call-outs.	Corridor	Medium	S01 Social impact management plan S02 Community communication strategy TT1 Traffic management plan (see *Chapter 11 (Traffic and transport)*)	Low
		Local	Medium		Low
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Accessibility	**Reduced access to housing and short-term accommodation due to increased workforce demand** The approach to dedicated workforce accommodation substantially reduces the potential demand of non-local workers to be accommodated in the project's social localities. Short-term transitional pressures may arise prior to the full establishment of the temporary accommodation facilities during early works of the project, with some non-local workers needing to secure local accommodation. Prior to the establishment of the temporary worker accommodation facilities, workers are likely to seek accommodation in towns including Muswellbrook, Singleton, Cessnock, and Lake Macquarie, where the regional social locality (combined LGA) capacity is more than 1000 short-term accommodation beds, but where economies are largely subject to tourism and seasonal peaks, and where rental vacancy rates remain low. Smaller communities such as Broke, Millfield, and Cooranbong have limited supply and heightened sensitivity to even minor increases in demand, raising the risk of rental price escalation, short-term visitor displacement, and competition for accommodation among existing vulnerable tenants. Stakeholder feedback substantiates these risks noting that without appropriate mitigations in place, even a modest increase in accommodation demand may exacerbate current conditions and vulnerabilities locally.	Corridor	Medium	S01 Social impact management plan S07 Temporary worker accommodation management plan(s)	Low
		Local	Medium		Low
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Accessibility	**Reduced access to health and other community services due to increase in construction workforce** The presence of temporary construction workers has the potential to increase demand on already limited health and community services catering to a rapidly growing population. This could lead to longer wait times and reduced service availability. Key service centres of Muswellbrook, Singleton, Cessnock and Cooranbong are identified with the greatest potential to experience increased service demand. Each accommodation facility includes workforce amenities including catering, sanitation, laundry and first aid. The accommodation is intended to be fully self-contained, minimising reliance on surrounding health and social infrastructure. Helipad sites may also facilitate onsite emergency response if required.	Corridor	Medium	S01 Social impact management plan S07 Temporary worker accommodation management plan(s)	Low
		Local	Medium		Low
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Accessibility	**Changed access to recreational infrastructure due to road network changes** Construction traffic will generate increased traffic along key roads also used for accessing recreation areas, including Hebden Road (Lake Liddell Recreation Area), Broken Back Road (Pokolbin State Forest), Martinsville Road and Watagans Forest Road. Stakeholders identified access to State forests and National parks and other nature-based recreational settings as a key community value, with concerns raised about the potential for construction traffic and road upgrades to reduce access or deter visitation, especially during weekends and peak holiday periods. While the traffic and transport assessment concluded that the forecast increase in construction traffic is unlikely to exceed the capacity of the local road network (see *Chapter 11 (Traffic and transport)*), from a social perspective, even minor delays, perceived safety risks, or uncertainty about access could deter residents and visitors from accessing their preferred recreational sites. Project-related traffic increases on Freemans Drive, which services Cooranbong Sports Facility and the broader Martinsville area, may also influence perceived diminished access to formal and informal use of sports fields, community parks and State forests.	Corridor	High	S01 Social impact management plan S02 Community communication strategy TT1 Traffic management plan (see *Chapter 11 (Traffic and transport)*)	Medium
		Local	Medium		Low
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Livelihoods	**Increased competition for workers impacting local and regional businesses** The project is expected to generate significant employment opportunities and as such workforce demands have the potential to strain labour availability. The project's workforce requirements align with dominant industries in the regional social locality, including mining, energy, trades, machinery operation, and civil construction. With a tight labour market, wages for roles on the project may be higher, making it more challenging for other sectors to attract and retain workers.	Corridor	Medium	S01 Social impact management plan S02 Community communications strategy S05 Local business and employment strategy S06 Industry and Aboriginal participation plan	Low
		Local	High		Low
		Regional	Low		Low
Livelihoods	**Impacts on rural livelihoods and biosecurity risks** Construction activities carry a risk of increasing biosecurity risks to farms and forested/riparian areas. Construction activities may also cause soil erosion, changes to overland flow, and restrictions on farm vehicle and/or stock movements. Landowners affected by easement acquisition and construction lease agreements within the corridor social locality carry the highest risks for this impact, however, in the local and regional social locality the risk is lower but still present due to the movement of construction vehicles around these areas.	Corridor	Medium	S04 Landowner engagement strategy, including property management plans (see LP2 in *Chapter 12 (Land use and property)*)	Medium
		Local	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
		Regional	Low	B1 Biodiversity management plan (see *Chapter 8 (Biodiversity)*)	Low
Livelihoods	**Impacts on tourism operation and visitor economy** Construction activities in high-tourism areas such as the Hunter wine region may affect the visitor experience due to increased traffic and visual impacts in certain areas. Increased construction noise, visual disturbances, road detours and increased traffic volumes on construction routes may also deter visitors from engaging in wine tourism, eco-tourism and cultural heritage experiences. Roads that traverse Pokolbin wine country that would be used for construction include Wine Country Drive, Broke Road, McDonalds Road and the lower portion of Pokolbin Mountains Road. Upgrades and minor works would also be required for some of these roads. Related social impacts including reduced access to short-term accommodation and changed access to recreational infrastructure (see above), are considered in the context of the project's potential effects on tourism operations and the visitor economy.	Corridor	Low	S01 Social impact management plan S02 Community communications strategy	Low
		Local	Medium		Low
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Health and wellbeing	**Diminished mental health and wellbeing due to project-related stressors** A number of project-related factors were found to be contributing to elevated stress, anxiety and diminished wellbeing among stakeholders, and particularly among directly affected landowners. These mental health and wellbeing impacts were commonly attributed by stakeholders to their experience of project planning, engagement and land acquisition processes, while other stakeholders highlighted more general concerns for how the project's effect on environmental values, attachment to place and property stewardship would affect people's mental health and wellbeing. Mental health conditions including depression and anxiety are already prevalent in the corridor social locality (at a rate higher in the local government areas than the NSW average), as are other chronic health conditions. These factors contribute to overall vulnerability within the communities associated with the project. Farming livelihoods also carry an elevated risk to mental health due to factors such as the solitary nature of work, lack of specialised support services, and high financial risk.	Corridor	High	S01 Social impact management plan S02 Community communications strategy S03 Complaints management system S04 Landowner engagement strategy	Medium
		Local	Medium		Low
		Regional	Low	-	Negligible

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Health and wellbeing	**Impacts on environmental values** The aesthetic appeal and wellbeing attributes of the Hunter region's natural environment is part of its regional identity, and its preservation and enjoyment are highly valued by the local community and visitors. As such, the project's potential impact on the natural environment was a key theme raised through the SIA engagement. In addition, representatives from Hunter Valley Wildlife Rescue conveyed the concern they have for the anticipated land clearing and wildlife casualties, and the pressure that the volunteer rescue community would experience in elevated call outs.	Corridor	High	S01 Social impact management plan S02 Community communication strategy	Medium
		Local	High		Medium
		Regional	Medium		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Health and wellbeing	**Changes to traffic movements, potentially creating new road safety risks** While the predicted increase in traffic volumes generated during construction to the road network's capacity and efficiency were generally assessed as minor (see *Chapter 11 (Traffic and transport)*), potential traffic and transport related impacts were raised as a key concern during engagement activities. This reflects the existing social sensitivity of the community and indicates how the potential traffic impacts of the project may be experienced by locals, and in the context of other established uses and peak periods. In addition, multiple road sections and intersections would require upgrades to accommodate safe project access and use and these project activities have the potential to cause temporary disruption to existing social uses of these road networks.	Corridor	High	S02 Community communication strategy S03 Complaints management system TT1 Traffic management plan (see *Chapter 11 (Traffic and transport)*)	Medium
		Local	High		Medium
		Regional	Medium		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Culture	**Potential impacts to Aboriginal cultural heritage, cultural landscapes and wellbeing** The project traverses a region of significant cultural value, intersecting known Aboriginal heritage places and affecting broader cultural landscapes. Consultation with Traditional Owners has raised concerns about the potential for irreversible harm to tangible and intangible cultural heritage, and its implications for cultural identity, wellbeing, and intergenerational connection. While project design refinements and proposed mitigations materially reduce impacts on Aboriginal cultural heritage, the impact on cultural heritage values - both tangible and intangible - cannot be entirely avoided.	Corridor	High	S01 Social impact management plan S02 Community communication strategy AH01 Aboriginal cultural heritage management plan (see *Chapter 9 (Aboriginal heritage)*)	Medium
		Local	High		Medium
		Regional	High		Medium

14.5 Potential impacts – operation

Potential social benefits and social impacts that may arise during operation of the project are summarised in Table 14.9 and Table 14.10 respectively, including the significance rating before and after the application of mitigation measures. Table 14.9 and Table 14.10 should be read in conjunction with Table 14.11 in *section 14.6*. Further detail is provided in *Technical Report 6 – Social impact assessment*.

Potential cumulative social impacts and benefits arising during operation are summarised in *Chapter 23 (Cumulative impacts)* and considered in detail *Technical Report 6 – Social impact assessment*.

Potential benefits and impacts have been identified in accordance with SIA Guideline principles, with the benefit and impact evaluations demonstrating a fair and impartial appraisal in line with SIA Guideline definitions for likelihood, magnitude and resultant significance (see *section 14.1.2).*

Table 14.9 Potential social benefits during operation

Social impact category	Benefit	Extent (social locality)	Benefit before enhancement	Relevant mitigation measure	Benefit after enhancement
Way of life	**Enhanced intergenerational equity through contributing to energy system decarbonisation and improved energy security** Once operational, the HTP would make a positive contribution to intergenerational equity by enabling NSW's transition to a more sustainable, reliable and affordable energy system. As a major transmission project, HTP supports long-term decarbonisation goals while bolstering stability of the electricity grid. These benefits – improved energy security, reduced emissions, and enabling a clean energy economy – are foundational to quality of life for future generations. While the broader public benefit of the energy transition is widely documented and acknowledged, the project's directly impacted stakeholders – including affected landowners and Traditional Owners – have highlighted concerns around loss of intergenerational connections associated with property and knowledge transfer. Similarly, 85% of survey respondents rated the impact of most concern with the project to be 'impacts on the natural environment'. These views emphasise social expectations for the transition to strike a balance between decarbonisation and preserving enduring personal and cultural legacies, and loss of/impacts to biodiversity.	Corridor	Medium	S02 Community communication strategy	Medium
		Local	Medium		Medium
		Regional	High		High

Table 14.10 Potential social impacts during operation

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Health and wellbeing	**Safety and well being concerns related to electromagnetic fields (EMF), bushfire hazards and anti-social behaviours** Despite technical evidence indicating low operational risk from EMF and bushfire, perceptions of health and safety risks combined with existing bushfire danger within the region, were reported from stakeholders in the corridor and local social localities. Stakeholders also expressed concern that the transmission line easement and access tracks may attract activities such as illegal 4WD and trail bike riding, parties and unauthorised camping.	Corridor	Medium	S01 Social impact management plan S02 Community communication strategy	Low
		Local	Medium		Low
		Regional	Low		Low

Social impact category	Impact	Extent (social locality)	Impact before mitigation	Relevant mitigation measure	Impact after mitigation
Surroundings	**Changes to the natural character of landscape altering sense of place** The project's permanent infrastructure would contribute to a permanent change in the visual and physical landscape during operation, possibly affecting residents' and visitors' experiences of rural, natural and cultural surroundings. Stakeholders expressed mixed sentiment about the visual and landscape impacts of the project. Tourism representatives acknowledged that, through the corridor planning process, EnergyCo had done well to minimise impacts on the Hunter Valley wine and tourism region. It was also acknowledged by local community representatives that the placement of the towers below ridgelines (where possible) would reduce visual amenity impacts. Others expressed concerns relating to: • changed rural and natural vistas, particularly around Millfield, Broke Road, and Congewai Valley • disruptions to landscapes that are culturally significant to Aboriginal communities, particularly the ridgelines of the Watagan State Forest • high impacts to some residents' sense of place and rural identity (limited to a small number of long-term and/or intergenerational landowners).	Corridor	High	S02 Community communication strategy	Medium
		Local	High		Low
		Regional	Medium		Low

14.6 Mitigation and management

14.6.1 Environmental management

Potential social impacts will be minimised through the application of mitigation and management measures that will be incorporated into a social impact management plan (SIMP) and implemented during construction of the HTP.

The SIMP will include:

- commitments and management measures, specifying the social impacts addressed, affected stakeholders, implementation timeframes, roles and responsibilities
- a description of how project-specific and regional social changes will be monitored to support adaptive management
- mechanisms for community and stakeholder input to mitigation planning and evaluation of effectiveness.

The SIMP will be implemented and monitored through quarterly data collection where possible to inform adaptive management and continuous improvement.

Monitoring outcomes will be shared with the RRG (which is now repurposing to form a Hunter-Central Coast Regional Reference Group (HCCRRG) and other stakeholder forums as relevant during construction. The proponent will also host annual community surveys to seek feedback on SIMP monitoring.

The SIMP will be reviewed annually and updated based on monitoring data and community and stakeholder feedback. This will include assessing the relevance of mitigation measures and identifying any new issues or initiatives requiring inclusion to ensure they meet the residual risk ratings.

14.6.2 Mitigation measures

The mitigation measures that will be implemented to avoid or minimise potential social impacts and enhance potential social benefits are listed in Table 14.11.

Mitigation measures in other chapters that will contribute to reducing social impacts and that have been considered in the residual impact ratings (impacts after mitigation) include:

- *Chapter 8 (Biodiversity)*
- *Chapter 9 (Aboriginal heritage)*
- *Chapter 10 (Landscape and visual)*
- *Chapter 11 (Traffic and transport)*
- *Chapter 12 (Land use and property)*
- *Chapter 13 (Agriculture)*
- *Chapter 15 (Historic heritage)*
- *Chapter 16 (Noise and vibration)*
- *Chapter 17 (Surface water)*

- *Chapter 19 (Flooding)*
- *Chapter 21 (Hazards and risk)*
- *Chapter 22 (Other matters), section 22.1 (Air quality)*
- *Chapter 22 (Other matters), section 22.4 (Economic).*

Table 14.11 Proposed mitigation and management measures - social

Reference	Impact / Benefit	Mitigation measure	Timing	Relevant location(s)
S01	Social impacts and benefits identified in SIA	A SIMP will be prepared in consultation with key stakeholders and implemented during construction of the HTP.	Detailed design Construction	Corridor Local Regional
S02	Social impacts and benefits identified in SIA	A community communication strategy will establish the approaches to facilitating communication between the proponent and the community during construction. The strategy will: • appoint dedicated community liaison officer(s) and ensure they receive adequate training aligned to trauma-informed care principles • ensure key stakeholders - including affected landowners, Hunter businesses, community groups and local government, are proactively informed through regular updates using a range of communications channels • undertake proactive, targeted engagement with impacted stakeholders located near construction support sites and accommodation facilities – including schools, childcare centres, and social services in Millfield, Cooranbong and Martinsville – to develop and implement agreed mitigation measures • undertake consultation with affected schools and childcare facilities and local governments on traffic impacts and management approaches • implement real time traffic monitoring and SMS alerts for local residents • establish a feedback mechanism by which the community can discuss or provide feedback to the proponent, including how the proponent will respond to enquiries or feedback from the community • implement targeted communications regarding visual, noise, and air quality impacts, road changes/closures, and emergency access coordination, ensuring timely notification ahead of disruptions (see also mitigation measures LV1–LV4, NV1, AQ1–AQ3, and TT1) • provide clear, accessible information on EMF, fire safety, and associated risk reduction measures to address community concerns	Detailed design Construction	Corridor Local Regional

Reference	Impact / Benefit	Mitigation measure	Timing	Relevant location(s)
		• offer 24/7 access to psychological services and tailored mental health support programs, with targeted confidential counselling for directly affected landowners • continue adaptive engagement with Traditional Owners, maintaining agreed governance arrangements and supporting ongoing cultural monitoring through planning and construction (see also mitigation measure AH01) • engage with affected tourism and recreation operators to minimise disruptions and support continuity of operations • set out a framework to develop a community notification processes in consultation with Forestry Corporation of NSW and councils during construction.		
S03	Decision making systems, way of life, community, accessibility, livelihoods, health and well being, culture	A complaints management system will be maintained throughout the construction period and for a minimum of 12 months after the completion of construction. The complaints management system will include the following (at a minimum): • contact details for a 24-hour response line and email address for ongoing stakeholder contact throughout the project • details of complaints received will be recorded • verbal and written responses describing what action will be taken will be provided to the complainant (or as otherwise agreed by the complainant).	Detailed design Construction	Corridor Local Regional

Reference	Impact / Benefit	Mitigation measure	Timing	Relevant location(s)
S04	Decision making systems, way of life, community, livelihoods, health and well being	A landowner engagement strategy will be developed and implemented for the project and will include: • appointing a dedicated land acquisition manager to oversee implementation of the strategy • ensuring all land and property access and community liaison personnel are trained in community and stakeholder engagement and trauma-informed care to support interactions with vulnerable individuals, including those with chronic illness, disability, or mental health conditions. Property management plans will also be implemented to complement the landowner engagement strategy These will be customised to address landowner concerns and property-specific needs, with a focus on respect for landowner values and expectations, co-existence principles, biosecurity, and permissible land uses (see LP2 in *Chapter 12 (Land use and property)*).	Detailed design Construction	Corridor Local

S05	Community, livelihoods	A local business and employment strategy will be prepared and implemented, reflecting EnergyCo's Hunter-first commitments to the local community. It will include the following initiatives: • identify local skills gaps and workforce skills and training requirements • set targets for local employment in line with the *NSW Renewable Energy Sector Board's Plan* (NSW Office of Energy and Climate Change 2022) • set diversity and inclusion targets that align with the *NSW Procurement Board Direction PBD 2023-01 Skills, Training, and diversity in construction* (NSW Treasury 2023) • education and training partnerships, including with TAFE NSW and local high schools and the upcoming Cessnock Education Precinct to support energy transition career pathways • support tailored training and upskilling programs for residents, with a targeted focus on young people, Aboriginal people, candidates seeking career transition from existing local industries, and older people • providing full, fair, and reasonable access to Australian, regional and local suppliers, and including commitments to an ongoing program of engagement with regional suppliers and contractors • investment in retraining and upskilling pathways for workers transitioning into renewable energy industries (e.g. technicians, infrastructure specialists) • maintaining a local and regional supplier database to increase promotion and access to project opportunities • prioritising local procurement and contractor engagement, with clear targets for small and medium enterprises (SMEs) linked to *NSW Procurement Board Direction PBD-2023-03 Procurement opportunities for small and medium businesses* (NSW Treasury 2023) and the *Small and Medium Enterprise and Regional Procurement Policy* (Buy NSW 2021) • partnering with Business Hunter and Local Chambers of Commerce to promote procurement opportunities • outlining mechanisms to monitor cumulative competition and changes to community access to key goods and services that may be affected by the project's local procurement activities • delivery of workforce initiatives focused on Aboriginal employment pathways and contractor engagement.	Detailed design Construction	Local Regional
S06	Community, livelihoods	An industry and Aboriginal participation plan, outlining tailored strategies to strengthen Aboriginal business participation, will be prepared and implemented and will include:	Detailed design	Local

Reference	Impact / Benefit	Mitigation measure	Timing	Relevant location(s)
		• 'meet-the-contractor' events for local and Aboriginal businesses to learn about potential opportunities associated with project delivery • supply chain mapping, with a focus on identifying goods and services suitable for local sourcing (e.g. select civil works, catering, cleaning, transport) and identifying the capacity of local and Aboriginal business to be ready for additional demand • Aboriginal procurement commitments of 2.5% with a stretch goal of up to 10% in line with the *NSW Renewable Energy Sector Board's Plan* (NSW Office of Energy and Climate Change 2022) • set targets for local procurement in line with the *NSW Renewable Energy Sector Board's Plan* (NSW Office of Energy and Climate Change 2022) • monitoring of the availability and price of goods and services in the community that are locally procured This plan will be developed in consultation with local business representatives including Traditional Owners and local Aboriginal business representatives.	Construction	Regional

Reference	Impact / Benefit	Mitigation measure	Timing	Relevant location(s)
S07	Way of life, community, livelihoods, health and well being	A temporary worker accommodation management plan(s) will be developed prior to construction to address requirements set out in the *NSW Guideline for Construction Workers Accommodation* (May 2025), and informed by consultation with neighbours, councils, health and emergency service stakeholders. It will include: • contemporary analysis of local accommodation capacity in key localities including consideration of updated workforce estimates • a code of conduct for workers, which will include a zero-tolerance policy relating to anti-social behavior, health and safety, environmental management and community engagement and cultural awareness raising • measures to support workforce well-being and integration with the local community (e.g., internet access, promotion of participation in local events, healthy food options, wellbeing and safety programs) • dedicated health, paramedic, catering, and recreational services • specific measures to support community cohesion and safety at nearby communities including Cooranbong, Martinsville, and the Lake Liddell Recreation Reserve • security protocols for each accommodation facility The plan will be reviewed on a 6-monthly basis to monitor effectiveness of management commitments and to address emerging or unanticipated impacts.	Detailed design Construction	Corridor Local

14.7 Summary and conclusion

A comprehensive socio-economic baselining process, a tailored stakeholder engagement program, and the incorporation of community engagement and the results of technical studies undertaken for the EIS enabled a robust evaluation of the potential social impacts and benefits of the HTP, in line with the SIA Guideline.

Key insights from community and stakeholder engagement carried out includes the need for the project to balance its strategic benefits with the identified social risks. Key focus areas include addressing landowner stress and mental health impacts; continued management of cultural heritage and landscape values; and management of temporary impacts to residential amenity and changed traffic conditions.

A relatively small number of directly affected landowners would experience high impacts resulting from property acquisition and relocation and land use changes due to whole of property, partial or easement acquisitions. The most prominent perceived social impacts are associated with the project's construction and include disruption to amenity and local traffic networks, visual and landscape change and reduced community cohesion and increased psychosocial stress. These impacts are likely to concentrate in communities along the transmission corridor, and in key social localities affected by proposed construction support sites and accommodation facilities.

The project's social and economic benefits would be realised in the short to medium term, in the form of construction-related employment, local business participation, regional supply chain opportunities and community benefit sharing. Further social value would be delivered during operation through increased energy reliability, improved transmission network performance, and a more sustainable energy future.

Social impacts and benefits would be managed through the implementation of a SIMP during construction of the HTP.

EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employment Benefit Program in the Hunter-Central Coast region that will ensure benefits are shared with the local communities hosting the renewable energy transition, including those hosting the HTP.

While, residual social impacts are predicted to remain, particularly for directly affected landowners, the project is also expected to deliver significant long-term positive residual impacts, including regional economic diversification and enhanced intergenerational equity through contributing to energy system decarbonisation and improved energy security.

Historic heritage

15

15 Historic heritage

This chapter provides a summary of the potential impacts of the Hunter Transmission Project (HTP, 'the project') to historic heritage and identifies appropriate mitigation and management measures. A detailed technical historic heritage impact assessment is provided in *Technical Report 7 – Historic heritage impact statement*. The relevant Planning Secretary's environmental assessment requirements (SEARs) as they relate to historic heritage, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance)*.

15.1 Assessment approach

15.1.1 Legislation, policies, plans and guidelines

The historic heritage impact assessment was undertaken in accordance with SEARs and with reference to the requirements of relevant legislation, policies and assessment guidelines, including:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)
- NSW *Heritage Act 1977* (Heritage Act)
- relevant local environment plans, including:
  - Singleton Local Environmental Plan 2013
  - Cessnock Local Environmental Plan 2011
  - Lake Macquarie Local Environmental Plan 2014
  - Central Coast Local Environmental Plan 2022
  - Muswellbrook Local Environmental Plan 2009
- *The Burra Charter: The Australia International Council on Monuments and Sites* (ICOMOS) charter for places of cultural significance (ICOMOS 2013) (The Burra Charter)
- *Guidelines for preparing a statement of heritage impact* (DPE 2023d)
- *Assessing Heritage Significance* (DPE 2023e)
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (DoP Heritage 2009)
- *Environmental Incident Reporting and Management Guideline* (Department of Defence 2020)
- *Section 170 Heritage and Conservation Register, maintained by NSW National Parks and Wildlife Service* (NPWS).

It is noted that no separate approvals are required for State significant infrastructure in relation to potential impacts to heritage items.

15.1.2 Study area

The study area for the assessment of potential impacts to historic heritage (historical heritage study area) is shown in Figure 15.1 and consists of:

- the project impact area (which includes heritage items and value sites immediately adjacent to the project impact area)
- the visual study area (i.e. land within 1.625 kilometres of the HTP corridor).

A distinction is made between the 2 components of the historical heritage study area to distinguish between direct and indirect impacts. The visual impact study area is in accordance with the *Transmission Guideline – Technical Supplement for Landscape Character and Visual Impact Assessment* (DPHI, 2024a) and further explained in *Chapter 10 (Landscape and visual)*.

15.1.3 Assessment methodology

The assessment methodology involved:

- a desktop assessment to develop an understanding of the known and potential historic heritage values of the historic heritage study area, identify areas of known or potential heritage value for subsequent field inspection and validation, and to provide a context against which the heritage significance of these values was assessed. Background research that formed part of the desktop assessment included:
  - searches of the World Heritage List, National Heritage List, Commonwealth Heritage List, NSW State Heritage Register, NSW State Heritage Inventory, relevant section 170 Heritage and Conservation registers, environmental heritage schedules from the relevant local environmental plans, and non-statutory registers (Register of the National Estate and the National Trust Register)
  - analysis of historical maps (cadastral, parish and topographic) and aerial imagery to develop an appreciation of the creation and evolution of the historical landscape of the historic heritage study area and identify areas of interest
  - literature review of previous heritage studies, as well as general histories of relevance to the historic heritage study area
- field surveys conducted on 25 January 2024, 27 June 2024 and 11 September 2024 to validate the findings of the desktop review (specifically known and potential historic heritage items identified within the project impact area), and to document the heritage values of items potentially impacted by the project
- an assessment of the heritage significance of potential heritage items identified in background research and field surveys to determine if they have world, National, State or local heritage significance based on the *Burra Charter* and *NSW Heritage Manual*
- an assessment of significance of the potential impacts from the project on the heritage values of the heritage items within and adjacent to the project impact area, using criteria developed from the *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* (ICOMOS 2011)
- the development of mitigation measures to avoid, minimise and manage the identified potential impacts.

Potential impacts to heritage values were assessed as follows:

- directness of impact – 'direct' or 'indirect'
- longevity of impact – 'temporary and reversible' or 'permanent'
- degree of impact – minor, moderate or major.

Direct impacts occur if a heritage item is within the project impact area and would be physically changed by the project elements. Indirect impacts, as defined by ICOMOS (2011), are secondary consequences of project activities, and can result in physical loss or changes to the setting of an asset beyond the development footprint (project impact area). Indirect impacts have the potential to alter the surrounding physical environment in such a way that a heritage item is affected. Examples of indirect impacts include vibration from construction activities causing structural damage, or changes to views to or from a heritage item due to the introduction of new structures or vegetation clearing. Indirect impacts have been considered for historic heritage items within the extent of the visual study area (i.e. land within 1.625 kilometres of the HTP corridor).

The longevity of impact is related to the construction and operation timescale of the project. Actions which are necessary to enable the construction of the project and would be, or can be, reversed are considered 'temporary and reversible'. The 'end state' of the project and its continuing operation are considered 'permanent' notwithstanding that in the long term they may have potential to be reversed.

The relative degree of impact is also considered in the context of its potential cumulative impacts. A development or action may have a minor and acceptable impact on its own but if that development or action is repeated at the place, the intensity of combined impacts may lead to a major impact.

Further detail on the assessment of historic heritage is provided in *Technical Report 8 – Historic heritage impact statement.*

15.2 Existing environment

15.2.1 Local context

The database and register searches identified the following:

- there are 12 heritage places within the project impact area:
  - 5 heritage value sites within the Singleton Military Area
  - 1 heritage items listed under the NPWS section 170 register
  - 2 heritage items listed under the Muswellbrook LEP
  - 1 heritage item listed under the Singleton LEP
  - 2 heritage items listed under Lake Macquarie LEP
  - 1 heritage item listed under Central Coast LEP
- there are 15 heritage places within the visual study area:
  - 2 heritage value sites within the Singleton Military Area
  - 2 heritage items listed under the NPWS section 170 register

- 6 heritage items listed under the Singleton LEP
- 3 heritage items m listed under the Cessnock LEP
- 2 heritage items listed under the Lake Macquarie LEP 2014.

There are no heritage items within the project impact area listed on the Commonwealth Heritage List, National Heritage List and Register of National Estate. However, there are several sites within the historic heritage study area (within the project impact area and visual study area) which have been identified as having Commonwealth heritage value, such as within the Singleton Military Area despite the Defence establishment not being listed as a Commonwealth Heritage place.

Assessments of significance for the heritage listings within the historic heritage study area are described in Table 15.1 and shown in Figure 15.1.

The 7 heritage sites within the Singleton Military Area have been assessed against the Garrison Estate Management System (GEMS) Heritage Importance Rankings Definitions, which is used for capturing, collating and interpreting environmental and heritage data by Department of Defence. While not listed as individual items on the Commonwealth Heritage List, the sites are on Commonwealth land. Therefore, works within the Commonwealth land boundary of the Singleton Military Area are subject to the provisions of the EPBC Act for actions affecting land under the ownership or control of the Commonwealth.

Table 15.1 Listed historic heritage items in the historic heritage study area

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
Heritage items within the Singleton Military Area					
Murinbin House complex	SMA ID: 170131	No Visual study area	Singleton Military Area	Commonwealth GEMS – High	The complex comprises a farmhouse and farm buildings and was built in January 1878. The complex is important in illustrating the principal characteristics of the siting, design, construction and landscaping of homesteads, farmhouses and farm buildings in the late nineteenth century. The siting was important due to historical views to the surrounding pastoral landscapes (Cth DCCEEW 2021). The HTP corridor would be 1680 m east of the heritage site. Cessnock Road and Oakley Lane intersection upgrade works would be directly adjacent to the site curtilage; however, would be about 350 m south of the Commonwealth Heritage listed farmhouse.
Blacksmith's shop and forge – Vere township	170113	Yes (partially)	Singleton Military Area	Commonwealth GEMS – Medium	This archaeological site is associated with a blacksmith shop and forge of the Vere township. Remains identified included ruins of a split slab hut, concrete foundations, a dam and exotic plantings. The HTP corridor would be about 88 m west of the heritage site. The project impact area may encroach into the site curtilage with upgrade works to access tracks immediately adjacent.

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
Unidentified site – Vere township	170118	Yes (partially)	Singleton Military Area	Commonwealth GEMS – Low	This archaeological site is associated with a structure on a property granted to Anne Weston in the mid-19th century. Remains identified included a post and rail fence, corrugated steel sheeting, building rubble and late-19th century artefact scatters. The HTP corridor would be about 240 m west of the heritage site. The project impact area may encroach into the site curtilage with upgrade works to access tracks immediately adjacent.
Vere school and second range warden's residence	170119	Yes (partially)	Singleton Military Area	Commonwealth GEMS – Medium	This archaeological site, historical plantings and a cultural landscape are associated with a school for Vere township established in 1882, along with a teacher's residence which later became the Second Range Warden's Residence. Remains identified included concrete footings, potential cesspit, artefact scatters, fence posts, remnant gardens and artefact deposits. The HTP corridor would be about 13 m west of the heritage site. The project impact area may encroach into the site curtilage with upgrade works to access tracks immediately adjacent.

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
Loder Family Sawmill	170125	No Visual Study Area	Singleton Military Area	Commonwealth GEMS – Low	The sawmill operated from the 1930s to 1960s and is associated with descendants of the locally significant Loder family. It is historically associated with the 'Old Myrtle' site. Remains of the sawmill were limited to cement and brick fragments, concrete slabs, machine bases and piers, and a wooden tank stand. The HTP corridor would be about 430 m southwest of the heritage site and about 246 m from the project impact area (access track upgrades).
Oakley Estate	170126/170127	Yes (partially)	Singleton Military Area	State Commonwealth GEMS – High	Along with the Murinbin House Complex, Oakley Estate is one of only 2 former homesteads with intact above-ground remains remaining in Singleton Military Area. Structures identified included a former dwelling, shed structure, cultural plantings and fences. The heritage item has 2 different locations, Location one being north of Oakley Lane and Location 2 being south of Cessnock Road. The HTP corridor would encroach into the curtilage of the heritage site (Location 1). Upgrade works to access tracks immediately adjacent would be adjacent to the item curtilage however would be 30 m from the homestead. A stringing site would be about 46 m to the south of the item curtilage. Areas of high archaeological potential within the site, including the homestead, range from 45 to 62 m from the project impact area. No works are proposed in the vicinity of Location 2.

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
Warringah Stud/Old Myrtle	170129	Yes (partially)	Singleton Military Area	Commonwealth GEMS – Low	This site refers to a homestead and associated outbuildings, dams, orchard and pigsties constructed in the 1870s. In 1998 the homestead and associated outbuildings were demolished. The property is associated with the Loder family, the original members who are of local significance. The HTP corridor would be about 402 m southwest of the heritage site. The project impact area may encroach into the site curtilage with upgrade works to access tracks immediately adjacent. The house within the site is about 65 m east of the project impact area and is in an extremely dilapidated state and has low structural integrity.
Listed heritage items					
Original Forest House Site	Osf 15	No Visual study area	Section 170 (NSW National Parks and Wildlife Service)	Not stated on inventory form	The site contains remnants of past activities associated with forestry and timber production with associations back to the early pine plantings within the area however these remains could not be located during the site inspection. The HTP corridor would be 545 m west of the heritage site and 100 m from the closest access track upgrades.

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
The Wishing Well	Osf 26	Yes	Section 170 (NSW National Parks and Wildlife Service)	Not stated on inventory form	The well is the site of a once important and well-used spring which ultimately gave rise to the name of the surrounding section of forest and is both a historic heritage and Aboriginal heritage item (HTP-S-CS01). The HTP corridor would be about 1.4 km from the heritage site however the heritage site would be within the disturbance area of track widening and upgrade works on Martinsville Hill Road.
Sawmill site (Cnr Martinsville Hill and Watagan Forest Roads)	NA	No Visual study area	Section 170 (NSW National Parks and Wildlife Service)	None available	Limited information is available about this item. The HTP corridor would be 544 m west of the heritage site and 100 m from the closest access track upgrades.
Belmont	I88	Yes (partially)	Muswellbrook LEP 2009	Local	The building and its outbuildings are typical of the genre locally and thus have local historic, aesthetic and scientific significance. The Belmont homestead is located outside of the heritage item curtilage but within the boundary of and adjacent to the Beer Homestead. The adjustments/upgrades to existing transmission lines in this area would be within the item curtilage however within an existing electricity easement and 400 m from the homestead. The closest track works would be 325 m south of the homestead within the site.

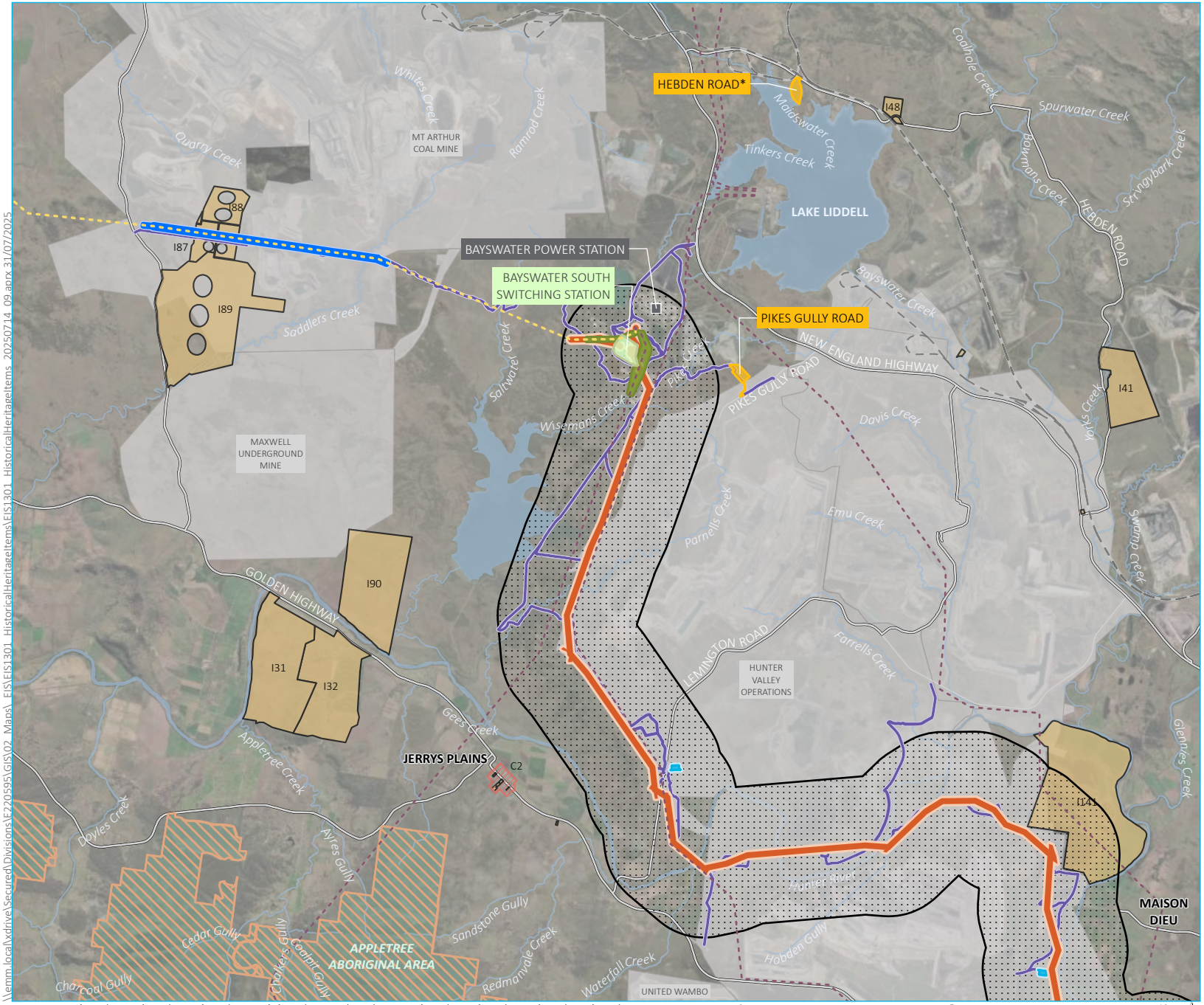
Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
Beer Homestead	I87	Yes (partially)	Muswellbrook LEP 2009	Local	The cottage represents the earliest “conditional purchases” of smaller lots of land in the Saddlers Creek area and region. Works to existing access tracks would encroach into the item’s curtilage however would be 325 m south of the homestead within the site.
‘Stafford’ homestead and ‘Clifford’ homestead (ruins)	I142	Yes (partially)	Singleton LEP 2013	Local	The original stone homestead at Stafford may date from c.1833. The remaining structure is a single-storey brick freestanding dwelling that is currently in a dilapidated condition. The HTP corridor would transect the centre of the curtilage of 'Stafford' homestead and 'Clifford' homestead (ruins). New access tracks would also be within the item curtilage however both the ‘Stafford’ homestead building and ‘Clifford’ homestead ruins within the heritage site would be about 280 m and 117 m from the project impact area, respectively.
Archerfield and outbuildings	I141	No Visual study area	Singleton LEP 2013	Local	No statement or evaluation of significance could be identified for this heritage item. The HTP corridor would be around 77 m from the curtilage of the item and access track works would be about 60 m. However, the HTP corridor would be 1.6 km west of the homestead complex.

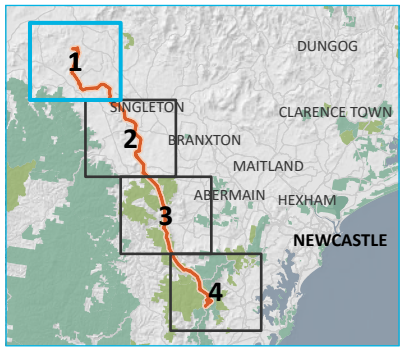
Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
Brick farmhouse	I40	No Visual study area	Singleton LEP 2013	Local	Limited historical information was available on this item however the remaining brick farmhouse is in poor condition and currently boarded up. Metal tanks, a water tank, a stack of sandstock bricks and ornamental plantings immediately surround the dwelling. The HTP corridor and project impact area would be around 284 m north from the item curtilage and 837 m from the farmhouse building.
Hambledon Hill Homestead	I24	No Visual study area	Singleton LEP 2013	Local	The Georgian-style homestead sits on 45 acres and was completed in 1865 and is now a private residence. The HTP corridor would be around 840 m southwest of the item curtilage and about one km from the Hambledon Hill homestead.
Cyril Moxham's House	I155	No Visual study area	Singleton LEP 2013	Local	Cyril Moxham's House is located on slightly elevated land within the Hunter River floodplain. The HTP corridor would be about 1.55 km west of the heritage site.
'Abbey Green' and outbuildings	I39	No Visual study area	Singleton LEP 2013	Local	The Abbey Green homestead, woolshed, slab stables, slab outbuilding and its siting high above a reach of the river are characteristics of a prosperous late Victorian Hunter River Homestead Group. The HTP corridor and access track upgrades would be immediately adjacent to the site curtilage and about 644 m from the homestead complex.

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
War Memorial	I5	No Visual study area	Singleton LEP 2013	Local	The HTP corridor would be about 4.3 km east of the heritage site. The Singleton Street and Wollombi Street upgrades would be immediately adjacent to the heritage item's curtilage however about 41 m from the heritage feature within the site.
Clark's Slab House	I47	No Visual study area	Cessnock LEP 2011	Local	Located in Pokolbin, the item is a rare survival and an early example of a typical settlers' cottage, demonstrating the early and continuous occupation and farming of land in this district. The HTP corridor would be about one km east and the Wollombi Road construction support site about 590 m southeast of the heritage item.
Bellevue Vineyard and Winery	I174	No Visual study area	Cessnock LEP 2011	Local	The small number of remains illustrate the use and development of this land as part of the early winemaking industry in the Pokolbin Hills. The HTP corridor would be over 6.5 km west of the heritage site. Intersection upgrades to McDonalds Road and Oakley Creek Road would be adjacent to the site curtilage however about 68 m from the main cluster buildings within the heritage site.
Millfield General Cemetery	I141	No Visual study area	Cessnock LEP 2011	Local	The cemetery contains graves of early settlers in the Millfield area and dates back to the late 19th Century. The HTP corridor would be about 3 km west of the heritage site. The cemetery gates and boundary fence are located about 45 m south of the proposed location for a laydown area on Hayes Road.

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
Eraring Power Station	93	Yes	Lake Macquarie LEP 2014	Local	Eraring Power Station is the biggest industrial undertaking around the lake, and one of the biggest in the Hunter region. According to the State Heritage Inventory (2008), it is uncertain whether Eraring Power Station yet qualifies as a heritage item however the item is listed on the Lake Macquarie LEP 2014. The item is located partially within the project impact area. The adjustments/upgrades to existing transmission lines in this area would be within the item curtilage.
Former Union Church	242	Yes (partially)	Lake Macquarie LEP 2014	Local	The former church played a vital role in the community life of Martinsville. The project impact area would encroach into the southeastern corner of the curtilage of the heritage item however the church itself would be about 80 m from the proposed intersection upgrade works at Martinsville Road and Watagan Road.
Catholic Church and Cemetery	77	No Visual study area	Lake Macquarie LEP 2014	Local	The project impact area would be immediately adjacent to the curtilage of the cemetery. The church within the heritage site would be located about 20 m and the cemetery about 60 m northwest of the proposed intersection upgrade works at Martinsville Road and Freemans Drive.

Item name	Item no.	Within project impact area	Heritage Register / Listing	Significance	Description
North Corrumbung Cemetery	79	No Visual study area	Lake Macquarie LEP 2014	Local	The item would be about 540 m southeast from the proposed adjustments/upgrades to existing transmission lines in this area and about 380 m from access track works.
Stone house, timber slab barn and fencing	I12	Yes (partially)	Central Coast LEP 2022	Local	The project impact area would encroach into the northeastern corner of the curtilage of the heritage item. The heritage features for which this item is listed would be about 300 m south of the proposed adjustments/upgrades to existing transmission lines in this area.





KEY

- Visual study area
- National heritage item

Local environmental plan

- Conservation area- general
- Item- general

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining

Historical heritage items within the study area
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 15.1

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

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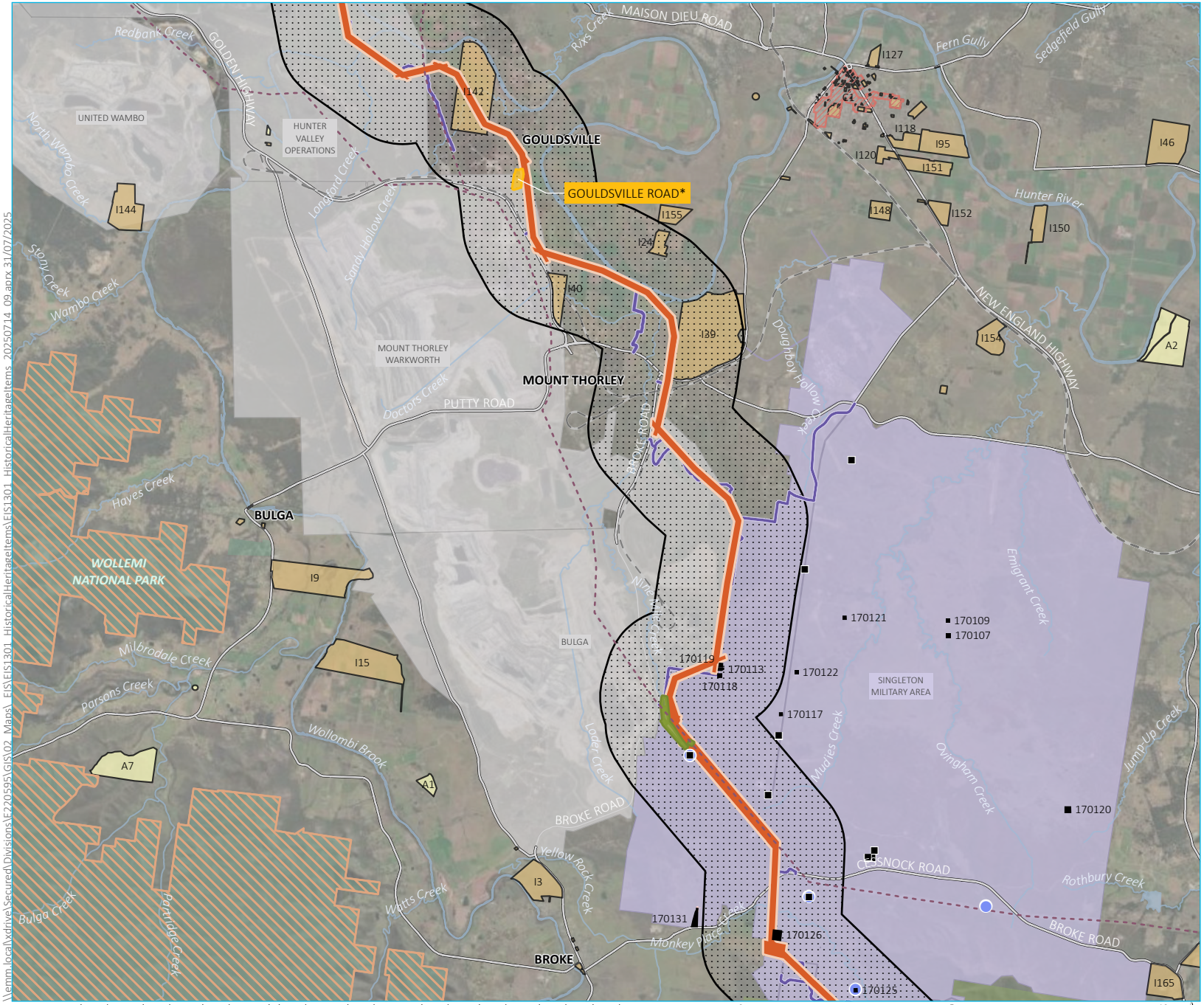

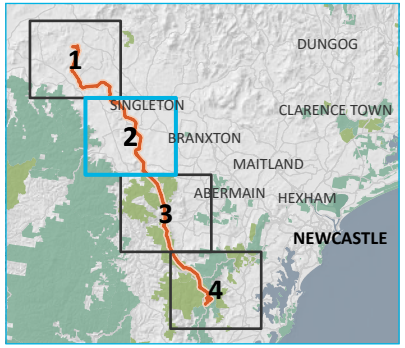

KEY

- Visual study area
- Historic Heritage Value (HHV) site
- SMA Garrison and Estate Management System (GEMS) site
- National heritage item
- Commonwealth heritage item

Local environmental plan

- Conservation area- general
- Item- archaeological
- Item- general

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

Historical heritage items within the study area Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 15.1

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

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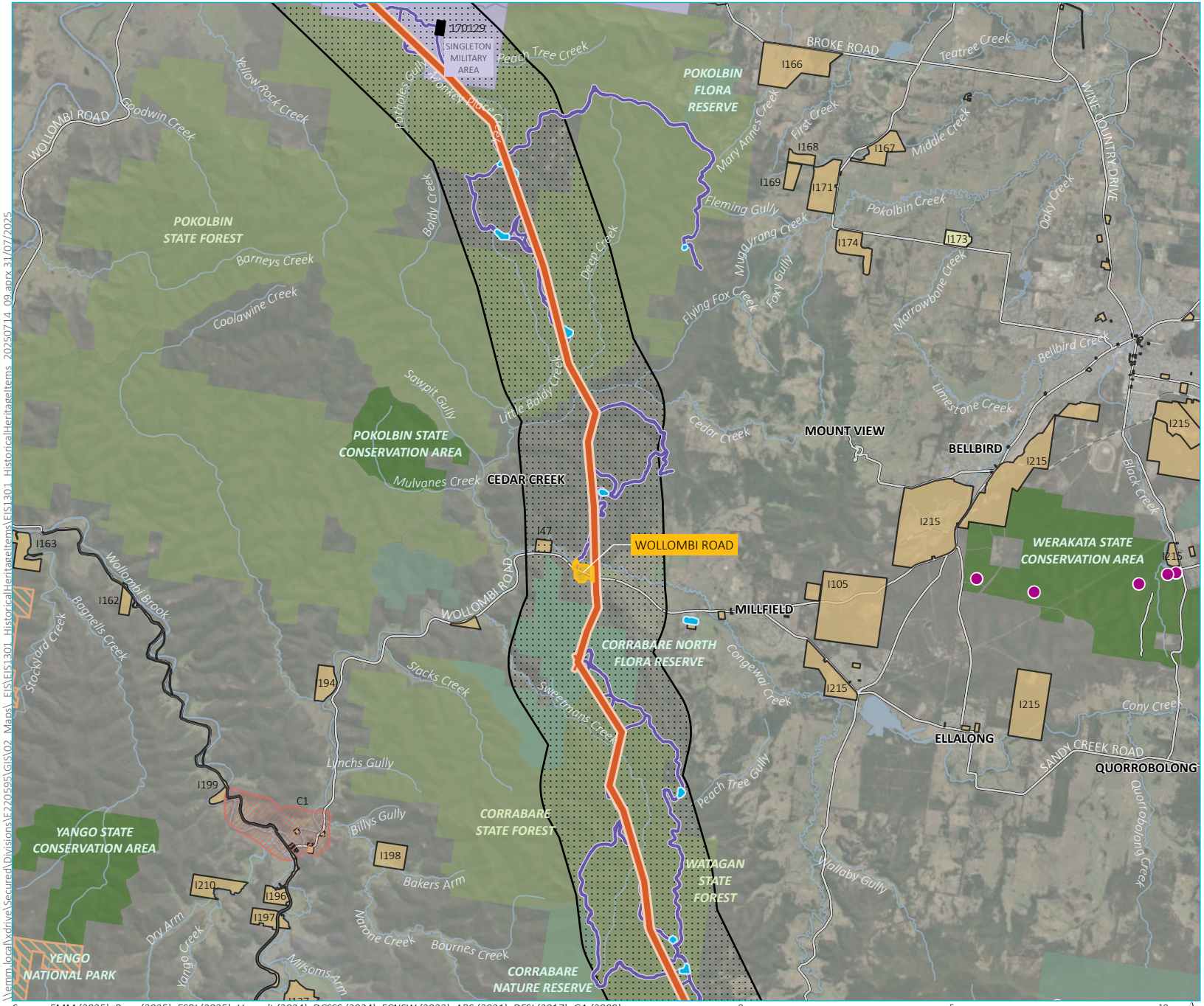

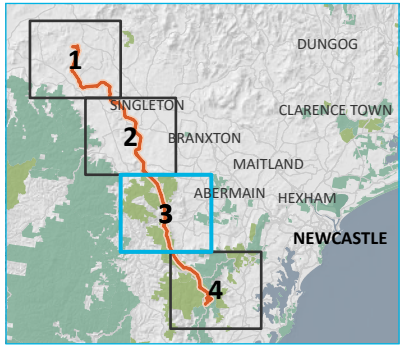

KEY

- Visual study area
- Historic Heritage Information Management System (HHIMS) site
- SMA Garrison and Estate Management System (GEMS) site
- National heritage item

Local environmental plan

- Conservation area- general
- Item- archaeological
- Item- general

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence

Historical heritage items within the study area
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 15.1

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

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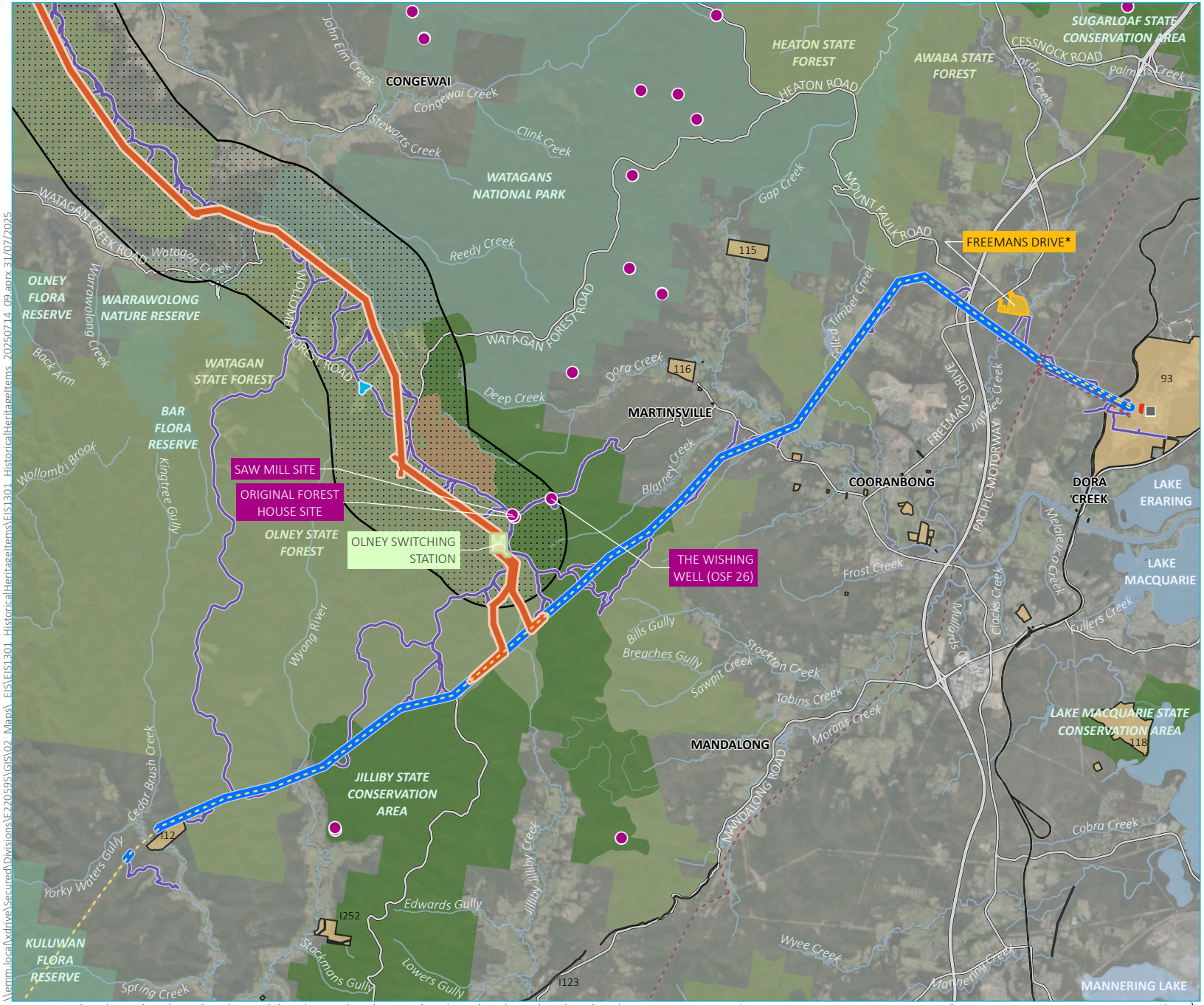

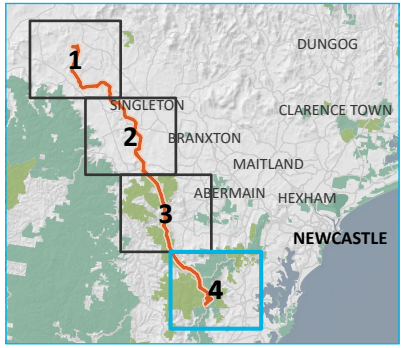

KEY

- Visual study area
- Historic Heritage Information Management System (HHIMS) site

Local environmental plan

- Item- general

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Recreation area

Historical heritage items within the study area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 15.1

EMM
creating opportunities

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

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15.3 Potential impacts - construction

During construction, the project may potentially result in direct impacts to 12 heritage items located within the project impact area. Continued development and refinement of the project design has avoided direct impacts to one historic heritage item (Brick farmhouse (I40)), now located outside the project impact area.

Potential direct impacts to heritage items that would occur during construction include:

- major impacts to the Wishing Well (*Historical Heritage Information Management System* (HHIMS) Osf 26)
- moderate impacts to Blacksmith's shop and forge – Vere township (SMA 170113), Oakley Estate (SMA 170126/170127) and 'Stafford' homestead and 'Clifford' homestead (ruins) (I142)
- minor impacts to the remaining heritage items identified as within or partially within the project impact area
- disturbance of archaeological sites.

Indirect impacts have potential to alter the surrounding physical environment of a historic heritage item in such a way that its historic heritage value is affected. Potential indirect impacts from the project to the historic heritage items identified as being located within the visual study area that would occur during construction include:

- temporary visual changes to the setting of a heritage item
- potential for accidental damage to a heritage structure from construction activities in close proximity such vibration impacts from as moving vehicles and machinery.

A summary of the potential direct and indirect impacts (unmitigated) to the listed heritage items within and next to the construction impact area is provided in Table 15.2. The assessed significance of direct impacts to historic heritage items ranges from no impact to major, with impacts of minor/moderate significance occurring at 11 heritage items. Of these, one heritage item (Blacksmith's shop and forge – Vere township (SMA 170113)) is a potential archaeological site that could be directly disturbed by construction and would have a moderate impact.

Impacts to the Wishing Well (HHIMS Osf 26) would be major however impacts to its heritage significance would be reduced through the implementation of mitigation measures. None of the other potential direct impacts to historic heritage that have been identified are considered as being significant enough to diminish an items cultural significance to a degree where it is no longer recognisable. The potential direct and indirect impacts that could occur would require management to avoid the loss of important historical data.

Through the implementation of mitigation measures, impacts to the Blacksmith's shop and forge (SMA 170113) and Oakley Estate (SMA 170126/170127) would be reduced to minor. Given the HTP corridor would change aesthetic values and views within the 'Stafford' homestead and 'Clifford' homestead (ruins) (I142), the level of impact would likely not be reduced from moderate, with the implementation of mitigation measures (see *section 15.5)*.

The heritage items within the visual study area have only been assessed for operational impacts (see s*ection 15.4*), given the distance from the project impact area and temporary, short-term nature of construction visual impacts. The Millfield General Cemetery has, however, been included given its proximity to a laydown area which may cause visual impacts for the duration of the construction period.

Table 15.2 Assessment of potential construction impacts (unmitigated) to historic heritage listed items within the project impact area

Item name	Item no.	Within project impact area	Potential impact	Direct or indirect	Significance of impact
Heritage items on Commonwealth Land					
Blacksmith's shop and forge – Vere township	170113	Yes (partially)	The curtilage of these sites may be impacted by upgrades to and widening of the adjacent access tracks. Permanent impact to the curtilage of the sites would be avoided if access tracks are reverted to their previous condition post-construction. Access track upgrades may result in ground disturbance in areas of potential archaeological deposits. Therefore, some impacts to the potential archaeological resource may occur.	Direct Indirect	Moderate Minor
Unidentified site – Vere township	170118	Yes (partially)	Upgrades to and widening of an access track adjacent to this site would enter the curtilage of the site. Permanent impact to the curtilage of the sites would be avoided if access tracks are reverted to their previous condition post-construction.	Direct Indirect	Minor Minor
Vere school and second range warden's residence	170119	Yes (partially)	Upgrades to and widening of access track adjacent to this site would enter the curtilage of the site. Permanent impact to the curtilage of the sites would be avoided if access tracks are reverted to their previous condition post-construction.	Direct Indirect	Minor Minor
Oakley Estate	170126/ 170127	Yes (partially)	The construction impact area would intersect the curtilage of this site however the site and areas of high and moderate archaeological potential would not be disturbed by the project. Therefore, there would be no direct impacts to the potential archaeological resource. It is noted the homestead is in a dilapidated state and has low integrity. Notwithstanding, the proposed new access tracks would be 97 m from the homestead and visible remains. The site is and outside the risk buffer for vibration impacts.	Direct Indirect	Minor Moderate

Item name	Item no.	Within project impact area	Potential impact	Direct or indirect	Significance of impact
Warringah Stud/Old Myrtle	170129	Yes (partially)	New access tracks or upgrades to existing access tracks would traverse the curtilage of this item. The access track works would avoid the majority of the heritage site, including the area, which previously contained the homestead and other buildings.	Direct Indirect	Minor Minor
Other listed heritage items					
The Wishing Well	HHIMS Osf 26	Yes	The access track upgrade and widening on Martinsville Hill Road works would require cutting into the slope where this item is located which would result in a permanent impact to the item's heritage significance through its demolition.	Direct	Major
Belmont	I88	Yes (partially)	Establishment of tower pads for the adjustments/upgrades to existing transmission lines in this area would result in permanent physical changes within the item curtilage however would not alter the features for which the item has been listed (Belmont homestead). The access tracks extension from McDonalds Road to the existing transmission line easement would encroach into and result in permanent physical changes within the item curtilage. However, the proposed access track extension would be along existing informal tracks to reduce impacts. The above works and replacement of wiring would result in temporary visual impacts during construction.	Direct Indirect	Minor Minor
Beer Homestead	I87	Yes (partially)	The replacement of wiring and establishment of tower pads would result in temporary visual impacts during construction. The road reserve for McDonalds Road is outside of the curtilage for this item and would not result in any direct impacts to the heritage item however should minor works extend outside the road reserve; they would encroach into the curtilage of the heritage item resulting in minor impacts. The works are outside of the risk buffer for vibration impacts.	Direct Indirect	Minor Minor

Item name	Item no.	Within project impact area	Potential impact	Direct or indirect	Significance of impact
'Stafford', homestead and 'Clifford', homestead (ruins)	I142	Yes	The HTP corridor and access track works would extend through the item curtilage however the construction impact area would avoid the extant built fabric of 'Stafford' homestead and the archaeological resources associated with 'Clifford' homestead remains. As such, the construction of the project would result in a minor direct impact to the heritage item. The works would be outside of the risk buffer for vibration impacts. The construction of proposed towers and stringing of conductors would be visible from the 'Clifford' homestead however the item has a low scenic quality due to existing transmission lines, proximity to a mining area and busy road. However, the higher scenic quality of the setting and views south and west of the 'Stafford' homestead would result in a moderate visual impact during construction.	Direct Indirect	Minor Moderate
Millfield General Cemetery	I141	No	The establishment of a laydown area on the opposite side of Crump Street would result in a temporary visual impact to the item's setting for the duration of construction. The trees within the road reserve serve as a partial visual buffer.	Indirect	Moderate

Item name	Item no.	Within project impact area	Potential impact	Direct or indirect	Significance of impact
Eraring Power Station	93	Yes	The following proposed works would be undertaken within the curtilage of the heritage item: • adjustments/upgrades to existing transmission lines in this area would be undertaken within an existing electricity easement and would replace wiring with same as existing • establishment of tower pads for the adjustments/upgrades to existing transmission lines in this area • minor works to existing access tracks • underground fibre cable works would run within the existing transmission line easement • extension of the existing substation would be in a location which has been cleared in the past and is currently used for access tracks. The above works are an extension of the existing functionality of the adjacent substation and the existing heritage features and structures within the item would not be directly affected. As such, the proposed construction works would not have an adverse impact.	Direct Indirect	Minor Minor
Former Union Church	242	Yes (partially)	The majority of works (road widening) would take place within the road reserve and at the intersection itself (about 80 m southeast of the church) and would be unlikely to extend to or into the curtilage for this item. The heritage features associated with this item would be outside of the risk area for vibrations. The heritage feature is bordered by trees with the exception of views directly to Martinsville Road. As such, there would not be any visual impacts during construction.	Direct Indirect	None Minor

Item name	Item no.	Within project impact area	Potential impact	Direct or indirect	Significance of impact
Stone house, timber slab barn and fencing	I12	Yes (partially)	The construction of the tower pads associated with the adjustments/upgrades to existing transmission lines in this area and access tracks would be undertaken within the item curtilage, however, these are located in an existing transmission line easement and on existing tracks where disturbance is already likely. The adjustments/upgrades to existing transmission lines in this area may be partially visible from the heritage features of this item, which would result in a temporary visual impact. The locations of the tower pads and stringing site are unlikely to be visible. The access track works would not be visible given the dense vegetation and distance.	Direct Indirect	Minor Minor

15.4 Potential impacts – operation

Direct impacts to historic heritage items during operation of the project would be unlikely as operational activities would primarily involve routine inspection and maintenance of transmission lines, towers and easements.

Maintenance activities required for operation of the project, such as vegetation trimming and maintenance of access tracks and associated project infrastructure, would not result in disturbance of additional areas compared to those assessed during construction. As such, no additional direct or partial direct disturbance impacts to historic heritage would occur during operation of the project.

Potential impacts to historic heritage during operation would predominantly relate to indirect visual impacts from the presence of permanent elements of the project, including transmission lines, towers and switching stations. These elements have potential to change landscape character. Given the majority of listed heritage items are archaeological sites, impacts to the setting are of reduced concern when compared to direct or indirect impacts to archaeological resources.

A visual impact would occur at heritage sites where the transmission line and infrastructure would alter the setting of the heritage site and create permanent visual changes, detracting from the significance of the surrounding landscape. A moderate visual impact is anticipated at 2 sites: Oakley Estate (170126/170127) and 'Stafford' homestead and 'Clifford' homestead (ruins) (I142). Once the final tower locations are known, the actual visual impacts on heritage sites may need to be reassessed and additional mitigation measures considered, if relevant. Negligible/minor visual impacts are anticipated at the remaining heritage sites. See *Technical Report 3 - Landscape character and visual impact assessment* for further information on visual impacts to heritage listed dwellings.

15.5 Mitigation and management

Historic heritage impacts will be managed in accordance with the environmental management strategy (EMS). As part of the EMS, a historic heritage management plan (HHMP) will be prepared and will include final mitigation measures and management actions in accordance with this report and the conditions of approval for the project. The HHMP will be submitted to Heritage NSW for consultation. The NSW National Parks and Wildlife Service (NPWS) will be notified of the removal of the Wishing Well heritage item.

The mitigation and management measures that will be implemented to avoid or minimise potential impacts to historic heritage are listed in Table 15.3.

Mitigation and management measures in other chapters that are relevant to the management of historic heritage include:

- *Chapter 9 (Aboriginal heritage)*, specifically measures which address impacts on Aboriginal cultural heritage
- *Chapter 10 (Landscape and visual)*, specifically measures which address visual impacts on the landscape
- *Chapter 17 (Noise and vibration),* specifically measures which address vibration impacts on heritage items.

Table 15.3 Proposed mitigation and management measures – historic heritage

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
HH1	Historical heritage management	An HHMP will be prepared by a suitably qualified and experienced heritage specialist to provide the post-approval framework for managing archaeological mitigation and historical heritage within the project impact area. The HHMP will include as a minimum: • measures that will be implemented to manage potential impacts on listed heritage items and sites with historical heritage value • inclusion of heritage awareness and management training within the site induction process for relevant personnel involved in site works • identify heritage sites that would be subject to archival recording • details of the management of any historic heritage artefacts recovered during construction.	Detailed design Construction	Project impact area, and all identified heritage items that will be adversely impacted by the project

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
HH2	Impacts to heritage curtilage	Prior to construction activities near the heritage item, an exclusion barrier (e.g. fence or suitable alternative) will be installed at the curtilage of heritage items and sites where works will be in the vicinity to reduce the risk of unintentional impacts to heritage values. Where works enter the curtilage of an item or site: • any significant elements of the heritage item or site will be fenced off, preferably with a minimum of a 5 m buffer, where possible • where not possible, the area of works will be fenced off from the remaining part of the item or site curtilage • the barrier will be maintained for the duration of construction	Detailed design Construction	• Blacksmith's shop and forge – Vere township • Unidentified site – Vere township • Vere school and Second Range Warden's Residence • Oakley Estate (Location 1) • Warringah Stud/Old Myrtle • 'Stafford' homestead and 'Clifford' homestead • Archerfield and outbuildings • Catholic Church and Cemetery
HH3	Impacts to heritage curtilage	The construction impact area at tower pad areas will be remediated at the end of construction to minimise impacts to setting of the heritage curtilage.	Construction	• Belmont • Beer Homestead • 'Stafford' homestead and 'Clifford' homestead • Eraring Power Station • Stone house, timber slab barn and fencing

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
HH4	Ground disturbance at archaeological areas	Where possible, ground disturbance will be avoided within heritage site curtilages. Alternatives to ground disturbance for temporary access track upgrades may include laying of protective materials, such as thick plastic and geofabric, over the ground surface followed by a layer of gravel. Materials for the upgrade of the access track can be deposited on top of this protective layer.	Detailed design Construction	• Blacksmith's shop and forge – Vere township • Unidentified site – Vere township • Vere school and Second Range Warden's Residence
HH5	Changes to settings of item or heritage site	A review of visual impacts may be required once the final tower locations are known.	Detailed design	• Oakley Estate • 'Stafford' homestead and 'Clifford' homestead
HH6	Changes to settings of item or heritage site	Minimise tree removal in the laydown area at Crump Street.	Construction	• Millfield General Cemetery

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
HH7	Disturbance or destruction of unexpected items of potential heritage significance, relics or human remains	Any items of potential heritage significance or human remains discovered during construction will be managed in accordance with an unexpected finds procedure. Work in the vicinity of the find will stop if objects such as bonded bricks, timber or stones appearing in formation indicating a wall or floor for instance are found, or if soil with artefacts concentrations, is excavated. A description of the types of finds that will stop works within the vicinity of the finds will be determined prior to construction as part of the HHMP and staff involved in excavation work will be informed about how to apply it. The unexpected finds procedure will include actions such as: • stop work procedures and exclusion buffers • using the advice of a technical specialist • consultation with Heritage NSW, Department of Climate Change, Energy, the Environment and Water (Heritage NSW) • protocols for continuing work in the area after assessment	Detailed design Construction	• Blacksmith's shop and forge - Vere township • Unidentified site - Vere township • Vere school and Second Range Warden's Residence • Oakley Estate (Location 1) • Warringah Stud/Old Myrtle • Belmont • Beer Homestead • 'Stafford' homestead and 'Clifford' homestead • Brick farmhouse • Archerfield and outbuildings • Eraring Power Station
HH8	Potential disturbance or destruction of known items of potential heritage significance, relics or human remains	Should it not be possible to avoid ground disturbance, archaeological monitoring of any ground disturbing works will be prepared at sites of archaeological potential. An Archaeological Method Statement (AMS) will be prepared for the proposed works, in accordance with the HHMP.	Detailed design Construction	• Blacksmith's shop and forge - Vere township • Unidentified site - Vere township • Vere school and Second Range Warden's Residence

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
HH9	Confirmed destruction of known items of heritage significance, relics or human remains	Direct impacts to the Wishing Well are unavoidable due to access track upgrades to Martinsville Hill Road. The Wishing Well will be subject to archaeological excavation and recording to ensure that a record is made prior to its demolition. An AMS will be prepared for these works. A commemorative plaque will be installed in a location as close as possible/practicable to the water source of the Wishing Well, which will be determined through further consultation with NPWS, Forestry Corporation of NSW and Heritage NSW. Continue consultation regarding engineering solutions for maintaining access to the water source post-construction.	Detailed design Construction	• Wishing Well

15.6 Summary and conclusion

The historic heritage assessment has identified 12 heritage items or heritage value sites to be within the project impact area, and 15 heritage items or heritage value sites within the visual study area.

During construction, the project would result in direct impacts to 11 heritage items or value sites. One heritage item (The Wishing Well, Osf 26) would be completely demolished however mitigation measures will be implemented to preserve, as much as possible, the archaeological and cultural significance of the item. None of the other impacts identified are significant enough to diminish the cultural significance of the historic heritage items or sites to a degree where it is no longer recognisable. Indirect construction impacts would include temporary visual changes to the setting of a heritage item and potential for accidental damage to a heritage structure from construction activities in close proximity. Mitigation measures are proposed to manage potential impacts to heritage items during construction such as a Historical Heritage Management Plan and exclusion barriers installed at the curtilage of heritage items.

Once operational, the project would be unlikely to have any direct impacts to historic heritage items as activities would primarily involve routine inspection and maintenance of transmission lines and towers. Potential ground disturbing works (such as vegetation clearing within the transmission line easement) would be infrequent. Potential impacts to historic heritage during operation would predominantly relate to indirect visual impacts from the presence of permanent elements of the project which have potential to change landscape character. A moderate permanent visual impact is anticipated at 2 heritage sites (Oakley Estate (170126/170127) and 'Stafford' homestead and 'Clifford' homestead (ruins) (I42).

Management measures are proposed to protect historic heritage values including preparation of an HHMP.

Noise and vibration

16

16 Noise and vibration

This chapter assesses the potential impacts associated with the noise and vibration during construction and operation of the Hunter Transmission Project (HTP, 'the project') and identifies mitigation measures to be adopted for the project to reduce potential noise and vibration impacts.

The chapter is based on a Noise and vibration impact assessment provided in *Technical Report 8 - Noise and vibration* (including audible noise).

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to noise and vibration, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance)*.

16.1 Assessment approach

16.1.1 Legislation, policies, plans and guidelines

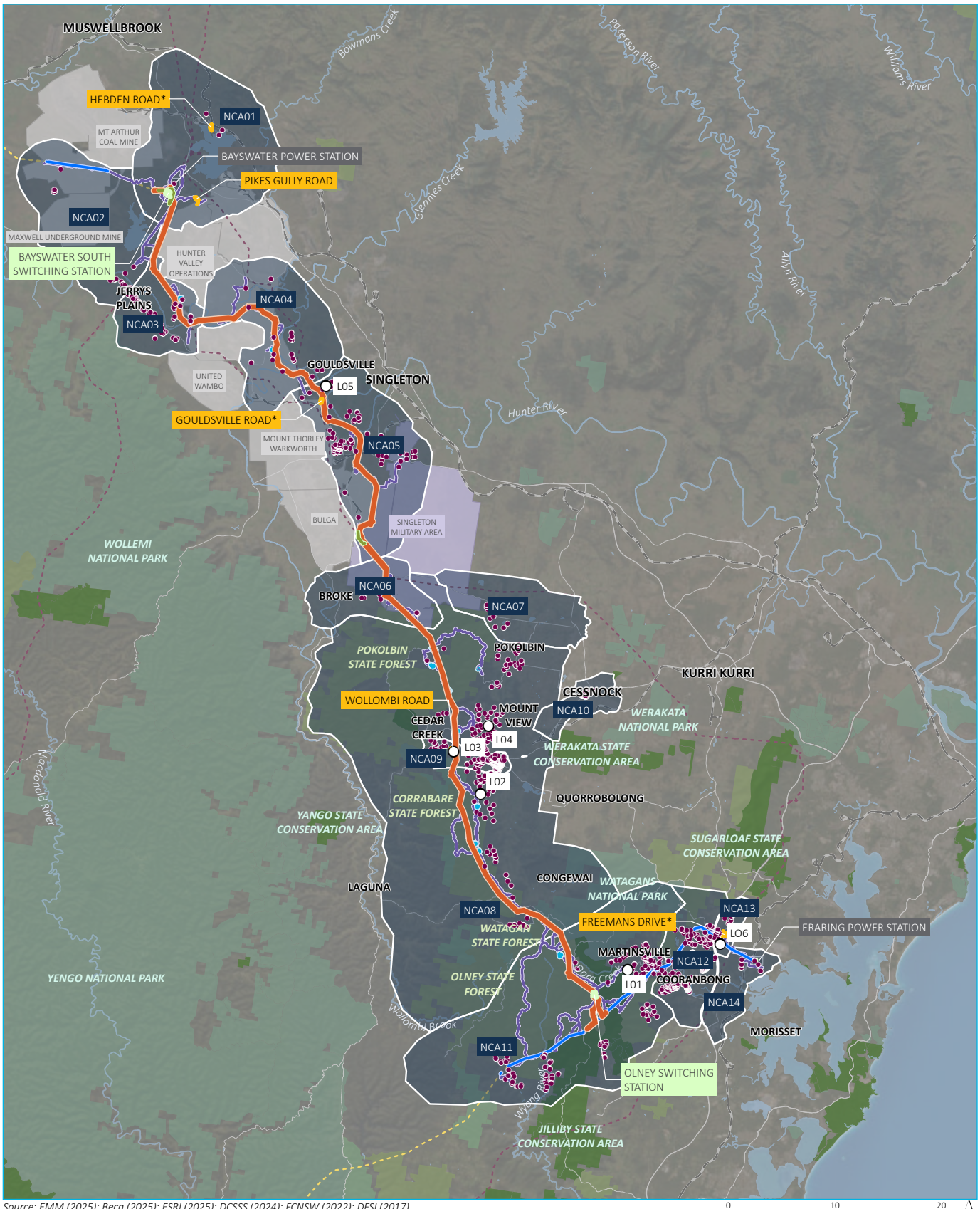
The noise and vibration assessment was undertaken in accordance with SEARs and with reference to the requirements of relevant policies, assessment guidelines and standards including:

- *Commonwealth Air Navigation Act 1920*
- Air Navigation (Aircraft Noise) Regulations 2018
- *Airservices Australia Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise* (2002)
- *Australian Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107)
- *Interim Construction Noise Guideline* (NSW Department of Environment, Climate Change and Water (DECCW), 2009) (ICNG)
- *Road Noise Policy* (RNP) (DECCW, 2011) (RNP)
- *Noise Policy for Industry* (NPfI) (NSW Environment Protection Authority, 2017a) (NPfI)
- *Assessing Vibration: A Technical Guideline* (NSW Department of Environment and Conservation, 2006) (AVTG)
- *Australian Standard AS 2436:2010 Guide to noise and vibration control on construction, demolition and maintenance sites*
- *British Standard BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings*
- *British Standard BS 7385-2:1993 – Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration* (British Standard Institution 1993) (BS 7385)

- *German Standard DIN 4150-3 Structural Vibration Part 3: Effects of Vibration on Structures* (Deutsches Institut für Normung, 1999) (DIN 4150-3)
- *Construction Noise and Vibration Guideline* (Transport for NSW 2023) (CNVG)
- *Designing, Constructing and Operating Assets Near Jemena Gas Pipelines* (Jemena Limited 2021)
- *Helicopter Association International (HAI) Fly Neighbourly Guide*.

16.1.2 Study area

The study area reflects the possible distance within which noise and vibration sensitive receivers may experience noise and vibration impacts from the project. The study area is further defined by noise catchment areas (NCAs) that form a buffer around the project impact area of varying size depending on the relevant project component and proposed construction activities. The study area and NCAs are shown in Figure 16.1.



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

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KEY

- Noise monitoring location
- Sensitive receiver
- Noise catchment area

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

Noise study area and monitoring locations

Hunter Transmission Project
Environmental Impact Statement
Figure 16.1

EMM
creating opportunities

16.1.3 Assessment methodology

The assessment methodology involved:

- desktop review and field investigations to understand the existing noise and vibration environment including:
  - identification of potential noise and vibration sensitive receivers within the study area based on aerial imagery
  - attended and unattended noise monitoring at 6 locations within the study area in February and March 2025 to determine rating background levels (RBLs). Where noise monitoring could not be undertaken, the assessment also used previous noise studies undertaken for other projects to inform the RBL. The RBL is the background noise level used for the purpose of assessment
  - review of the existing meteorological conditions of the study area using data from the Bureau of Meteorology (BOM) (described in section 4.2 of *Technical Report 8 – Noise and vibration impact assessment* including audible noise)
  - identification of the applicable noise and vibration criteria with reference to relevant guidelines, standards and the noise monitoring results collected for the project (see *section 16.1.4)*
- for construction noise:
  - noise modelling of representative 'realistic worst-case' scenarios that are based on likely construction stages and plant and equipment during standard and non-standard construction hours (as defined by the ICNG). This assumed certain equipment would be used simultaneously at the boundary of the project impact area
  - assessment of sleep disturbance impacts where construction work would occur outside standard construction hours
  - assessment of likely airborne noise impacts from proposed aircraft use during construction:
    - aircraft noise is predicted with a 3D noise model implemented using SoundPLAN
  - identification of standard and additional site-specific noise mitigation where exceedances of applicable Noise Management Level (NML) occur (see *section 16.5*)
- assessment of construction road traffic noise impacts on sensitive receivers based on existing traffic volumes and traffic volumes generated by the project along construction routes
- assessment of construction vibration impacts through the identification of structures or sensitive receivers within minimum vibration working distances identified in the CNVG
- for operational noise, the assessment of:
  - corona noise discharges from proposed transmission lines. This has been informed by the Audible Noise Report (Beca, 2025). Noise emissions from the project transmission lines are considered for the Olney to Bayswater section only as the project will result in only minor alterations to the existing 500 kilovolt (kV) transmission line from Eraring to Kemps Creek

- sleep disturbance impacts during the operation of circuit breaker switches at Olney and Bayswater South switching stations, transformers at Eraring substation and reactors at Bayswater South switching station

- identification of feasible and reasonable construction measures to mitigate predicted exceedances of the noise criteria or where vibration-intensive activities occur within minimum working distances
- identification of feasible and reasonable operational mitigation measures based on predicted exceedances of the noise criteria at sensitive receivers from operation of transmission infrastructure.

Further detail on the noise and vibration assessment methodology is provided in *Technical Report 9 - Noise and vibration impact assessment* (including audible noise).

16.1.4 Construction noise assessment approach

Construction scenarios

Several representative construction scenarios have been developed to assess the likely noise impacts from the construction activities associated with works in the transmission corridor, switching stations and substations, and the establishment and operation of the construction support sites including temporary worker accommodation.

The scenarios represent the 'realistic worst-case' potential noise impacts during the noisiest 15-minute period. This approach is generally considered conservative as the calculations for each scenario assume several items of construction plant and equipment are in use at the same time and work occurs at the boundary that is the closest point to each receiver. This scenario would not typically occur for most construction activities; it is expected that the actual construction noise levels would frequently be lower than the predictions for these construction scenarios. A brief description of the construction scenarios is presented in Table 16.1 and full descriptions are provided in *Technical Report 8 - Noise and vibration impact assessment* (including audible noise).

Table 16.1 Construction scenario descriptions

Scenario	Description
Earthworks and access	Bulk earthworks across the construction impact area and construction activities for switching stations, substation upgrades and access tracks. Typical activities included in this scenario are the clearing of vegetation and removal of topsoil, excavation work, levelling/grading the ground, and drainage works. Noise intensive equipment such as a rock-breaker would be required at times during the works. Some access tracks would only require 'minor' works such as minimal excavation and laying of suitable road base while others would require 'major' construction activities involving the use of earthwork equipment such as graders, excavators (with and without hydraulic hammer) and rollers. This construction scenario has been applied to construction support sites, tower pads, stringing sites, switching station locations, the Eraring and Bayswater substation areas, new access tracks and road upgrade areas.

Scenario	Description
Intersection works	Construction activities required to upgrade/augment existing road intersections to accommodate project related traffic movements. Depending on the extent and type of work proposed at each intersection a 'typical' and 'intensive' construction scenario has been assessed. Some intersections would only require 'typical' works while others would require 'typical' and 'intrusive' construction activities.
Vegetation clearing	Vegetation clearing, processing and removal for vegetated areas of the HTP corridor.
Concrete works for hardstand areas	Construction and concrete works for hardstand areas across the construction impact area including construction support sites, tower locations, switching station locations and Eraring and Bayswater substation areas.
Tower assembly/ construction of structures	Construction of transmission line structures by assembling sections of the structures on the ground and hoisting or lifting successive sections into place using cranes or erected in place on the footings by installing individual sections hoisted into place.
Stringing	Stringing, tensioning and pulling of transmission line by ground-based winches.
Construction support sites (including laydown areas)	These sites would be required to support construction activities and would include activities such as: • laydown yards for temporary storage of materials, plant and equipment • concrete batch plant • delivery and handling of materials • worker parking • site offices and worker accommodation areas • helicopters/helipads (located at the following 4 construction support sites: Hebden Road, Pikes Gully Road, Gouldsville Road and Freemans Drive). The construction support sites with worker accommodation would operate out of standard construction hours and would include vehicle movements and power generators.

The construction scenarios have considered both work during and outside of standard construction hours. Standard construction hours and out of hours work as defined by the ICNG are presented in Table 16.2. It is expected that construction activities would largely be undertaken during standard construction hours. However, project-specific constraints may require some construction activities during the evening and nighttime.

Two construction scenarios involving stringing and construction support sites have been assumed to require out of hours work.

It is expected that aircraft including helicopters and drones (officially known as remote piloted aircraft) would be used during construction of the project to transport material where access to remote sites is required and for the stringing of the transmission lines. The Air Navigation (Aircraft Noise) Regulations 2018 applies to the noise emissions from aircraft, including helicopters and drones.

The assessment considers the following aircraft noise scenarios:

- helicopter arrival and departure at the nominated 4 construction support sites
- helicopter flight between potential helipads and the HTP corridor. This component of the assessment is limited to prediction of aircraft noise at indicative offset distances, due to the unknown and potentially variable flight paths at this time
- helicopter flight within the HTP corridor for stringing at 52 metres (170 feet) above ground level (AGL).

Noise management levels

In accordance with the ICNG, feasible and reasonable work practices to minimise noise emissions are to be investigated where construction noise levels are predicted or measured to be above the relevant NMLs (the noise levels above which management measures are required to be considered). The NMLs are set with reference to the time of day and RBLs. The ICNG NMLs for residential sensitive receivers are provided in Table 16.2.

The ICNG also sets a highly noise affected level for residential sensitive receivers (75 $L_{Aeq\ 15\ min}$ dB(A)) above which further mitigation needs to be considered. This includes additional consultation and notification and additional respite periods.

Table 16.2 NMLs for residential receivers (ICNG)

Time of day	Applicable noise management level ($L_{Aeq15min}$)
Standard construction hours: • 7:00 am to 6:00 pm Monday to Friday • 8:00 am to 1:00 pm Saturday • No work on Sundays or public holidays	RBL + 10 dB RBL + 5 dB
Outside standard construction hours (out of hours) (OOH)): • Day: 1:00 pm to 6:00 pm Saturday and 8:00 am to 6:00 pm Sunday • Evening: 6:00 pm to 10:00 pm Monday to Sunday • Night: 10:00 pm to 7:00 am Monday to Saturday and 10:00 pm to 8:00 am Sunday	RBL + 5 dB

Project specific NMLs for residential receivers are determined using the results from unattended ambient noise monitoring (refer Table 16.9).

Perception of noise impacts at a receiver relates to the noise level above the RBL and assists with determining the level of mitigation applied. The exceedance bands considered in relation to NMLs is described in Table 16.3.

Table 16.3 NML exceedance bands

Perception	dB(A) above NML	
	Standard hours	OOH
Negligible	No exceedance	No exceedance
Noticeable	-	1 to 5 dB
Clearly Audible	1 to 10 dB	6 to 15 dB
Moderately Intrusive	11 to 20 dB	16 to 25 dB
Highly Intrusive	> 20 dB	> 25 dB

Sleep disturbance

The assessment of sleep disturbance during construction has applied the maximum noise level event criteria established by the NPfI being L_{Fmax} 52 dBA or the RBL plus 15 dB, whichever is the greater.

Maximum noise impacts may cause awakening events (L_{AFmax} criteria), while maintained elevated noise levels may reduce the quality of sleep ($L_{Aeq(15min)}$ criteria). The sleep disturbance criteria for the project are shown in
Table 16.9 and have been determined using the results from the unattended ambient noise monitoring.

Construction road traffic noise

Potential impacts from construction traffic noise associated with the project has been assessed using guidance from the RNP. The assessment compares the predicted construction traffic volumes from the project against existing traffic volumes on the road network to determine potential changes in noise levels.

The RNP makes a distinction between the assessment criteria for road traffic noise from freeway / arterial / sub-arterial roads and local roads. A +7 dB correction has been applied to the predictions for unsealed roads to account for increased pass-by noise levels. Mitigation measures would be investigated where the road traffic noise levels increase by more than 2 dBA (from the existing noise level) as a result of the proposed construction traffic and the relevant noise level criteria are exceeded, as described in Table 16.4. Existing traffic volumes on some of the access roads are not available. Given the expected low volume of traffic on these roads, for the purpose of calculating a potential increase in road traffic noise it has been assumed that at least one non-project related light vehicle would use the road during the morning (nighttime) and afternoon (daytime) peak hour period.

Table 16.4 Road traffic noise assessment criteria for residential land uses

Road type	External road traffic noise criteria (dBA)	
	Day (7:00 am to 10:00 pm)	Night (10:00 pm to 7:00 am)

Freeway/arterial/sub-arterial roads	$L_{Aeq\ (15hr)}$ 60	$L_{Aeq(9hr)}$ 55
Local roads	$L_{Aeq\ (1hr)}$ 55	$_{LAeq\ (1hr)}$ 50

16.1.5 Construction vibration assessment approach

Vibration criteria relate to:

- cosmetic building damage (and structural damage in extreme cases)
- loss of amenity due to perceptible vibration, termed human comfort
- impacts on the condition and structural integrity of sensitive structures.

Cosmetic damage is considered minor in nature as it is readily repairable and does not affect a building's structural integrity. If there is no significant risk of cosmetic building damage, then structural damage is not considered a significant risk and is not assessed.

The CNVG summarises the relevant minimum working distances for certain vibration intensive plant and equipment with regard to cosmetic damage and human comfort impacts. These distances have been calculated according to the BS 7385 for cosmetic damage and AVTG for human comfort impacts.

In relation to human comfort, the nominated minimum working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable.

Guidance for more sensitive structures or vibration sensitive activities is outlined in the German Guideline, DIN 4150-3. For the assessment purposes at this stage, the more stringent DIN 4150-3 has been considered. Heritage buildings and structures should be considered on a case-by-case basis but as noted in BS 7385, they should not be assumed to be more sensitive to vibration, unless structurally unsound. Item specific vibration criteria would be developed following conditions inspection of each identified heritage site and incorporated into the construction noise and vibration management plan when developed.

Minimum working distances for typical vibration intensive construction equipment are provided in the CNVG and are shown in Table 16.5. The minimum working distances presented are indicative and would vary depending on the item of plant and local geotechnical conditions. The cosmetic damage thresholds apply to typical buildings under typical geotechnical conditions.

Table 16.5 Recommended minimum working distances from vibration intensive equipment

Plant item	Rating/description	Minimum distance		
		Cosmetic damage		Human response (AVTG)
		Residential and light commercial (BS 7385)	Heritage items (DIN 4150, Group 3)	
Vibratory roller	<50 kN (1 to 2 t)	5 m	11 m	15 to 20 m
	<100 kN (2 to 4 t)	6 m	13 m	20 m
	<200 kN (4 to 6 t)	12 m	25 m	40 m
	<300 kN (7 to 13 t)	15 m	31 m	100 m
	>300 kN (13 to 18 t)	20 m	40 m	100 m
	>300 kN (>18 t)	25 m	50 m	100 m
Small hydraulic hammer	300 kg (5 to 12 t excavator)	2 m	5 m	7 m
Medium hydraulic hammer	900 kg (12 to 18 t excavator)	7 m	15 m	23 m
Large hydraulic hammer	1600 kg (18 to 34 t excavator)	22 m	44 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	5 m to 40 m	20 m
Piling rig – bored	≤800 mm	2 m (nominal)	5 m	4 m
Jackhammer	Handheld	1 m (nominal)	3 m	2 m

The Newcastle to Sydney high pressure gas pipeline runs in proximity to the project impact area and is owned by Jemena Gas Networks (NSW) Ltd. The Jemena Gas Networks (NSW) Ltd guideline document provides a vibration criteria for the buried high-pressure pipeline of vibration limit of 20 millimetres per second peak particle velocity (PPV) has been applied to the buried high pressure gas pipeline. This vibration limit has been applied in the vibration assessment accordingly.

16.1.6 Operation noise assessment approach

Transmission lines

Operation of high-voltage transmission lines has the potential to generate audible noise (typically a broadband hum or crackling noise) during certain meteorological conditions (i.e. during rainy conditions and at higher temperatures).

The potential audible noise from the transmission lines was determined using the Electric Power Research Institute method and is documented in HTP Audible Noise and Radio Interference (Beca, 2025). Noise emissions from the project transmission lines are considered for the Olney to Bayswater section only as the project will result in only minor alterations to the existing 500 kV transmission line from Eraring to Kemps Creek.

Two weather scenarios were modelled:

- fair weather – maximum ambient temperature and altitude from historical weather data for the region
- L50 (light rain or mist) – maximum altitude for the region with rain simulated at a rate of 0.75 millimetres per hour.

In addition to the weather scenarios, existing 330 kV transmissions lines that run parallel to the HTP corridor were also considered to understand any cumulative noise emissions.

In the absence of standards or guidelines on noise limits applicable to transmission lines, the assessment applied the nighttime noise trigger level from the NPfI criteria (see Table 16.6). As the tower locations within the HTP corridor are indicative, predicted noise levels are conservatively based on the distance from the edge of the HTP corridor to allow for variation in placement of the transmission towers. The transmission line infrastructure would not generate any vibration during operation and therefore has not been assessed.

Operational maintenance and traffic

During the operational phase of the project the transmission lines may be inspected via helicopter on a regular schedule or as needed. The assessment of helicopter noise from work within the HTP corridor as described in *section 16.4.3* is conservatively representative of aircraft noise from flyover inspections. This is due to helicopters during inspections likely flying at higher elevations and generally moving more quickly along the corridor, reducing the potential for noise impacts to nearby sensitive receivers.

Switching stations

It has been assumed the only operational noise source from the Olney switching station would be activation of the switches. Given the short duration of noise, the operation of the switching stations has only been assessed against the sleep disturbance LA_{max} criteria.

Two additional shunt reactors (a device that absorbs reactive power and stabilises voltage) and 2 neutral earthing reactors are proposed to be installed at the Bayswater South switching station.

The noise modelling was conducted using the CONCAWE prediction algorithm within SoundPLAN v8.2 software and assumes that all noise generating equipment operates in a continuous steady state nature on a 24/7 basis. All noise sources are modelled at a height of two metres above ground level assessed under noise enhancing meteorological conditions.

Eraring substation

An operational noise assessment was undertaken for Eraring substation as it is proposed to contain noise generating equipment including 9 power transformers and 2 auxiliary transformers.

The noise modelling was conducted using the CONCAWE prediction algorithm within SoundPLAN v8.2 software.

An operational noise assessment was not undertaken for Bayswater substation as no additional noise-producing equipment is proposed.

Project noise trigger level

Noise impacts from transmission lines and switching stations were assessed against the NPfI which includes both intrusiveness and amenity criteria. The assessment procedure for industrial noise sources outlines 2 components:

- controlling intrusive noise impacts in the short-term for residences
- maintaining noise level amenity for particular land uses for residences and other land uses.

The intrusiveness criterion aims to minimise noise increases from a single new development by applying a criterion of 5 dB(A) above RBL, while the amenity criteria aim to limit continuing increases in ambient noise by applying recommended levels for certain receiver types. The more stringent of the 2 applies to determine the project noise trigger level (PNTL). If the PNTL is exceeded, proponents are required to consider feasible and reasonable noise mitigation.

Table 16.6 Project noise trigger levels

NCA or receiver type	Period	Noise level (dBA)				
		Recommended Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level	PNTL (dBA L_{Aeq} (15min))		
			RBL[1]	L_{Aeq}(period)	Intrusiveness	Amenity[3,4]
NCA01	Day	55	37	-	42	53
	Evening	45	36	-	41	43
	Night	40	36	-	41	38
NCA03	Day	50	36	-	41	48
	Evening	45	33	-	38	43
	Night	40	32	-	37	38
NCA04	Day	50	35	-	40	48
	Evening	45	31	-	36	43
	Night	40	31	-	36	38
NCA05	Day	50	38	65	43	48
	Evening	45	35	51	40	43
	Night	40	33	48	38	38

NCA or receiver type	Period	Noise level (dBA)				
		Recommended Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level	PNTL (dBA L_{Aeq} (15min))		
			RBL[1]	L_{Aeq}(period)	Intrusiveness	Amenity[3,4]
NCA09	Day	50	35	55	40	48
	Evening	45	34	44	39	43
	Night	40	33	45	38	38
NCA11	Day	50	35	53	40	48
	Evening	45	32	61	37	43
	Night	40	30	52	35	38
NCA12	Day	55	37	47	42	53
	Evening	45	35	41	40	43
	Night	40	31	43	36	38
NCA13	Day	60	43	56	48	58
	Evening	50	43	57	48	48
	Night	45	42	51	47	43
NCA14	Day	55	35	49	40	53
	Evening	45	35	44	40	43
	Night	40	35	43	40	38
All other NCAs (NCA02, NCA06, NC08)	Day	50	35	-	40	48
	Evening	45	30	-	35	43
	Night	40	30	-	35	38

Note 1: RBL = Rating Background Level.

Note 2: The NPfI minimum RBL values have been used due to the measured RBLs being equal or lower than the minimum values.

Note 3: The recommended amenity noise levels have been reduced by 5 dB, to give the project amenity noise levels due to other sources of industrial noise being present, or potentially present in the area in the future, as outlined in the NPfI.

Note 4: The project amenity noise levels have been converted to a 15 minute level by adding 3 dB, as outlined in the NPfI.

Assessing sleep disturbance

The assessment of sleep disturbance during construction has applied the maximum noise level event criteria established by the NPfI being:

- L_{Aeq}(15min) 40 dBA or the RBL plus 5 dB, whichever is the greater, and/or
- L_{Fmax} 52 dBA or the RBL plus 15 dB, whichever is the greater.

16.2 Existing environment

16.2.1 Sensitive receivers

Noise

Sensitive receivers within the noise and vibration study area have been categorised as residential buildings, commercial/industrial buildings or 'other sensitive' land uses (e.g. places of worship, active recreation areas, etc). Most sensitive receivers in the study area are residential receivers consisting of dwellings on agricultural properties.

Vibration

Vibration sensitive receivers include all regularly occupied buildings and sensitive structures within the study area. At sufficient levels, vibration can lead to cosmetic (and possibly structural) building damage as well as cause disturbance to occupants (human comfort). For this assessment, all identified noise sensitive receivers are also considered potentially vibration sensitive.

Sensitive structures can include heritage sites. The heritage listed buildings and structures within the study area which are potentially sensitive to vibration are detailed in Table 16.7. This historic heritage listing is described further in *Chapter 15 (Historic heritage).*

Table 16.7 Heritage listed items in the vicinity of the project impact area

Item name	Address	Heritage significance	Heritage item number	Distance to nearest structure[1]
Oakley Estate	Singleton Military Area	State Commonwealth	170126/170127	45 m
Warringah Stud/Old Myrtle	Singleton Military Area	Commonwealth	170129	65 m
Catholic Church and Cemetery	6 Martinsville Road, Cooranbong	Local	Lake Macquarie LEP 2014 77	20 m
Former Union Church	447 Martinsville Road, Martinsville	Local	Lake Macquarie LEP 2014 242	35 m
Millfield General Cemetery	Crump Street and Hayes Road, Millfield	Local	Cessnock LEP 2011 I141	45 m

Bellevue Vineyard and Winery	529 and 555 Oakey Creek Road	Local	Cessnock LEP 2011 I174	68 m
Archerfield and outbuildings	Off Comleroi Road, Warkworth	Local	Singleton LEP 2013 I141	70 m

1 Approximate minimum horizontal distance from the project impact area to the nearest structure of the heritage listed item.

16.2.2 Noise catchment areas

The assessment uses noise catchment areas (NCAs) that reflect the land uses in the various parts of the study area and the existing ambient acoustic environment. The NCAs are described in Table 16.8 and shown in Figure 16.1.

Existing noise levels within the noise and vibration study area are typical of rural areas and dominated by natural sources such as wildlife and weather.

Unattended ambient noise monitoring was carried out at 6 locations within the noise and vibration study area. Short-term attended noise monitoring was also completed at each ambient monitoring location. The ambient noise monitoring locations were selected with reference to the procedures outlined in the ICNG and NPfI to establish representative background noise levels across the project impact area and surrounding land uses.

These monitoring locations represent the reasonably most-affected receivers, considering existing background levels and shielding between sources and receivers. Figure 16.1 shows the ambient noise monitoring locations (denoted L01 to L06) within the noise and vibration study area. Given the large extent of the study area noise monitoring data contained in publicly available noise assessments for other projects in the area have also been used to supplement measured noise levels. A summary of the ambient noise monitoring and publicly available noise monitoring levels is included in Table 16.8.

Table 16.8 NCAs and noise monitoring results

NCA	Noise monitoring location	Location and description of noise environment	Noise level (dBA)					
			Background noise (RBL)[1]			Average noise (LAeq)[1]		
			Day	Evening	Night	Day	Evening	Night
NCA01 – Liddell and Bayswater	Hebden Road north of Lake Liddell (Jacobs, 2021)	Area surrounding Lake Liddell the and the Bayswater Power Station. The New England Highway was identified as the dominant noise source in this NCA (Jacobs, 2021)	37[3]	36[3]	36[3]	-	-	-
NCA02 - Jerrys Plains West and Howick	2755 Jerry Plains Road, Jerry's Plains (EMM 2022)	Area generally to the west of the HTP corridor and to the south of Mount Arthur Coal Mine and northwest of Jerrys Plains	35[3,6] (33)	30[3,6] (28)	30[3,6] (27)	-	-	-
NCA03 – Jerrys Plains	Jerrys Plains Village and Moses Crossing (EMM 2022)	Township of Jerrys Plains and other rural areas of Lemington off the Golden Highway to the north of United Wambo Mine	36[3]	33[3]	32[3]	-	-	-
NCA04 – Maison Dieu West	Maison Dieu Road (EMM 2022)	Rural areas off Maison Dieu Road west of Rixs Creek Coal Mine as well as the area of Warkworth	35[3] (31)	31[3,4] (32)	31[3,4] (33)	-	-	-
NCA05 - Mount Thorley	L01 – 66 Long Point Road East, Gouldsville	Rural receiver areas of Gouldsville, Long Point and Mount Thorley	38	35	33	65	51	48
NCA06 – Broke	No noise monitoring undertaken. (Minimum background noise levels have been adopted)	Township of Broke and surrounding rural receiver areas. Noise levels in the area are low and typical of a rural environment	35[5]	30[5]	30[5]	-	-	-

NCA	Noise monitoring location	Location and description of noise environment	Noise level (dBA)					
			Background noise (RBL)[1]			Average noise (LAeq)[1]		
			Day	Evening	Night	Day	Evening	Night
NCA07 - Pokolbin	Palmers Lane, Pokolbin (Spectrum 2018)	Township of Pokolbin. The only component of the project in this NCA is the intersection upgrade of Broke Road and McDonalds Road	35[2,5] (31)	31[2,3] (35)	30[2,5] (28)	48[2]	48[2]	41[2]
NCA08 – HTP Central	L02 33 Mount Baker Road, Mount Baker	Large rural areas without any significant noise from major roadways	35[5] (29)	30[5] (28)	305[5] (25)	44	46	41
	L04 - 192 MF1 Road, Millfield		35[5] (32)	30[5] (25)	30[5] (22)	44	42	41
NCA09 – Millfield and Wollombi Road	L03 – 1611 Wollombi Road, Millfield	Residential receivers near Wollombi Road and in the township of Millfield	35[5] (34)	34	33	55	44	45
NCA10 – Cessnock	91 Wollombi Road, Cessnock[4] (RAPT 2024)	Built up area of Cessnock. The only component of the project in this NCA is the intersection upgrade of Wollombi Road and Allandale Road. Dominant noise source in the area is road traffic on Wollombi Rd (RAPT 2024)	51[2]	40[3]	30[2,5] (29)	-	-	-
NCA11 – Olney	L06 – 295 Watagan Road, Martinsville	Area in the southern portion of the HTP corridor with little road traffic noise contribution from the M1 Motorway	35[5] (33)	32	30	53	61	52

NCA	Noise monitoring location	Location and description of noise environment	Noise level (dBA)					
			Background noise (RBL)[1]			Average noise (LAeq)[1]		
			Day	Evening	Night	Day	Evening	Night
NCA12 – Cooranbong West	695 Freemans Drive, Cooranbong (Muller 2022)	Area between NCA11 and to the west of the M1 Motorway. The ambient noise environment in this NCA contains noise from the M1 motorway as well as the suburban and urban areas of Cooranbong	37[2]	35[2]	31[2]	47[2]	41[2]	41[2]
NCA13 – Eraring	L05 – 1262 Freemans Drive, Cooranbong	Area to the east of the M1 Motorway near Freemans Drive. The ambient noise environment in this NCA contains significant noise contribution from the M1 motorway	43	43[3] (44)	42	56	57	51
NCA14 – Dora Creek	Gradwells Road, Dora Creek (GHD 2025)	Area to the east of the M1 Motorway near Newport Road. The ambient noise environment in this NCA contains significant noise contribution from the M1 motorway as well as industrial noise	35[2]	35[2,3] (38)	35[2]	49[2]	44[2]	43[2]

1: The RBL and LAeq noise levels have been determined with reference to the procedures in the NPfI.

2: Data obtained from publicly available noise impact assessments.

3: The monitored evening or night level was found to be higher than the daytime. In this situation the NPfI requires that the evening or night level be reduced to match the daytime. The monitored level is shown in brackets.

4: The minimum RBLs in the NPfI are listed as 35 dBA in the daytime and 30 dBA in the evening and nighttime. These minimum RBLs have been adopted for this NCA in the absence of other data.

5: RBL adjusted to the minimum RBL. Minimum RBLs in the NPfI are listed as 35 dBA in the daytime and 30 dBA in the evening and nighttime. The monitored level is shown in brackets.

16.2.3 Noise management levels

The project specific NMLs for residential receivers are outlined in Table 16.9 and have been determined using the results from the unattended ambient noise monitoring.

Table 16.9 Project-specific NMLs for residential receivers

Location	NML ($L_{Aeq15min}$dBA)				Sleep disturbance screening criteria (52 dBA or RBL + 15 dB whichever is higher)
	Standard construction (RBL+10dB)	Out of hours (RBL + dB)			
	Day	Day	Evening	Night	
NCA01 – Liddell and Bayswater	47	42	41	41	52
NCA02 - Jerrys Plains West and Howick	45	40	35	35	52
NCA03 – Jerrys Plains	46	41	38	37	52
NCA04 – Maison Dieu West	45	40	36	36	52
NCA05 - Mount Thorley	48	43	40	38	52
NCA06 – Broke	45	40	35	35	52
NCA07 - Pokolbin	45	40	36	35	52
NCA08 – HTP Central	45	40	35	35	52
NCA09 – Millfield and Wollombi Road	45	40	39	38	52
NCA10 – Cessnock	61	56	45	35	52
NCA11 – Olney	45	40	37	35	52
NCA12 – Cooranbong West	47	42	40	36	52
NCA13 – Eraring	53	48	48	47	57
NCA14 – Dora Creek	45	40	40	40	52

16.3 Potential impacts – construction

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted, as the noise levels presented in this report are based on each worst-case scenario occurring at the work site boundary which is the closest point to each sensitive receiver. The assessment also assumes several items of construction equipment are in use simultaneously within individual scenarios. In reality, there would frequently be periods when construction noise levels are much lower than the worst-case levels predicted as well as times when no equipment is in use.

16.3.1 Construction hours and noise sources

Construction of the project would result in potential noise and vibration impacts to surrounding sensitive receivers. The potential impacts would vary across the construction impact area depending on timing, intensity and location of construction activities. Noise levels generated by the project would be influenced by RBLs, topography and the weather conditions. Construction noise and vibration sources from the project include:

- operation of mobile and stationary plant and equipment such as cranes, piling rigs and excavators
- operation of construction support sites, workforce accommodation facilities and other ancillary facilities (which are considered fixed noise sources)
- construction traffic.

Construction of the project would be carried out during standard construction hours where possible (Monday to Friday between 7.00 am and 6.00 pm and Saturday between 8.00 am and 1.00 pm), as defined in the ICNG (see Table 16.2). Further detail on construction hours is provided in *Chapter 4 (Project description)*.

The extended hours are proposed for some construction activities including overhead stringing of transmission lines at Wollombi Road, Cessnock Road, Putty Road and M1 Motorway for optical ground wire (OPGW) works between Eraring Power Station and the Olney switching station. Stringing work near roads or other infrastructure require strict outage conditions therefore would need to be conducted OOH. Other OOH work may include (but not be limited to):

- stringing of transmission line over a main road or railway
- work where a road occupancy licence (or similar) is required, depending on licence conditions
- transmission line cutover and commissioning
- the delivery of equipment or materials outside standard hours requested by police or other authorities for safety reasons due to their size such as the delivery of transformer and reactor units, utility relocations
- connection of the new assets to existing assets under outage conditions
- emergency work to avoid the loss of lives and/or property and/or to prevent environmental harm

- work timed to correlate with system planning outages
- situations where agreement is reached with affected sensitive receivers
- activities that do not generate noise that exceeds the applicable noise management level at any sensitive receiver.

Further OOH work sites may be identified in Detailed Design phase when detailed construction planning information is available.

To support construction activities during these extended hours, operation of the main construction support sites would also be required. The workforce accommodation facilities would be operational 24 hours a day, 7 days a week.

Where sensitive receivers are noise affected during extended construction hours (that is, where construction noise is above the NML, and the works cannot be undertaken during standard work hours, measures would be implemented through an OOH work protocol (see *section 16.5*).

Chapter 4 (Project description) of the EIS provides a detailed description of construction activities *(section 4.3)* and construction hours *(section 4.4.6).*

16.3.2 Extended construction hours

If there are no sensitive receivers that would be impacted by the construction work in a given location, the construction hours may be extended. Examples of this would be construction work in the vicinity of the existing Bayswater and Eraring power stations, the mining complexes and in some parts of the State forests where construction would not impact recreational or operational activities.

The required offset distance to any residential receiver location to meet the nighttime NML (i.e. the most stringent time period for extended construction hours) is shown in Table 16.10.

Table 16.10 Offset distance from construction activities to meet NML at residential receivers

NCA	Nighttime NML (dBA)	Offset distance required to meet NML (m)				
		Vegetation Clearing	Earthworks	Earthworks (without breaker)	Concrete works	Tower assembly /
NCA1	41	1574	2033	1358	1123	923
NCA2, NCA06, NCA07, NCA08, NCA10, NCA11	35	2540	3164	2233	1891	1588
NCA03	37	2182	2751	1906	1601	1334
NCA04, NCA12	36	2356	2953	2065	1742	1457
NCA05, NCA09	38	2017	2558	1756	1469	1220
NCA13	47	914	1220	776	630	509
NCA14	40	1713	2199	1482	1231	1014

Construction activities during extended construction hours would only be conducted where construction noise levels would not exceed the NML at any noise sensitive receiver and in consultation with relevant stakeholders.

16.3.3 Airborne noise

Construction noise from construction support sites and ancillary works

Construction activities for the construction support, laydown areas and switching station sites would typically include the following components of work:

- establishment and operation of construction support sites and laydown areas
- worker accommodation facilities
- helicopter/helipad facilities
- utility service relocation
- vegetation clearing.

Aerial stringing of transmission lines via helicopters would be required. It is proposed that, where this method is adopted, helipads would operate from the construction support sites, representing a potential new noise source. Using helicopters may result in potential exceedances of daytime NMLs. However, these impacts would not be undertaken during evening or nighttime hours.

The main noise generating activity associated with the establishment and operation of the laydown areas would be earthworks. However, as noted, it is expected that the construction noise levels would frequently be lower than predicted, as the noise levels predicted are conservatively based on each construction support, laydown and switching station sites' scenario occurring at the project impact area boundary, which is the closest point to each receiver.

The maximum noise levels from worker accommodation facilities are predicted to exceed the sleep disturbance screening level at receivers near Gouldsville Road and Freemans Drive. However, the highest predicted noise level at any residence is less than 65 dBA and as such OOH operation of the accommodation facilities are unlikely to cause awakening reactions (as concluded by the RNP).

Construction noise from access track construction and intersection upgrades

Access tracks and intersection upgrades are required across the project impact area. The project would establish new access tracks as well as upgrade existing tracks and intersections to facilitate access to the transmission lines and transmission line towers, switching stations and upgrades at the existing substations.

The majority of (potentially) highly noise affected receivers are in proximity to the Wollombi Road/Hayes Road intersection upgrade and Martinsville Road and Freemans Drive intersection upgrade. This is due to the higher number of receivers in these areas. It is noted that these exceedances would be short term and in advance of the other construction activities associated with the project.

The proposed mitigation measures to minimise and manage the predicted impacts are described in *section 16.5.*

Construction noise from activities within the HTP corridor and stringing sites

Construction activities within the HTP corridor and stringing sites would include civil works such as earthworks, construction pads, construction of footings, steel fabrication, concrete pours, erection of transmission line structures, line stringing and vegetation clearing.

Some stringing activities (over road and rail) would need to occur OOH within the HTP corridor across M1 Pacific Motorway, Wollombi Road, Cessnock Road and Putty Road. The maximum noise levels from the stringing activities over roads are predicted to exceed the sleep disturbance screening level at receivers near the stringing sites, however the highest predicted noise level at any residence is less than 65 dBA and as such stringing activities are unlikely to cause awakening reactions.

The assessment conservatively assumed that all components related to the HTP corridor, tower sites and stringing sites would occur at any location within the project impact area, that several items of construction equipment would be in use at the same time and there is a flat topography between the noise source and receivers. In reality, construction at each transmission line structure would be intermittent and construction activities would not occur for the full duration at any one location. Therefore, the worst-case noise impacts at a receiver would likely be short-term as the noise intensive work passes. Additionally, it is expected there would be long periods of respite between different phases of noise intensive work near to any individual receiver.

Summary of noise exceedances

An overview of predicted NML exceedances for each NCA construction element is provided in Table 16.11 and in the following sections. The noisiest works in each area may vary from each NCA, depending on the type of works being undertaken closest to sensitive receivers.

Table 16.11 Summary of construction components and typical noisiest work stage

Construction element	Relevant NCAs	Typical noisiest work stage	
		Type	Description
Construction support sites, laydown areas, substation and switching sites	NCA 3, NCA 4, NCA 5, NCA 8, NCA 9, NCA 13	Earthworks with rock breaker (excluding laydown areas)	Bulk earthworks to establish the landform would be undertaken in the early stages of construction at each site.
Worker accommodation facilities	NCA 1, NCA 4, NCA 5, NCA 12, NCA 13, NCA 14	OOH operation	Nighttime operation of the accommodation facilities including vehicle movements and power generators.
Access tracks and road and intersection upgrades	NCA 2, NCA 3, NCA 4, NCA 5, NCA 6, NCA 8, NCA 9, NCA 11, NCA 12, NCA 13, NCA 14	Intensive intersection works	Construction activities required to upgrade/augment existing intersections to accommodate project related traffic movements. It is assumed vibratory rollers would be used.

Construction element	Relevant NCAs	Typical noisiest work stage	
Transmission lines	NCA 2, NCA 3, NCA 4, NCA 5, NCA 6, NCA 8, NCA 9, NCA 11, NCA 12	Earthworks with rock breaker	Construction of the transmission line tower foundations would involve excavation and piling work. This work stage would occur progressively along the alignment.

There are no predicted noise exceedances for any construction activities in NCA 1, NCA 7 and NCA 10. The predicted exceedances of NMLs for all other NCAs within the study area are provided in Table 16.12 to Table 16.22.

Table 16.12 Summary of predicted noise exceedances in NCA 2 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	No exceedances are predicted.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 3 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10dB at one receiver • 11 to 20 dB at 2 receivers.
Intersection upgrades	No exceedances are predicted.
Transmission lines	During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be up to 10 dB at one receiver.

Table 16.13 Summary of predicted noise exceedances in NCA 3 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	Exceedances are predicted at up to 3 receivers. During the noisiest works (earthworks without rock breaker), the exceedances are predicted to be: • up to 10 dB at 2 receivers • over 20 dB at one receiver.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 12 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10dB at 4 receivers • 11 to 20 dB at 5 receivers • over 20 dB at 2 receivers • greater than 75 dB at one receiver (highly noise affected).
Intersection upgrades - rural areas	Exceedances are predicted at up to 7 receivers. During the noisiest works (intensive intersection works), the exceedances are predicted to be: • up to 10 dB at 4 receivers • 11 to 20 dB at 2 receivers • greater than 75 dB at one receiver (highly noise affected).
Transmission lines	Exceedances are predicted at up to 9 receivers. During the noisiest works (earthworks with rock breaker within the HTP corridor and at tower sites), the exceedances are predicted to be: • up to 10dB at 5 receivers • 11 to 20 dB at 3 receivers • greater than 75 dB at one receiver (highly noise affected).

Table 16.14 Summary of predicted noise exceedances in NCA 4 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	Exceedances associated with laydown areas during earthworks (without rock breaker) are predicted to be up to 10 dB at 2 receivers.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 18 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10 dB at 9 receivers • 11 to 20 dB at 7 receivers • over 20 dB at one receiver • greater than 75 dB at one receiver (highly noise affected).
Intersection upgrades	No exceedances are predicted.
Transmission lines	Exceedances are predicted at up to 15 receivers. During the noisiest works (earthworks with rock breaker within the HTP corridor), the exceedances are predicted to be: • up to 10 dB at 7 receivers • 11 to 20 dB at 4 receivers • over 20 dB at 3 receivers • greater than 75 dB at one receiver (highly noise affected).

Table 16.15 Summary of predicted noise exceedances in NCA 5 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	No exceedances are predicted.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 20 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10 dB at 11 receivers • 11 to 20 dB at 3 receivers • over 20 dB at 4 receivers • greater than 75 dB at 2 receivers (highly noise affected).
Intersection upgrades - rural areas	Exceedances are predicted at up to 8 receivers. During the noisiest works (typical intersection works), the exceedances are predicted to be: • up to 10 dB at 6 receivers • 11 to 20 dB at 2 receivers.
Transmission lines	Exceedances are predicted at up to 20 receivers. During the noisiest works (earthworks with rock breaker within the HTP corridor), the exceedances are predicted to be: • up to 10 dB at 17 receivers • 11-20 dB at 3 receivers.

Table 16.16 Summary of predicted noise exceedances in NCA 6 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	No exceedances are predicted.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 6 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10 dB at 5 receivers • 11 to 20 dB at one receiver.
Intersection upgrades - rural areas	During the noisiest works (typical intersection works), the exceedances are predicted to be up to 10 dB at 7 receivers.
Transmission lines	Exceedances are predicted at up to 6 receivers. During the noisiest works (earthworks with rock breaker within the HTP corridor and at tower sites), the exceedances are predicted to be: • up to 10 dB at 5 receivers • 11 to 20 dB at one receiver.

Table 16.17 Summary of predicted noise exceedances in NCA 8 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	During the noisiest works (earthworks without rock breaker), exceedances are predicted to be up to 10 dB at 7 receivers.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 62 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10 dB at 54 receivers • 11 to 20 dB at 7 receivers • over 20 dB at one receiver.
Intersection upgrades	No exceedances are predicted.
Transmission lines	Exceedances are predicted at up to 19 receivers. During the noisiest works (earthworks with rock breaker within the HTP corridor), the exceedances are predicted to be: • up to 10 dB at 18 receivers • 11 to 20 dB at one receiver.

Table 16.18 Summary of predicted noise exceedances in NCA 9 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	During the noisiest works (earthworks without rock breaker), exceedances are predicted to be up to 10 dB at 4 receivers.
Laydown areas	Exceedances are predicted at up to 39 receivers. During the noisiest works (earthworks without rock breaker) exceedances are predicted to be: • up to 10 dB at 21 receivers • 11 to 20 dB at 12 receivers • over 20 dB at one receiver.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 8 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10 dB at 7 receivers • 11 to 20 dB at one receiver.
Intersection upgrades - rural areas	During the noisiest works (intensive intersection works), the exceedances are predicted to be up to 10 dB at 2 receivers.
Intersection upgrades – Wollombi Road with Hayes Road and Mt View Road	Exceedances are predicted at up to 139 receivers. During the noisiest works (intensive intersection works), the exceedances are predicted to be: • up to 10 dB at 78 receivers • 11 to 20 dB at 34 receivers • over 20 dB at 20 receivers • greater than 75 dB at 7 receivers (highly noise affected).
Intersection upgrades – Wollombi Road and Mt View Road	Exceedances are predicted at up to 19 receivers. During the noisiest works (intensive intersection works), the exceedances are predicted to be: • up to 10 dB at 10 receivers • 11 to 20 dB at 2 receivers • greater than 75 dB at 7 receivers (highly noise affected).
Transmission lines	During the noisiest works (earthworks with rock breaker within the HTP corridor and at tower sites), the exceedances are predicted to be up to 10 dB at 7 receivers.

Table 16.19 Summary of predicted noise exceedances in NCA 11 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	No exceedances are predicted.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 82 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10 dB at 51 receivers • 11 to 20 dB at 25 receivers • over 20 dB at 3 receivers • greater than 75 dB at 3 receivers (highly noise affected).
Intersection upgrades - rural areas	Exceedances are predicted at up to 24 receivers. During the noisiest works (typical intersection works), the exceedances are predicted to be: • up to 10 dB at 14 receivers • 11 to 20 dB at 5 receivers • over 20 dB at 5 receivers.
Transmission lines	Exceedances are predicted at up to 11 receivers. During the noisiest works (stringing), the exceedances are predicted to be: • up to 10 dB at 10 receivers • 11 to 20 dB at one receiver.

Table 16.20 Summary of predicted noise exceedances in NCA 12 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	No exceedances are predicted.
Substation and switching stations	No exceedances are predicted.
Access tracks	Exceedances are predicted at up to 36 receivers. During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be: • up to 10 dB at 29 receivers • 11 to 20 dB at 7 receivers.
Intersection upgrades - rural areas	Exceedances are predicted at up to 41 receivers. During the noisiest works (intensive intersection works), the exceedances are predicted to be: • up to 10 dB at 34 receivers • 11 to 20 dB at 7 receivers.
Intersection upgrade – Martinsville Road and Freemans Drive	Exceedances are predicted at up to 108 receivers. During the noisiest works (intensive intersection), the exceedances are predicted to be: • up to 10 dB at 74 receivers • 11 to 20 dB at 25 receivers • over 20 dB at 6 receivers • greater than 75 dB at 3 receivers (highly noise affected).
Transmission lines	Exceedances are predicted at up to 5 receivers. During the noisiest works (stringing), the exceedances are predicted to be up to 10 dB at 5 receivers.

Table 16.21 Summary of predicted noise exceedances in NCA 13 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	Exceedances are predicted at up to 5 receivers. During the noisiest works (earthworks without rock breaker) exceedances are predicted to be: • up to 10 dB at 3 receivers • 11 to 20 dB at 2 receivers.
Laydown areas	No exceedances are predicted.
Substation and switching stations	No exceedances are predicted.
Access tracks	During the noisiest works (earthworks with rock breaker), the exceedances are predicted to be up to 10dB at 3 receivers.
Intersection upgrades	Exceedances are predicted at up to 5 receivers. During the noisiest works (intensive intersection works), the exceedances are predicted to be: • up to 10 dB at 4 receivers • greater than 75 dB at one receiver (highly noise affected).
Transmission lines	No exceedances are predicted.

Table 16.22 Summary of predicted noise exceedances in NCA 14 during construction

Component	Summary of predicted exceedances of NMLs
Construction support sites	No exceedances are predicted.
Laydown areas	No exceedances are predicted.
Substation and switching stations	No exceedances are predicted.
Access tracks	During the noisiest works (minor earthworks), the exceedances are predicted to be up to 10 dB at 2 receivers.
Intersection upgrades	No exceedances are predicted.
Transmission lines	No exceedances are predicted.

Sleep disturbance

Exceedances of the sleep disturbance criterion is predicted during out of hours construction at the following NCAs:

- NCA 5 - exceedances of the sleep disturbance criterion are predicted as follows:
  - during stringing at the stringing site crossing Putty Road at up to one receiver; however, would be unlikely to cause awakening reactions (see *section 16.1.4)*

- during out of hours operation at the worker accommodation facility located at the Gouldsville Road at one receiver, however, would be unlikely to cause awakening reactions

- NCA 6 - exceedances of the sleep disturbance criterion are predicted during stringing at the stringing site crossing Cessnock Road at up to 2 receivers; however, would be unlikely to cause awakening reactions
- NCA 12 - exceedances of the sleep disturbance criterion are predicted during stringing at the stringing site crossing M1 Pacific Motorway at up to 2 receivers; however, would be unlikely to cause awakening reactions
- NCA 13 - exceedances of the sleep disturbance criterion is predicted during out of hours operation at the accommodation facility located at Freemans Drive at up to 2 receivers; however, would be unlikely to cause awakening reactions.

16.3.4 Aircraft noise

Helicopters/helipad facilities

Helicopters/helipad facilities would be located at the following 4 construction support sites:

- Hebden Road
- Pikes Gully Road
- Gouldsville Road
- Freemans Drive.

Of the 4 potential locations considered for helipads, 2 locations with the least distance to sensitive receivers have predicted aircraft noise impacts (L_{Amax}) for some residential receivers as follows:

- One receiver above 85 dBA at the Gouldsville Road construction support site
- up to 5 receivers above 75 dBA at the Freemans Drive construction support site.

However, these impacts would be intermittent and typically only occur during helicopter arrival and departure at the helipad.

Flights within the HTP corridor

Most aircraft use within the transmission line corridor would include helicopters and drones for stringing work to install draw wires between the transmission line structures and would typically involve flight from the potential helipad to the designated transmission line structure then flight along the transmission line route pulling the draw wire.

The assessment shows that up to 3 sensitive receivers may experience noise levels above 85 dBA during helicopter flights at 52 metres (170 feet) AGL within the transmission line corridor with the majority of nearby receivers experiencing 60 to 65 dBA.

Drone flights at 170 feet AGL within the transmission line corridor are predicted to produce L_{Amax} noise levels less than 80 dBA at ground level and are considered unlikely to cause significant annoyance or impact the noise amenity of sensitive receivers.

Flights outside the HTP corridor

Helicopters would be required to fly from the nominated helipad to and from the HTP corridor work sites. This component of helicopter use would typically include flight over areas outside of the project impact area. The predicted L_{Amax} noise levels show that helicopter flight outside of the project impact area is considered unlikely to cause significant annoyance or impact the noise amenity of sensitive receivers. Helicopter noise from flights outside of the project impact area are expected to be relatively short-term and would likely be apparent for less than a minute at any individual sensitive receiver underneath the flight path.

It is assumed helicopters would be flown at a minimum height of 1000 feet (305 metres) AGL over towns and 500 feet (152 metres) AGL over unpopulated areas when travelling outside of the project impact area. Noise levels experienced by sensitive receivers from helicopters at these heights are expected to be equivalent to or less than a car passing by.

16.3.5 Road traffic noise impacts

The construction access routes for the project are discussed *Chapter 11 (Traffic and transport)* and *Technical Report 4 - Traffic and transport assessment* and include national, state, regional and local roads. The assessment has been completed for the construction routes to be used for access between the construction support sites, temporary worker accommodation, laydown areas, the transmission line alignment and switching stations

Exceedances of the RNP criteria (see *section 16.1.4* for more information on the criteria) on local sealed roads are predicted for:

- all local roads if receivers are 100 metres from the road edge
- 5 local roads (Lemington Road, Howick) if receivers are 250 metres from the road edge
- 4 local roads if receivers are 500 metres from the road edge.

The approximate distance to comply with the RNP criteria at all roads, including unsealed roads, would be 883 metres from the road assuming very low existing traffic volumes.

Exceedances of the RNP criteria are not predicted for major roads used for construction access such as the New England Highway, Golden Highway and Freemans Drive near Cooranbong. Construction traffic on arterial roads would likely result in a noticeable increase in noise levels (above 2 dB) due to the low existing traffic volumes on these roads. However, compliance with the RNP is predicted for all sub-arterial roads at offset distances of more than 60 metres from the roadway.

The predicted noise exceedances, particularly during the nighttime on local roads, are high as existing traffic volumes are low and the addition of even low volumes of construction vehicles can result in a relatively large increase in road traffic noise. This is due to the criteria being framed at least partly by the noise differential, so that when background noise is low, any noise which is relatively small would still result in an exceedance. Typical noise levels are likely to be lower than the predicted exceedances, as construction traffic would vary according to the stage of construction and the location of construction activity in the construction area. In addition, it is anticipated that most access routes would not be used for the full duration of construction.

The above assessment is based on the worst-case scenario. Nonetheless, noise management measures would be employed to minimise the potential for noise disturbance from construction traffic including limiting traffic movements to daytime periods as far as reasonable and feasible (see *section 16.5.2*).

16.3.6 Vibration impacts

Residential receivers

Vibration intensive plant such as vibratory rollers, hydraulic hammers, bored piling rigs or jackhammers have the potential to generate vibration which can cause damage to buildings and other structures or discomfort to people.

Based on the potential vibration generating plant identified for construction of the project, the minimum working distances from the construction area were identified (see *section 16.1.5*). Worst-case vibration impacts for the construction of the project have been determined based on the minimum working distances and use of 3 to 5 tonne and 8 to 10 tonne vibratory rollers at the boundary of the project impact area. Vibration sensitive receivers and structures were identified within the minimum working distances of construction components as shown Table 16.23.

Table 16.23 Overview of vibration impacts

Works area	Number of receivers within recommended working distance	
	Cosmetic damage	Human comfort
Construction support sites, substations, laydown sites and HTP corridor	4 (3 receivers within the project impact area)	19
Access tracks and intersection upgrades	6	39

The use of a 2 to 4 tonne vibratory roller in place of the larger vibratory rollers proposed would result in a reduction of impacted receivers within the cosmetic damage minimum working distances to 4, with 3 located within the project impact area. The number of residential receivers within the minimum working distance for human comfort would be reduced to 16. These impacts would be transient and short term.

High pressure gas pipeline

Minor access track upgrades would occur within 25 metres of the Newcastle – Sydney high pressure gas pipeline. The use of a 3 to 5 tonne vibratory roller is predicted to result in PPV vibration levels of less than 3 millimetres per second at the pipe location, which would be well below the 20 millimetres per second limit. As such, vibration intensive works are not predicted to impact the buried pipeline.

Heritage items

There is one historic heritage item (Catholic Church and Cemetery) identified within the minimum working distances, which has potential to be impacted by vibration from construction activities. A total of 39 Aboriginal objects are within the adopted minimum 10 metre safe working distance for

Aboriginal heritage items. Of these, 21 are within the project impact area. However, impacts to heritage sites due to vibration would be confirmed prior to any vibration generating works occurring in proximity to the relevant item. If required, specific criteria will be developed and management responses may include alternative methods or monitoring to manage this risk (see *section 16.5.2*).

In the event that the power rating of the proposed plant and equipment are higher than assessed, further review would be completed prior to construction to identify any required mitigation.

16.4 Potential impacts – operation

16.4.1 Operational noise impacts from transmission lines

The new transmission lines may generate audible noise during operation. Noise emissions from the project transmission lines have been considered for the new transmission corridor between Bayswater and Olney only as the project would result in only minor alterations to the existing 500 kV transmission line to Eraring. The majority of sensitive receivers who are potentially impacted are scattered rural residences surrounding the HTP corridor in NCA 3, NCA 4 and NCA 5.

The operational noise emissions of the transmission lines are assessed based on the offset distance at which the nighttime PNTL of $L_{Aeq,15min}$ 35 dBA is expected to be reached. Under fair weather conditions, noise levels are predicted to be under 35 dBA at the edge of the HTP corridor and as such would be compliant at all receivers. The operational noise impacts from the transmission lines under worst-case scenario (i.e. L50 light rain or mist) conditions are summarised in Table 16.24. Predictions have been compared against the nighttime PNTL as this is the most stringent operational criteria in all NCAs.

Table 16.24 Transmission line corona noise – predicted number of exceedances

NCA	Summary of predicted exceedances of the nighttime PNTLs		
	≤ 2 dB	≥ 3 but ≤ 5 dB	> 5 dB
NCA3	-	3	1
NCA4	1	3	1
NCA5	1	-	-

Transmission line operational noise levels for up to 10 residential receivers closest to the HTP corridor are predicted to be up to around 40 dBA during light rain or mist conditions, which exceeds the most stringent nighttime PNTL by 5 dB. The distance at which operational transmission line noise impacts are expected to be experienced varies across the operation impact area and is dependent on weather conditions. Operational noise impacts are greatest during light rain and mist conditions and reduced during fair weather conditions. This assessment is based on predicted operational noise levels during light rain or mist conditions and therefore represents a worst-case scenario and not reflective of typical weather conditions.

16.4.2 Operational residual impacts

The NPfI defines residual noise impacts where noise from a development remains above the PNTLs after all feasible and reasonable source and pathway noise mitigation have been considered.

The above assessment shows during light rain or mist conditions (which is expected to be the worst-case condition for audible noise impacts) the significance of the noise impact is:

- considered to be 'significant' (more than 5 dBA exceedance) at 2 residential receivers
- considered to be 'moderate' (between 3 to 5 dBA exceedance) at 6 residential receivers
- considered to be 'negligible' (less than 2 dBA exceedance) at 2 residential receivers.

The assessment considers only horizontal distance between the corridor and sensitive receivers, without factoring in terrain or sound propagation, which are expected to lower noise levels at greater distances. Therefore, the significance or residual impacts are considered indicative and likely to decrease with further detailed design of the transmission line.

The proposed mitigation measures to minimise and manage operational impacts are provided in *section 16.5.2.*

16.4.3 Operational noise impacts from switching stations

Maximum noise levels from the operation of the Olney switching station are predicted to be below 35 dBA under noise enhancing meteorological conditions at all residential receivers. This is significantly below the sleep disturbance noise criteria of 52 dBA and, as such, operation of the switching stations is not predicted to cause sleep disturbances at any residential receiver. Impacts at other periods (e.g. the daytime and evening) are also not predicted to occur.

Operational noise from the Bayswater South switching station under noise enhancing meteorological conditions is predicted to be less than 30 dBA L_{Aeq}(15 minute) at the nearest residential receivers off Hebden Road and Edderton Road. This is significantly below the relevant PNTLs for NCA1 (38 dBA) and NCA2 (35 dBA).

16.4.4 Operational noise impacts from Eraring substation

Maximum noise levels from the operation of Eraring substation at the nearest residential receivers in NCA14 off Gradwells Road and Border Street, are predicted to be up to 37 dBA under noise enhancing meteorological conditions. This is below the most stringent nighttime PNTL of 38 dBA. Notwithstanding, predicted compliance with the PNTLs, the proposed mitigation measures to minimise potential noise impacts from the operation of the Eraring substation are provided in *section 16.5.2.*

16.4.5 Operation and maintenance activities

Once operational, the project switching stations and transmission lines would be inspected on a regular basis (see *Chapter 4 (Project description)* for more details on the maintenance activities). These activities would be intermittent, minor in nature and unlikely to generate substantial noise or vibration at surrounding sensitive receivers.

Operation and maintenance vehicle movements on public roads and access tracks are not expected to exceed the RNP screening criteria of a greater than 2 dB increase for road traffic noise impacts, noting that this level of increase generally requires a 60% increase in traffic. Therefore, the risk of noise and vibration impacts from operational and maintenance vehicle traffic at sensitive receivers was considered minimal and were not assessed.

16.5 Mitigation and management

16.5.1 Environmental management

Construction

There is the potential for construction noise impacts at the nearest sensitive receivers, particularly from earthworks and transmission line stringing activities (when helicopters are in use). The construction schedule and equipment are subject to further refinement during detailed design and construction planning. However, a construction noise and vibration management plan (CNVMP) will be prepared as part of the environmental management strategy (EMS), which will identify feasible and reasonable measures to reduce the potential for noise impacts.

The CNVMP will consider the following as a minimum:

- confirm proximity to residences and other sensitive land uses once detailed design is complete
- confirm applicable NMLs consistent with the ICNG
- develop vibration limits consistent with AVTG and other relevant guidelines
- confirm the potential impacts from the proposed construction methods and staging, including road traffic noise
- where NMLs are exceeded examine feasible and reasonable noise mitigation and develop associated noise and vibration monitoring programs, as required
- details of how community consultation in relation to noise and vibration would be completed
- develop an out of hours protocol
- assign roles and responsibilities for the management of noise complaints
- develop reactive and proactive strategies for dealing with any noise complaints including possibility of respite periods.

Furthermore, construction traffic noise management measures would be included as part of the CNVMP to mitigate predicted road noise impacts at locations where exceedances are predicted including:

- driver training and measures to ensure driver awareness and adherence to speed limits and designated routes
- limiting traffic movements to daytime periods as far as reasonable and feasible
- minimising traffic movements by ensuring full loads
- restriction of heavy vehicle movements to standard (daytime) hours where feasible.

Operation

Where operational noise from the project is predicted to exceed the relevant noise criteria, feasible and reasonable operational noise mitigation measures will be considered. Mitigation measures will be generally in accordance with the typical hierarchy for mitigating and managing industrial noise sources as follows:

- reducing noise emissions at the source (i.e. noise source control)
- reducing noise in transmission to the receiver (i.e. noise path control)
- reducing noise at the receiver (i.e. at-receiver control).

16.5.2 Mitigation measures

Mitigation measures will be implemented to avoid or minimise potential noise and vibration impacts are listed in Table 16.25. Mitigation measures in other chapters that are relevant to the management of noise and vibration include *Chapter 11 (Traffic and transport)*.

Table 16.25 Proposed mitigation and management measures -noise and vibration

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
NV1	General noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared to provide the framework and mechanisms for the management and mitigation of all potential noise and vibration construction impacts from the project. The CNVMP will include: • confirmation of nearby sensitive receivers • confirmation of work, construction equipment and hours of work would be completed and quantify resulting impacts at sensitive receivers. • criteria for the project and approval conditions • procedures and mitigation measures for potential impacts during out-of-hours work • requirements for noise and vibration monitoring • details of how community consultation in relation to noise and vibration would be completed • procedures for handling complaints • details on how respite would be applied where ongoing high impacts are expected at certain receivers.	Detailed design Construction	Project impact area and sensitive receivers
NV2	Prolonged construction noise impact from fixed work areas	Noise path control, such as hoarding or earth bunds will be investigated and implemented where required. Positioning of site structures will be considered to act as barriers between noisy work and receivers where practical.	Detailed design Construction	Construction support sites, laydown areas, substations and switching sites where receivers are predicted to be noise affected and near fixed work areas with long work durations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
NV3	Out of hours construction works	Construction of the project would be carried out during standard construction hours where possible (Monday to Friday between 7.00 am and 6.00 pm and Saturday between 8.00 am and 1.00 pm). An Out of Hours work protocol that details how the project will identify, assess and approve out of hours work outside standard construction hours will be developed and implemented. The protocol will include provisions to: • carry out additional assessments for work proposed outside standard construction hours, to confirm noise levels at potentially affected sensitive receivers and determine suitable mitigation measures to minimise noise levels • notify and engage with potentially noise affected receivers about upcoming work outside standard construction hours and address any associated complaints • identify appropriate respite for noise affected receivers (where required).	Detailed design Construction	Stringing transmission lines across main roads (M1 Pacific Motorway, Wollombi Road, Cessnock Road, Putty Road) Other works that may need to be conducted out of standard construction hours

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
NV4	Construction noise impacts	Where construction is likely to result in exceedances of NMLs at sensitive receivers, mitigation and management measures will be implemented where practicable and appropriate. This will include (but is not limited to) the following measures: • select quieter plant and equipment and use alternative construction methods to minimise noise levels • plan and schedule concurrent noisy activities to minimise the number of items of noisy plant operating at one time and cumulative noise levels • install screens or use barriers to mitigate noise from stationary noise sources • maximise the offset distance between noisy plant and sensitive receivers • orient noisy plant and equipment away from sensitive receivers • use noise source controls, such as residential class mufflers, to reduce noise from all regularly used plant including cranes, excavators and trucks • use non-tonal reversing alarms in place of traditional beeper reversing alarms during OOH where noise impacts are predicted • turn off machinery when not in use • confirm equipment is maintained in accordance with manufacture's requirements to minimise generation of excessive noise • operate machinery in a manner which reduces occurrence of maximum noise level events, such as excavator bucket impacts, material drop heights, steel on steel impacts and dragging materials across hard surfaces • provide awareness training regarding noise mitigation measures to be implemented as part of regular toolbox meetings • notify and consult with potentially noise affected receivers about upcoming noisy activities • confirm that noise affected receivers outside standard construction hours and highly noise affected sensitive receivers are managed with consideration to the CNVG additional mitigation measures such as notifications, verification, and respite where appropriate.	Construction	All locations where exceedances of the applicable construction noise criteria are predicted at sensitive receivers

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
NV5	Construction noise validation	Monitoring will be carried out at representative locations during noise intensive activities that have the potential to cause noise exceedances at sensitive receivers, to confirm that actual levels are consistent with the predictions and that appropriate mitigation measures have been implemented.	Construction	All locations where exceedances of the applicable construction noise criteria are predicted at sensitive receivers
NV6	Noise levels from construction traffic	All construction vehicle movements will adhere to the following measures: • OOH vehicle movements will be minimised where possible • construction delivery vehicles will be fitted with straps rather than chains for unloading, wherever possible • use of engine compression brakes will be avoided at night and in residential areas • site access points and access tracks will be located as far as practical away from sensitive receivers • traffic flow, parking and loading/unloading areas will be planned to minimise reversing movements • construction inductions will include driver behaviour requirements to minimise vehicle noise emissions.	Construction	Construction routes and access tracks

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
NV7	Vibration	Where vibration intensive work is required within the recommended minimum working distances and is considered likely to exceed the cosmetic damage criteria: • different construction methods with lower source vibration levels will be investigated and implemented, where feasible • confirm any vibration-sensitive heritage structures that could be impacted by the proposed works including confirming the structural integrity of the structure and applying appropriate vibration criteria • vibration monitoring will be undertaken at the start of work to determine actual vibration levels at the receiver • work will be ceased if the monitoring indicates vibration levels are likely to, or do, exceed the relevant criteria • direct and indirect impacts to all identified aboriginal objects and sites of high significance and their immediate environment (≥55 m) within the project impact area will be avoided.	Construction	All locations
NV8	Construction aircraft noise	Management measures will be implemented to minimise aircraft noise at sensitive receivers where practicable and appropriate, including: • notifying nearby sensitive receivers of upcoming work involving aircraft. This will include use of helipads within construction support sites, flight paths outside of the project impact area and stringing or other work within the HTP corridor. Notification will include scheduled dates, locations, indicative hours and a description of the proposed work • prioritising use of helipad locations at the construction support sites with the maximum distance offset from sensitive receivers (Hebden Road and Pikes Gully Road construction support sites) • varying flight paths between helipads and the HTP corridor to avoid repeated helicopter noise at sensitive receivers • operating aircraft in accordance with Airservices Australia Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise (2002) and the Helicopter Association International (HAI) Fly Neighbourly Guide.	Construction	HTP corridor and construction support sites

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
NV9	Operational transmission line noise	Operational transmission line noise impacts will be reviewed during detailed design, once the transmission tower and line placement, conductor arrangement and any property acquisitions are known. For each residence where potential operational noise levels are predicted to exceed the PNTL, noise monitoring to confirm actual operational noise levels will be carried out at representative locations following commencement of project operation. The noise monitoring will occur during representative L50 weather/atmospheric conditions conducive to generating 'worst case' noise from corona discharge. For residences where the monitoring identifies corona discharge levels above PNTLs, consultation will be undertaken with the landowner of the affected residence to identify solutions. Once the appropriate solutions have been agreed with the landowner, these will be implemented as soon as reasonably practical.	Detailed design Operation	All locations
NV10	Operational switching station and substation noise	Operational switching station and substation noise impacts will be reviewed during detailed design. The design will consider the following measures with a view to minimising noise impacts: • selection of equipment with consideration of operating sound power levels, where feasible • incorporation of transformer barriers where reasonable and feasible.	Detailed design Operation	Bayswater South and Olney switching stations Eraring substation

16.6 Summary and conclusion

The noise study area has been divided into 14 noise catchment areas which reflect groups of receivers that have a similar noise environment. Existing noise levels within the noise and vibration study area are typical of rural areas and dominated by natural sources such as wildlife and weather.

The assessment has predicted construction noise impacts from upgraded intersections and access tracks, potential construction support sites and laydown sites. Within the HTP corridor, transmission line construction is generally predicted to have high noise levels, but the impacts are only expected when work is at the transmission line structures closest to each receiver and would be relatively short-term. For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted, as the noise levels presented in this report represent worst case scenarios. In reality, construction noise levels would be much lower than the worst-case levels predicted.

Construction road traffic noise has been assessed and compared to the existing traffic on all proposed routes to be used for access between the construction support sites, temporary worker accommodation, laydown areas, the transmission line alignment and switching stations to determine the relative increase and total road traffic noise levels. Notable increases in road traffic noise (i.e. greater than 2.0 dB) are predicted on all arterial roads and local roads with low existing traffic volumes. However, the assessment is based on peak construction workforce and represents a worst-case scenario and mitigation measures will be implemented to further reduce any impacts.

The construction vibration assessment identifies 58 receivers would be located within the recommended working distance of the project for human comfort, with 10 of these receivers within the minimum working distance for cosmetic damage. Different construction methods with lower source vibration levels will be investigated and implemented, where feasible.

Operational noise has been assessed at the proposed switching stations and Eraring substation with noise levels predicted to comply with the relevant noise criteria at all receivers.

The audible noise assessment for the operation of transmission lines has considered the effect of weather conditions on audible noise emission, with up to 11 receivers expected to potentially experience audible noise impacts above the relevant most stringent nighttime criteria during light rain, misty conditions when increased noise emissions can occur. Under fair weather conditions, noise levels at the edge of the HTP corridor would be compliant at all receivers. It is important to note that the assessment does not account for local topography and other factors which affect sound propagation, so this assessment is considered conservative.

Operational transmission line noise impacts will continue to be considered as the project progresses and confirmed with noise monitoring post construction.

Surface water

17

17 Surface water

This chapter provides a summary of the potential impact to surface water from construction and operation of the Hunter Transmission Project (HTP, the 'project') and identifies appropriate mitigation and management measures to be adopted to avoid, minimise and manage these impacts.

This chapter is based on a surface water impact assessment, which is provided in full in *Technical Report 10 – Surface water impact assessment*.

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to surface water, and where in the EIS these have been addressed are detailed in *Appendix A (Assessment requirements compliance)*.

17.1 Assessment approach

17.1.1 Legislation, policies, plans and guidelines

Legislation relevant to the assessment of surface water include:

- NSW *Water Management Act 2000* (WM Act)
- NSW *Protection of the Environment Operations Act 1997* (POEO Act)
- NSW Water Management (General) Regulation 2018
- relevant water sharing plans made under the WM Act, including:
  - Hunter Regulated River Water Source 2016
  - Hunter Unregulated and Alluvial Water Sources 2022
  - Central Coast Unregulated and Alluvial Water Sources 2022
  - North Coast Fractured and Porous Rock Groundwater Sources 2016.

The surface water impact assessment was prepared with reference to the following policies and guidelines:

- *Australian and New Zealand Guidelines for fresh and marine water quality* (ANZG 2018)
- *NSW Water Quality and River Flow Objectives* (DECCW 2006)
- NSW Controlled activity guidelines, including:
  - *Controlled activities – Guidelines for riparian corridors on waterfront land* (DPE Water 2022a)
  - *Controlled activities – Guidelines for watercourse crossings on waterfront land* (DPE Water 2022b)
  - *Controlled activities – Guidelines for instream works on waterfront land* (DPE Water 2022c)

  - *Controlled activities – Guidelines for laying pipes and cables on waterfront land* (DPE Water 2022d)
  - *Controlled activities – Guidelines for outlet structures on waterfront land* (DPE Water 2022e)
  - *Controlled activities – Guidelines for vegetation management plans on waterfront land* (DPE Water 2022f)
- *Policy and guidelines for fish habitat conservation and management – Update 2013* (DPI 2013)
- *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge 2003)
- Managing Urban Stormwater: Soils and Construction:
  - *Volume 1* (Landcom 2004)
  - *Volume 2A, Installation of services* (DECC 2008b)
  - *Volume 2C, Unsealed roads* (DECC 2008c)
- *Best Practice Erosion and Sediment Control* (IECA 2008)
- Liquid Chemical Storage, Handling and Spill Management: Review of Best Practice Regulation (DECC 2005)
- *Storing and Handling Liquids: Environmental Protection: Participant's Manual* (DECC 2007a).

Additional discussion on the legislation and policies relevant to the assessment of groundwater are provided in *Technical Report 10 – Surface water impact assessment*.

17.1.2 Study area

The surface water study area encompasses the project impact area, along with all watercourses and catchments which interact with and extend downstream of the project impact area. In broad terms, the surface water study area is the sub-catchments of the 3 catchments that are intersected by the project impact area (namely the Hunter River, Lake Macquarie and Tuggerah Lakes catchments) as shown in Figure 17.1 and Table 17.4.

While potential surface water impacts would originate within the project impact area, where construction and operation occur, they may affect downstream watercourses. Existing land uses in the catchments contributing to these watercourses can influence their existing condition. Therefore, the existing surface water environment is described in relation to the broader surface water study area.

17.1.3 Assessment methodology

The surface water impact assessment considers the potential impacts of the project on water quality, streamflow regimes and interactions with watercourses and riparian corridors within the surface water study area. Potential impacts to water quality and streamflow regime were assessed against the water quality objectives (WQOs) and river flow objectives (RFOs) for the surface water study area. Surface water licensing and regulatory considerations associated with the project are also summarised.

The assessment methodology for the surface water impact assessment involved:

- a desktop review of legislation and policy context for assessing surface water impacts

- determining the surface water study area for the assessment
- a desktop review of publicly available water quality data, guidelines and studies for the surface water study area
- a water quality assessment, which included conducting a water quality monitoring program, characterisation of baseline water quality against relevant WQOs and a qualitative assessment of potential impacts to water quality from construction and operation of the project, which included:
  - identifying project activities that have the potential to impact surface water quality
  - identifying the risks to surface water quality from the identified project activities and their potential impact pathways
  - identifying mitigation and management measures to minimise risks to water quality, including measures that are integrated into the design and management measures that will be applied throughout construction and operation of the project
  - determining the residual impact rating for each activity, considering the scale of the activity within the project impact area, the sensitivity of the receiving environment where the project activity is being undertaken and the mitigated risk to water quality
  - assessing the potential impacts of the project to surface water quality during construction and operation, with consideration of the WQOs
- an assessment of the potential impacts of the project on catchment hydrology and streamflow regime/geomorphology, which included an assessment of the potential impacts of the project to streamflow with consideration of the relevant RFOs
- a watercourse and riparian corridor assessment, which included:
  - identifying watercourses within the study area and determining their associated riparian corridors in accordance with relevant policy and guidelines
  - undertaking a desktop mapping assessment to identify what project components would occur within identified riparian corridors
  - determining the residual impact rating for each activity, considering 3 factors: scale of the activity, the sensitivity of the receiving environment, and the mitigated risk to watercourses and riparian corridors
- identification of mitigation and management measures to minimise impacts to water quality, streamflow regimes, watercourses and riparian corridors.

The following sections summarise the assessment methodologies that were applied to undertake the surface water impact assessment. Additional information is provided in *Technical Report 10 – Surface water impact assessment.*

Further details on the approach to water supply for the project are detailed in *section 4.4.4*.

17.1.4 Water quality risk assessment

A qualitative assessment of potential risks to surface water quality from project activities during construction and/or operation was undertaken. Project activities that may impact surface water quality were identified, and for each activity, the potential risks to water quality and the impact

pathways were also identified. Mitigation and management measures were then developed to minimise the potential risks associated with these project activities (see *section 17.5*).

The residual impact rating of each activity considered 3 factors:

- location and scale of the activity
- sensitivity of the receiving environment
- mitigated risk rating.

Each activity was assigned a value of 1 to 3 for each of these factors, and the sum of these values per activity determined the impact rating. A description of the rating system applied to the impact factors and the residual impact rating is provided in Table 17.1.

The residual impacts to water quality were qualitatively assessed against the WQOs applicable to the study area as listed in Table 17.2.

Table 17.1 Surface water assessment – impact rating factors

	Rating		
Impact factor	1 (low)	2 (moderate)	3 (high)
Magnitude/scale of activity	An activity that is proposed to occur at 10 or less discrete locations (e.g. construction support sites, switching stations).	An activity that is proposed to occur at greater than 10 discrete locations (e.g. tower pads).	An activity that covers a large spatial area and not restricted to discrete locations (e.g. vegetation clearing).
Sensitivity of receiving environment	Heavily modified catchment affected by mining and energy generating industries.	Slightly to moderately disturbed catchments including agricultural area and forests.	Receiving watercourses and/or their catchments are largely undisturbed. Topography is typically a moderate to high grade such that watercourse beds and banks are susceptible to instabilities.
Mitigated risk rating	Following the implementation of management and mitigation measures the activity is considered to have low risk.	Following the implementation of management and mitigation measures the activity is considered to have moderate risk.	Following the implementation of management and mitigation measures (see *section 17.5*) the activity is considered to have high risk.
Residual impact rating	Sum of the above factors equals 3 or 4.	Sum of the above factors equals 5 to 7.	Sum of the above factors equals 8 or 9.

17.1.5 Water quality objectives and river flow objectives

The *NSW Water Quality and River Flow Objectives* (DECCW 2006) provides WQOs and RFOs for all catchments in New South Wales (NSW).

The NSW WQOs are the agreed environmental values and long-term goals for surface waters within NSW. They set out the community's values and uses for watercourses as well as a range of water quality indicators to help assess whether the current condition of watercourses supports those values and uses.

The NSW RFOs are the agreed high-level goals for surface water flow management. They identify the key elements of the flow regime that protect river health and water quality for ecosystems and human use.

The project and all potentially impacted receiving watercourses lie within the Hunter River, Lake Macquarie and Tuggerah Lakes catchments. Table 17.2 and Table 17.3 show the WQOs and RFOs that apply to the surface water study area.

Table 17.2 WQOs for the Hunter River, Lake Macquarie and Tuggerah Lakes catchments

	Applicable WQOs										
Catchments	Aquatic ecosystems	Visual amenity	Secondary contact recreation	Primary contact recreation	Livestock water supply	Irrigation water supply	Homestead water supply	Drinking water at point of supply-disinfection only	Drinking water at point of supply-clarification and disinfection	Drinking water at point of supply-groundwater	Aquatic foods (cooked)
Hunter River (mainly forested areas)	✓	✓	✓	✓	×	×	×	×	×	×	×
Hunter River (uncontrolled streams)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hunter River (major regulated rivers)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lake Macquarie and Tuggerah Lakes (mainly forested areas)	✓	✓	✓	✓	×	×	×	✓	✓	✓	×

	Applicable WQOs										
Lake Macquarie and Tuggerah Lakes (uncontrolled streams)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 17.3 RFOs for the Hunter River, Lake Macquarie and Tuggerah Lakes catchments

	Applicable RFOs										
Catchments	Protect pools in dry times	Protect natural low flows	Protect important rises in water levels	Maintain wetland and floodplain inundation	Mimic natural drying in temporary watercourses	Maintain natural flow variability	Maintain natural rates of change in water levels	Manage groundwater for ecosystems	Minimise effects of weirs and other structures	Minimise effects of dams on water quality	Make water available for unforeseen events
Hunter River (mainly forested areas)	✓	✓	×	×	×	✓	×	✓	✓	×	×
Hunter River (uncontrolled streams)	✓	✓	✓	✓	×	✓	×	✓	✓	×	×
Hunter River (major regulated river)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lake Macquarie and Tuggerah Lakes (mainly forested areas)	✓	✓	×	×	×	✓	×	✓	✓	×	×
Lake Macquarie & Tuggerah Lakes (uncontrolled streams)	✓	✓	✓	✓	×	✓	×	✓	✓	×	×

Note: Water sharing plans for regulated rivers in NSW incorporate environmental flow rules which are generally based on the principles of RFOs

17.1.6 Derivation of default guideline values

Default guideline values (DGVs) (i.e. water quality values for a range of analytes) are derived for each sub-catchment and consider a range of factors including:

- the mapped sub-catchment, relating to existing land use and condition of the watercourses (e.g. regulated river, unregulated rivers, mainly forested areas). These are mapped online at https://www.environment.nsw.gov.au/ieo/Hunter/map.htm
- whether the watercourse is lowland (less than 150 metres Australian Height Datum (AHD)) or upland (greater than 150 metres AHD) elevation
- the species protection level (SPL) (ANZECC 2000), relating to the level of disturbance of the receiving environment. Three categories exist:
  - 80th percentile protection for highly disturbed streams
  - 95th percentile protection for slightly to moderately disturbed streams
  - 99th percentile protection for high ecological value streams.

The 95% SPL was applied for all catchments in the surface water impact assessment, as:

- ANZG 2018 recommends that for highly disturbed systems the slightly to moderately disturbed systems DGV (typically 95% SPL) is applied in the first instance
- 99% SPLs are not available for all toxicants, and where values are provided, the limit of reporting (lowest detection limit) for some analytes higher than the 99% SPL. These should be considered when deriving site specific trigger values for construction impact monitoring in highly sensitive receiving environments.

A comparison of existing water quality against the DGVs for the surface water study area is presented in *section 17.3.1* and *section 17.4.1*.

17.2 Existing environment

17.2.1 Catchments and watercourses

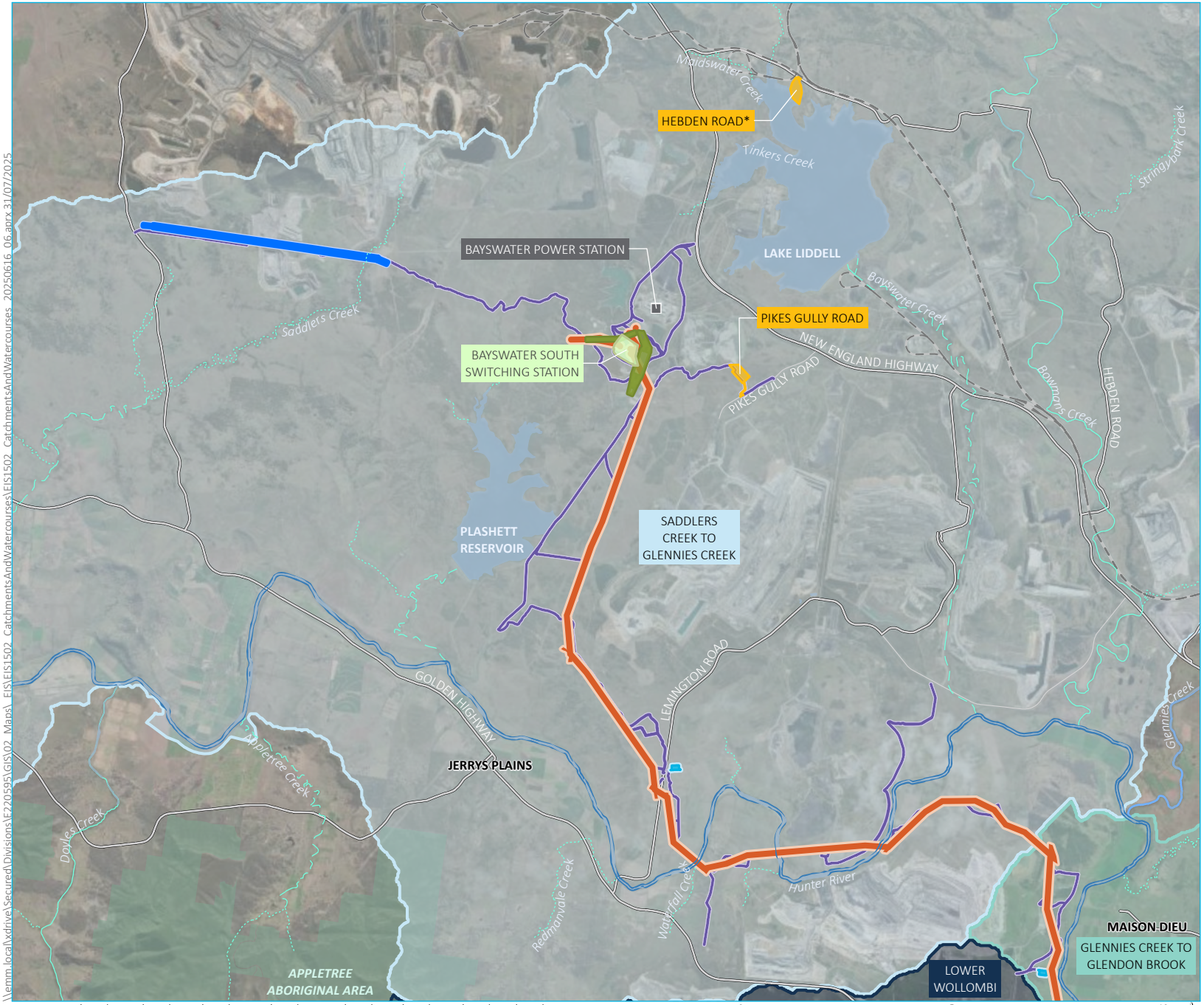
The surface water study area is partially located within the 3 major surface water catchments, and the relevant sub-catchments which intersect the project impact area are summarised in Table 17.4 and shown in Figure 17.1.

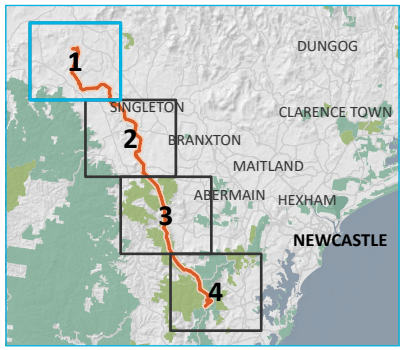
The majority of the project impact area ultimately drains to the Hunter River via several major (and minor) watercourses including Wollombi Brook and Congewai Creek. Small parts of the project impact area at its southern extent drain to Lake Macquarie via Dora Creek and Tuggerah Lakes via Wyong River.

Table 17.4 Surface water catchments and sub-catchments that intersect the project impact area

Catchment	Sub catchments which intersect the project impact area	Description
Hunter River	• Saddlers Creek to Glennies Creek • Glennies Creek to Glendon Brook • Black Creek • Lower Wollombi Brook • Upper Wollombi Brook	The Hunter River catchment covers an area of around 21,500 km^2 and flows for 460 km, draining the 3rd largest coastal catchment in NSW. The Hunter River is regulated by 2 main storages, Glenbawn Dam and Glennies Creek Dam, as well as several smaller storages. The Hunter Valley supports a range of landscapes, from mountain ranges up to 1500 m high, to broad fertile floodplains and extensive estuarine areas. Land uses in the catchment are diverse, including large areas of wilderness and national park in upper reaches, as well as established agricultural, equine and coal mining industries which are supported by villages, towns and major cities throughout the catchment. Around 90% of the project impact area is located within the Hunter River catchment. The project impact area intersects the Hunter River at 3 locations in the northern portion of the project impact area within the Saddlers Creek to Glennies Creek and Glennies Creek to Glendon Brook sub-catchments. The project intersects Wollombi Brook, a major tributary to the Hunter River within the Lower Wollombi sub-catchment upstream of its confluence with the Hunter River.
Lake Macquarie	Dora Creek	The Lake Macquarie catchment covers an area of around 600 km^2. 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. The western catchment includes areas of Watagan State Forest and Watagans National Park. These forested areas reach elevations of up to 600 m. To the east, the catchment is low lying with elevation generally below 50 m supporting townships, agriculture and other industry. Dora Creek is the largest watercourse in the catchment and runs south-east for 25 km to meet west Lake Macquarie at the township of Dora Creek. Jigadee Creek is a major tributary of Dora Creek, draining the northern catchment area and confluencing with Dora Creek, 8 km upstream of Lake Macquarie. The tidal influence extends around 12 km upstream of Lake Macquarie to the Dora Creek weir at Cooranbong. Several access tracks and roads (existing and new) and upgrades to existing transmission lines are proposed to occur within the Wyong River sub-catchment of the Lake Macquarie catchment. During construction, the Freemans Drive construction support site would be located adjacent to Jigadee

Catchment	Sub catchments which intersect the project impact area	Description
		Creek and also within the Wyong River sub-catchment of the Lake Macquarie catchment.
Tuggerah Lakes	Wyong River	The Tuggerah Lakes catchment has an area of 714 km^2. The catchment 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 lake is surrounded by small towns and the Wyrrabalong National Park to the east. To the west there is pastureland and other cultivated areas, but the catchment is largely forest. The topography is close to sea level around Tuggerah Lakes with elevations up to 300 m to the west in Ourimbah and Wyong State Forest. Around 11 km of the project impact area, (including adjustments to existing transmission lines) intersects with the upper catchments of Wyong River and Jilliby Jilliby Creek which are tributaries to Tuggerah Lake. Within the Olney State Forest, several access tracks and adjustments to existing transmission lines are proposed within the Tuggerah Lakes catchment.





KEY

Hunter River Catchment
- Saddlers Creek to Glennies Creek
- Glennies Creek to Glendon Brook
- Lower Wollombi Brook

Strahler stream order
- 4th order
- 5th order
- 6th order
- 7th order
- 9th order

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
- Railway
- Major road
- Minor road
- Named waterbody
- NPWS reserve

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

0 5 10 km

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Catchments, sub-catchments and watercourses within the surface water study area
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 17.1

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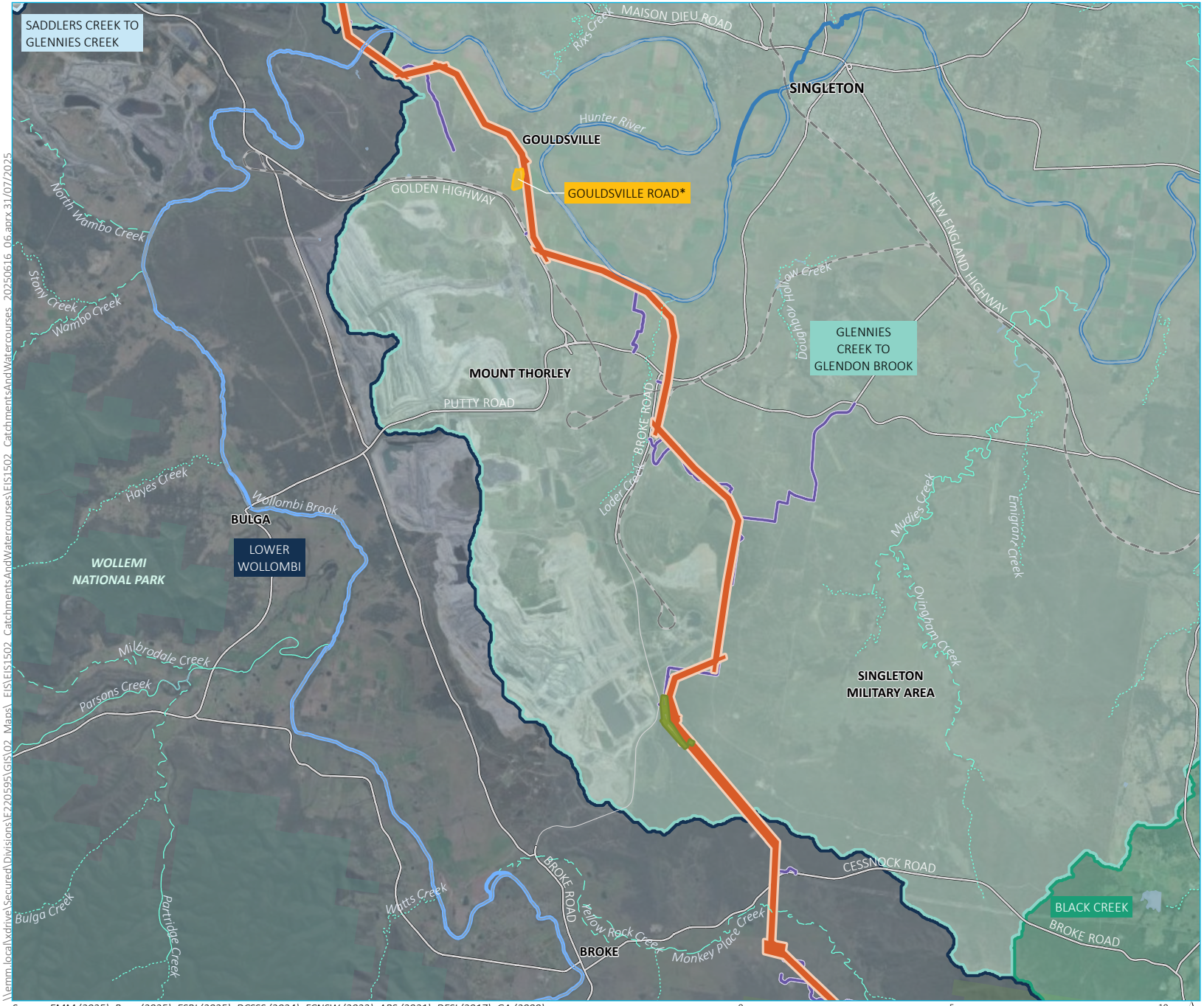

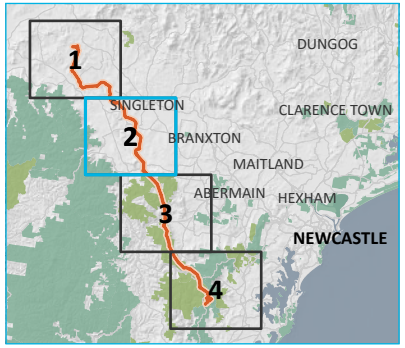

KEY

Hunter River Catchment
- Saddlers Creek to Glennies Creek
- Glennies Creek to Glendon Brook
- Black Creek
- Lower Wollombi Brook

Strahler stream order
- 4th order
- 5th order
- 6th order
- 8th order
- 9th order

Project impact area
- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Adjustment to existing transmission line (line 81)
- Access track

Existing environment
- Railway
- Major road
- Minor road
- Named waterbody
- NPWS reserve
- State forest

Catchments, sub-catchments and watercourses within the surface water study area Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 17.1

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

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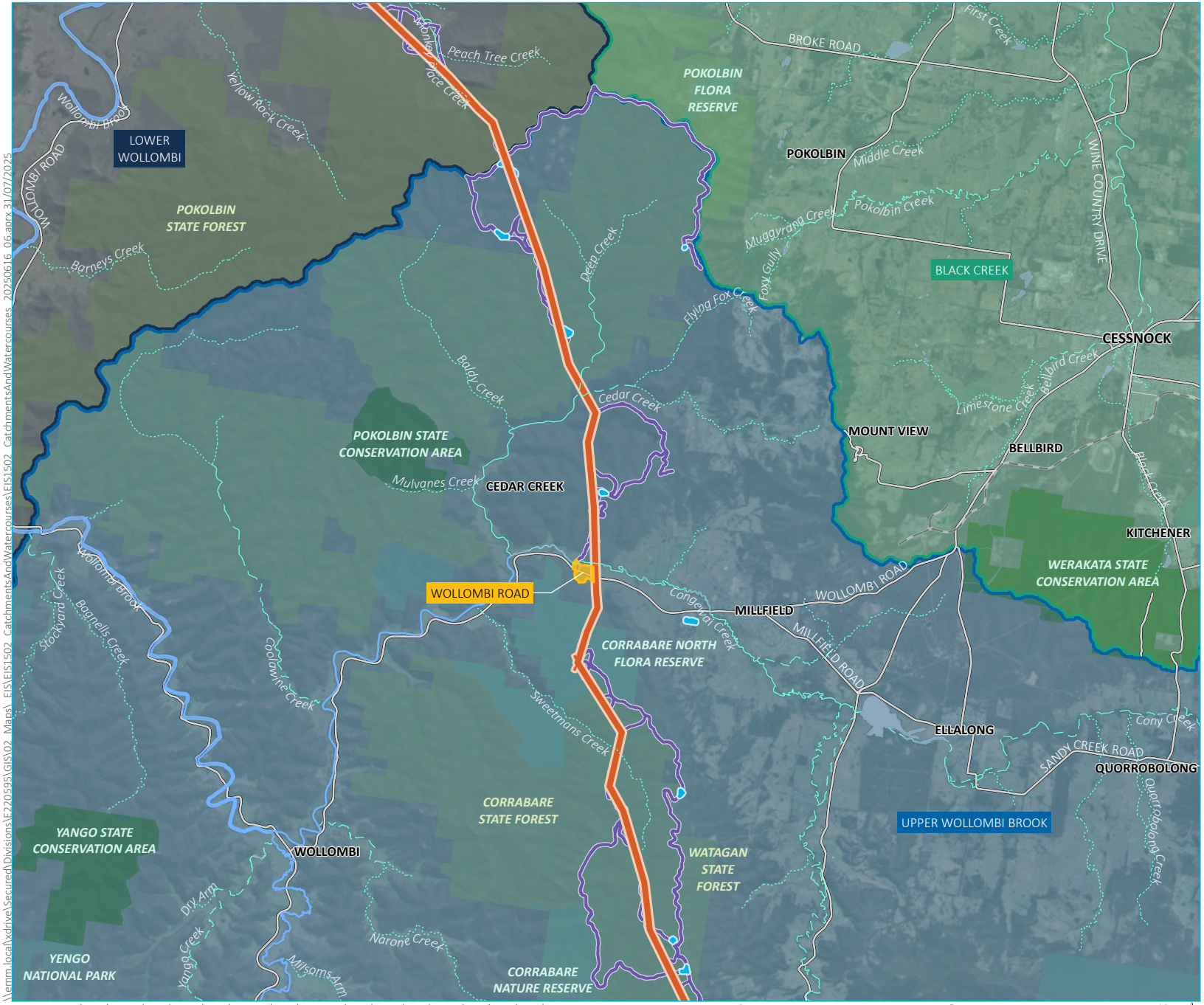

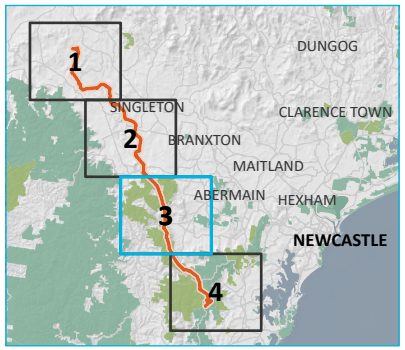

KEY

Hunter River Catchment
- Black Creek
- Lower Wollombi Brook
- Upper Wollombi Brook

Strahler stream order
- 4th order
- 5th order
- 6th order
- 7th order
- 8th order

Project impact area
- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Laydown area
- Access track

Existing environment
- Railway
- Major road
- Minor road
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

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

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Catchments, sub-catchments and watercourses within the surface water study area Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 17.1

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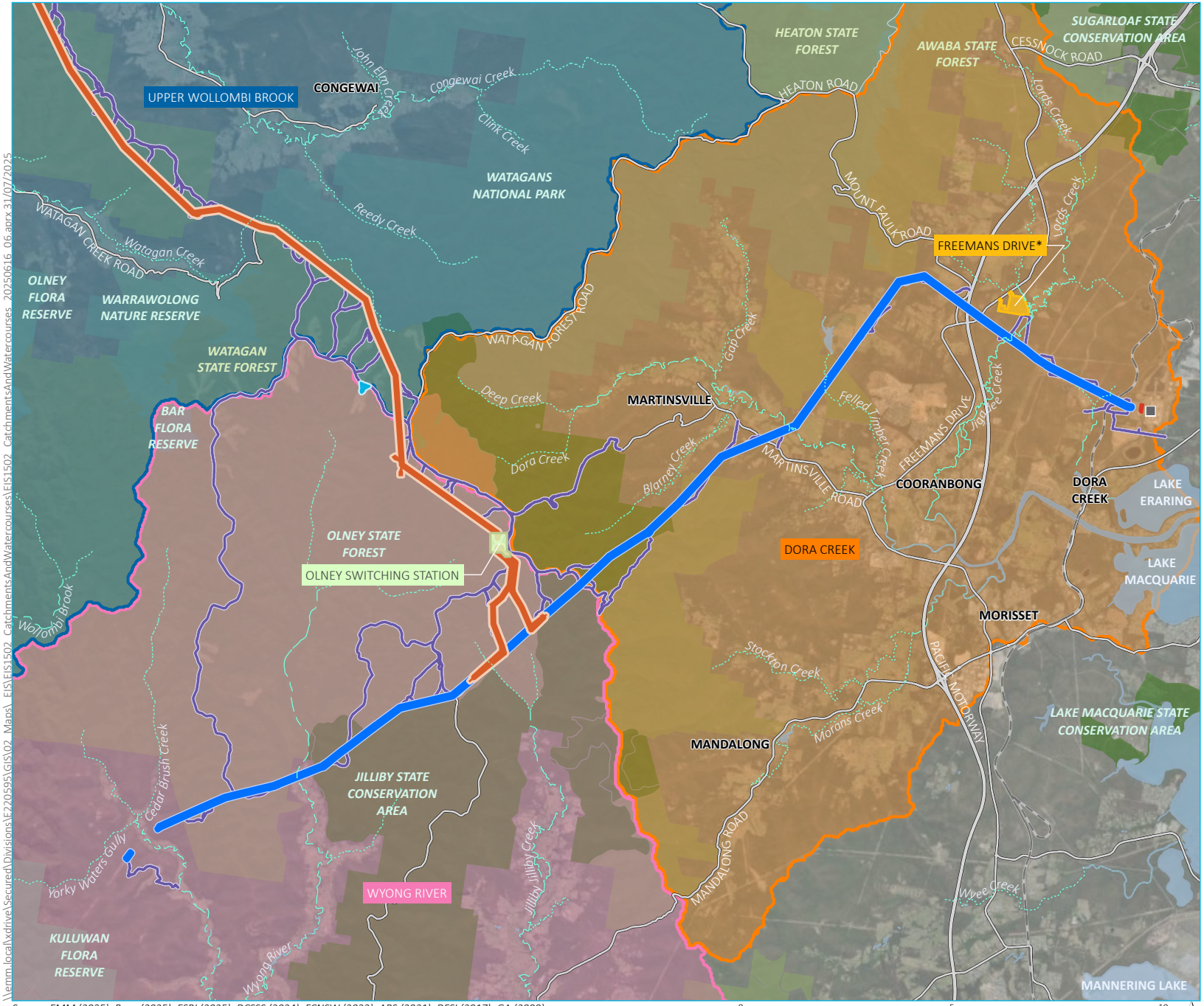

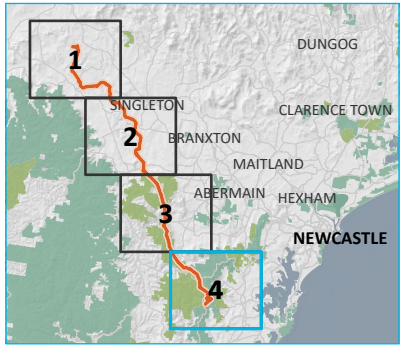

KEY

Hunter River Catchment
- Upper Wollombi Brook

Tuggerah Lakes Catchment
- Wyong River

Lake Macquarie Catchment
- Dora Creek

Strahler stream order
- 4th order
- 5th order
- 6th order

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
- Railway
- Major road
- Minor road
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Recreation area

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

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Catchments, sub-catchments and watercourses within the surface water study area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 17.1

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17.2.2 Geomorphology

The NSW River Styles Database (DPIE 2019b) provides an overview of geomorphic watercourse character, behaviour, condition and recovery potential for watercourses typically classified in the Strahler stream system as 3rd order and higher throughout NSW. The recovery potential provides an indication of the resilience of a watercourse to any physical interactions with the construction and operation of the project and may influence any mitigation and management strategies that need to be applied.

The existing geomorphic conditions of watercourses that intersect the project impact area vary from good to poor condition with varying recovery potential. Several watercourses in elevated areas in the State forests and similar less disturbed environmental contexts (such as Watagan Creek, Sweetmans Creek and Peach Tree Creek) are in good condition and recovery potential is intact. Watercourses within areas of lower elevation that are intersected by existing development, and areas of high industrial activity such as Monkey Place Creek, are in poor existing condition with a low recovery potential.

Watercourses with a Strahler stream order of 4th order and higher (considered the point at which a watercourse becomes perennial rather than ephemeral) that intersect the project impact area from north to south along with their condition, characteristics and recovery potential are shown in Table 17.5. The Strahler stream order classifies the hierarchy of streams and rivers in a river system from smallest (1st order) to biggest (9th order). The stream order increases as streams and rivers of the same system join, with the highest stream order found on the river's main stem in the downstream section of a river system.

Table 17.5 Major watercourse within the surface water study area

Watercourse*	Stream order	NSW River Style	Existing condition	Recovery potential **
Saddlers Creek	4	Floodplain pockets, gravel	Moderate	Rapid
Hunter River	9	Planform controlled, low sinuosity, gravel	Poor	Moderate
Wollombi Brook	8	Planform controlled, low sinuosity, sand	Moderate	Strategic
Loder Creek	4	Planform controlled, low sinuosity, gravel	Poor	Moderate
Monkey Place Creek	5	Low sinuosity, sand	Poor	Low
Monkey Place Creek	5	Planform controlled, low sinuosity, sand	Moderate	High
Monkey Place Creek	4	Planform controlled, low sinuosity, sand	Moderate	High
Monkey Place Creek	4	Headwater	Good	Conservation
Deep Creek	5	Floodplain pockets, sand	Good	Conservation
Black Creek	5	Bank confined, sand	Poor	Moderate
Cedar Creek	5	Floodplain pockets, sand	Good	Conservation
Congewai Creek	6	Meandering, fine grained	Moderate	High

Watercourse*	Stream order	NSW River Style	Existing condition	Recovery potential **
Sweetmans Creek	4	Floodplain pockets, sand	Good	Conservation
Watagan Creek	4	Floodplain pockets, sand	Good	Conservation
Jigadee Creek	5	Planform controlled, meandering, sand	Moderate	Rapid
Jigadee Creek	6	PCVS - Planform controlled, meandering, sand	Moderate	Rapid
Felled Timber Creek	4	PCVS - Planform controlled, meandering, sand	Good	Conservation
Dora Creek	5	Meandering, sand	Good	Conservation
Wyong River	5	Headwater	Good	Conservation

* a watercourse is included multiple times in instances where different reaches of the watercourse within the study area have different River Styles or Stream Orders

** Stream condition and recovery potential were obtained from the NSW River Styles Database (DPIE 2019)

17.2.3 Water quality

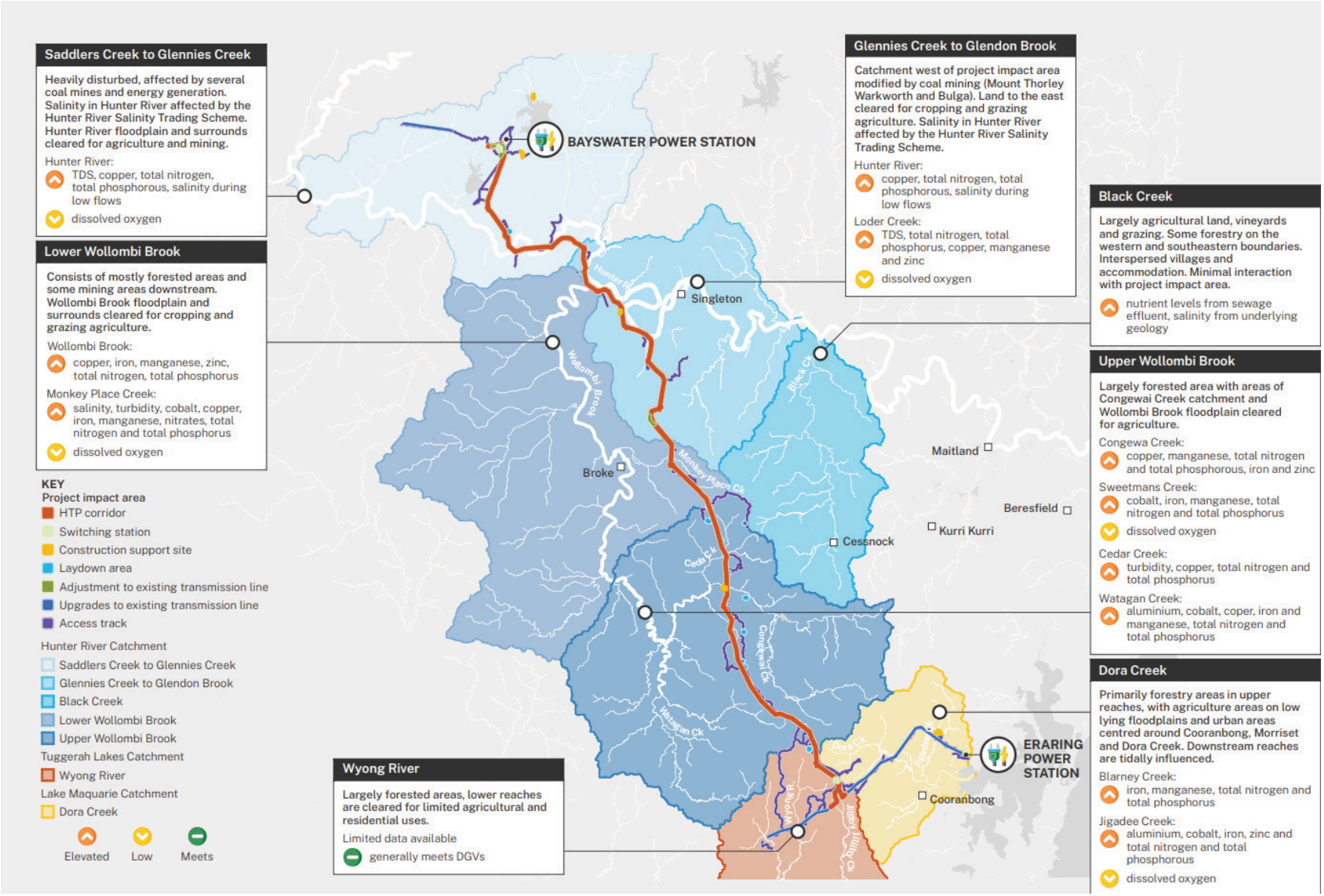
Surface water quality within the surface water study area exhibits significant variability, influenced by the diverse land uses present including National parks, State Forests and conservation areas, agricultural regions on the Hunter River floodplain and areas dominated by coal mining and energy generation in the Hunter Valley.

Water quality data obtained from both public sources and the project's water quality monitoring program has been used to characterise baseline water quality for watercourses which may potentially be impacted by the project.

The water quality has been compared against the WQOs derived for the project as per the NSW *Water Quality and River Flow Objectives* (DECCW 2006) for each applicable sub-catchment (see *section 17.1.3* for more information). The review indicates that existing water quality across the study area is variable and does not consistently achieve the DGVs (see *section 17.1.3*) for WQOs.

Water quality across the study area consistently exceeds DGVs for total phosphorus and total nitrogen, except in the Wyong River catchment where water quality data was limited. Dissolved oxygen is generally low for most watercourses considered. Other exceedances of DGVs for various metals such as copper, iron, zinc and manganese occur throughout the study area. Watagan Creek, a relatively undisturbed watercourse in the Watagan State Forest, indicates elevated aluminium, cobalt, copper, iron and manganese (as well as nutrients), indicating these analytes may be naturally elevated and may not be a result of anthropogenic influences.

An indication of existing water quality for the study area compared to the WQOs is shown in Figure 17.2. A detailed summary of the existing water quality against the WQOs is provided in *Chapter 4* of *Technical Report 10 – Surface water impact assessment.*



1 – Data collected between 2009 and 2014 from Wyong Shire Council

Figure 17-2 Water quality of sub-catchments within the surface water study area

17.2.4 Environmental receivers

Sensitive receiving environments within the surface water study area include key fish habitat, watercourses supporting threatened aquatic species, groundwater dependent ecosystems (GDEs) and wetlands (see *Chapter 8 (Biodiversity)* and *Chapter 18 (Groundwater)* for more information on the assessment of impacts associated with groundwater and GDEs).

Due to the large project extent and its interaction with various land uses of varying levels of disturbance, the sensitivity of the receiving environment varies widely. In order to establish the existing conditions and assess the potential impacts of the project, the sensitivity of the receiving environment has been classified into 3 broad categories. These categories and the basis for their classification are summarised in
Table 17.6.

Table 17.6 Classification of receiving environments

Classification	Low sensitivity	Moderate sensitivity	High sensitivity
Basis for classification	Highly disturbed ecosystems. Receiving watercourses and/or their catchments are significantly modified by mining and energy generation industries. Topography is typically a low to moderate grade and not particularly susceptible to instabilities.	Slight-moderately disturbed ecosystems. Receiving watercourses and/or their catchments have been impacted by human activity to a small to moderate degree. Topography is typically a low to moderate grade and not particularly susceptible to instabilities.	High value systems. Receiving watercourses and/or their catchments are largely undisturbed. Topography is typically a moderate to high grade such that watercourse beds and banks are susceptible to instabilities. Watercourses that contain known threatened species.

Classification	Low sensitivity	Moderate sensitivity	High sensitivity
Description of areas relevant to the study area	Areas where the water cycle is modified by large dams (for coal mining or energy generation industries), pumped water transfers, modified catchment landforms and diversion of watercourses. Areas in the study area include: • watercourses and catchments intercepted by coal mines • internally draining areas of Bayswater and Eraring Power Station (i.e. areas that do not discharge downstream).	Areas that have been cleared for agriculture and/or housing. Areas in the study area include: • transition areas between State forests and mining/energy generation land uses • cleared valleys and plains in the Lake Macquarie and Tuggerah Lakes catchments • Singleton Military Area • Hunter River Floodplain and associated pastural areas • mining areas under rehabilitation.	Areas are typically comprised of heavily vegetated areas, where watercourses are largely undisturbed, and topography is steep. Areas in the study area include: • the Watagan, Corrabare, Pokolbin and Olney State forests • Jilliby State Conservation Area. The crossing of Dora Creek is also considered high sensitivity due to the presence of threatened frog breeding habitat.

17.3 Potential impacts - construction

17.3.1 Water quality

A summary of the project elements and construction activities which may potentially impact downstream water quality are provided in Table 17.7.

Appendix L (*Aquatic biodiversity impact assessment*) of *Technical Report 1 - Biodiversity development assessment report*, provides an assessment of the potential aquatic biodiversity impacts as a result of potential impacts to water quality.

Table 17.7 Project components and activities that may impact downstream water quality during construction

Project component	Construction activity						
	Vegetation clearing	Bulk earthworks and stockpiling spoil	Concrete batching	Installation of watercourse crossings	Chemical/ hazardous materials storage and use	Intercepted groundwater from piling activities	Surface water extraction
Installation of transmission towers	✓	✓	✓	-	✓	✓	-
Clearing of transmission easements	✓	-	-	-	✓	-	-
Road works, construction of access roads and tracks	✓	✓	-	✓	✓	-	-
Establishment and use of construction support sites	✓	✓	✓	-	✓	-	-
Establishment and use of ancillary areas	✓	✓	-	-	✓	-	-
Construction of switching stations and substation upgrades	✓	✓	✓	-	✓	-	-
Adjustments/ upgrades to and crossing of existing transmission lines	✓	-	✓	-	✓	-	-
Water supply	-	-	-	-	✓	-	✓

Table 17.8 details impact pathways and potential impacts to water quality for project activities described in Table 17.7.

Residual risks to water quality for each construction activity were evaluated with consideration of:

- spatial scale of the activity
- the sensitivity of the receiving environment
- the impact pathways
- the potential risks to water quality
- the implementation of mitigation and management measures.

The potential for surface water quality impacts would vary depending on the proposed construction activities and the relative sensitivity of the area of disturbance. Risks to water quality are higher in the State forests where the topography is steep and where disturbance activities are located upstream of sensitive biodiversity areas. Steep topography increases the risk of erosion and sediment mobilisation due to higher velocity of runoff which can increase erosive forces, causing greater scour and mobilisation of sediments. Water quality risks are substantially lower in areas of the Hunter Valley of low to moderate grades where the receiving environment is highly modified as a result of land clearing, coal mining, and energy generation.

A summary of the impact pathways, potential impacts to water quality, sensitivity of receiving environment and mitigated impact rating (following the implementation of management measures in *section 17.5*) for each construction activity is provided in Table 17.8.

The implementation of mitigation measures described in *section 17.5* would effectively manage key risks to water quality. Additionally, the progressive nature of construction would limit the work areas and duration within which impacts could occur also reducing the risk profile.

Table 17.8 Water quality impact summary

Project activity	Impact pathway	Key potential impacts to water quality	Residual impacts – sensitive receiving environment		
			Low	Moderate	High
Vegetation clearing	Destabilisation resulting in erosion and mobilisation of sediments	• Increased turbidity • Reduced dissolved oxygen • Decreased visual amenity • Increased nutrients • Increased tannins	Low	Moderate	Moderate
Bulk earthworks and stockpiling spoil	Exposure of sediment and destabilisation resulting in erosion and mobilisation of sediments	• Increased turbidity • Reduced dissolved oxygen • Increased nutrients • Mobilising contaminants, such pesticides and metals	Low	Moderate	Moderate
Concrete batching	Discharge of concrete impacted water	• Increased alkalinity • Increased dissolved metals • Increased turbidity • Reduced dissolved oxygen	Low	Low	Moderate
Installation of watercourse crossings	Changing hydraulics and destabilisation resulting in erosion and mobilisation of sediments	• Increased turbidity • Reduced dissolved oxygen • Increased nutrients • Mobilising contaminants, such pesticides and metals	Low	Moderate	Moderate

Project activity	Impact pathway	Key potential impacts to water quality	Residual impacts – sensitive receiving environment		
Chemical/hazardous materials storage and use	Spills of chemicals, fuels and other hydrocarbons Inappropriate storage of chemicals	• Introduction of pollutants such as hydrocarbons	Low	Low	Moderate
Intercepted groundwater from piling activities	Discharge of groundwater (potentially affected by construction activities) to the environment	• Water quality of groundwater not reflective of the receiving surface water environment	Low	Low	N/A
Extraction of surface water	Changing hydraulics and destabilisation resulting in erosion and mobilisation of sediments at new extraction locations (Congewai Creek and Hunter River)	• Increased turbidity • Increased nutrients • Reduced dissolved oxygen • Decreased visual amenity	Low	Low	N/A

17.3.2 NSW water quality objectives

Following the implementation of mitigation measures, potential impacts to water from construction of the project are expected to be low to moderate.

A review of the potential impacts to water quality with regard to WQO identified the following:

- project impacts on water quality of the receiving environment during construction, if any, would be temporary and localised
- the project is expected to maintain the ecological condition of receiving waterbodies. Immediate impacts to riparian corridors will be minimised and re-established over the long term
- no material impacts to visual amenity, secondary and primary contact recreation, drinking water, aquatic food or livestock water supply, irrigation water supply or homestead water supply are anticipated as the water quality leaving the project is expected to be similar to the water quality of the receiving environment
- no impacts to groundwater quality are anticipated that would impact drinking water at point of supply (groundwater).

Water quality objectives in receiving environments as a result of the project would be protected and maintained. Any potential extraction from a new surface water source (e.g. Congewai Creek and the Hunter River) would conform with extractions limits applied as part of a Water Supply Work Approval under the WM Act (see *Chapter 5 (Statutory context)* for more information). Extraction limits would also be applied that maintain the RFOs of the downstream watercourse.

17.3.3 Streamflow regime

Construction activities have the potential to alter the streamflow regime at a localised scale. Potential risks to streamflow regime include:

- alteration of existing catchment areas by diverting flows to adjacent watercourses
- impoundment of runoff by stormwater control devices for water quality purposes
- increase of impervious areas, such as concrete hardstands associated with switching stations and substations, result in increased runoff to be conveyed by receiving watercourses
- watercourse crossings, if not constructed at bed level, can have the effect of detaining flows upstream
- extraction from surface water sources may reduce streamflow downstream.

In general, any residual impacts to the streamflow regime during construction are expected to be localised and to dissipate within a short distance downstream. Impacts related to stormwater management devices and flow diversions during construction will be temporary and confined to the period of active disturbance.

Potential impacts on streamflow, arising from stormwater controls, increased impervious surfaces, and the installation of watercourse crossings, will be minimised through the implementation of appropriate mitigation measures, outlined in *section 17.5*. These measures will help reduce

alterations to runoff patterns from existing catchments and include scour protection where increased flows are expected.

Following the implementation of management measures detailed in *section 17.5*, predicted impact to streamflow regime during construction is considered low. No material impacts to streamflow with regards to the RFOs are predicted for the project.

Any potential extraction from a surface water source (e.g. the Hunter River) would be undertaken in accordance with the NSW water regulatory framework including any conditions on water access licenses (WALs), and water supply and use approvals as well as rules in the relevant water sharing plan (WSP) under the WM Act. This framework considers measures to manage extractions such that there are minimal impacts to downstream water users and the environment. Further information is provided in *Chapter 4 (Project description)* and *section 17.3.5* for discussion on water supply.

17.3.4 Watercourses and riparian corridors

The design of the project has considered minimising the impact to riparian corridors, including:

- avoiding the placement of project infrastructure in riparian corridors as much as possible
- inclusion of no clearing corridors along the transmission line easements
- minimising clearing of riparian corridors for transmission line easements through consideration of tower placement
- maximising the use of existing access roads.

Impacts to riparian corridors are largely associated with vegetation clearance for the transmission alignment, the installation of watercourse crossing for access tracks, and the construction of the Olney switching station.

The majority of the project's interactions with riparian corridors is associated with vegetation clearing within the HTP corridor and access tracks (new or upgrades). Clearing of vegetation within riparian corridors would be undertaken in accordance with the modified clearing methods described in *Chapter 4 (Project description)* and *section 17.5*. This approach will reduce impacts to riparian corridors and maximise stability of the watercourses. Indicative riparian zones (IRZs) are approximate representations of riparian corridors as defined by the WM Act. IRZs were determined along each watercourse corridor by assigning buffers to the watercourses consistent with the vegetated riparian corridor widths in *Controlled activities – Guidelines for riparian corridors on waterfront land* (DPE Water 2022a).

A summary of the project's interactions with riparian corridors by project component, sensitivity of receiving environment and mitigated impact rating (following the implementation of management measures in *section 17.5*) for each construction activity is provided in Table 17.9.

Impacts to riparian corridors are highest in the State forests where there is a greater presence of vegetation and disturbance activities are located in or upstream of sensitive biodiversity areas. The impacts to riparian corridors are substantially lower in low lying areas of the Hunter Valley where vegetation clearing is extensive and the receiving environment is highly modified as a result of land clearing, coal mining, and energy generation.

The clearing and earthworks associated with construction of the Olney switching station would occur across the riparian corridors of 2 minor watercourses upstream of sensitive receiving environments. Detailed design and construction activities will include mitigation and management measures tailored to the local conditions and consideration of the receiving environment.

The implementation of mitigation measures described in *section 17.5* would effectively manage key risks to watercourses and riparian corridors.

Table 17.9 Summary of project interactions with IRZs

Project component	Interactions with IRZs	Construction activities with the potential to interact with IRZs	Residual impact within receiving environment		
			Low	Moderate	High
HTP transmission alignment	Interactions with riparian corridors of minor and major watercourses, including: • about 230 interactions with IRZs of 1st order watercourses • about 60 interactions with IRZs of 2nd order watercourses • about 20 interactions with IRZs of 3rd order watercourses • about 20 interactions with IRZs of 4th order watercourses and higher.	• Vegetation clearance for transmission line easements • Installation of transmission tower infrastructure and associated works	Low	Moderate	Moderate
Access tracks	Interactions with riparian corridors of minor and major watercourses, including: • about 170 interactions of 1st order watercourses • about 60 interactions of 2nd order watercourses • about 25 interactions of 3rd order watercourses • about 20 interactions of 4th order watercourses and higher.	Construction and/or upgrading of access tracks, including: • vegetation clearing • minor earthworks • installation of cross-drainage infrastructure.	Low	Low	Moderate
Ancillary works	The location of ancillary works in riparian corridors are possible but will be avoided where practicable.	• Vegetation clearing • Minor earthworks • Stockpiling	Low	Low	Low

Project component	Interactions with IRZs	Construction activities with the potential to interact with IRZs	Residual impact within receiving environment		
			Low	Moderate	High
Construction support sites, switching stations and substation upgrades	Interactions with riparian corridors of minor and major watercourses, including: • about 5 interactions of 1st order watercourses • about 3 interactions of 2nd order watercourses • about one interactions of 3rd order watercourses • about 3 interactions of 4th order watercourses and higher.	• Vegetation clearing • Earthworks • Installation of temporary infrastructure and permanent infrastructure	Low	Low	Moderate

17.3.5 Water supply licensing and regulation

Due to the geographical extent of the project and variety of water quality requirements for construction, water is likely to be sourced from several sources including from reuse within the project impact area, environmental sources (including surface water and existing groundwater bores) and private sources (including recycled water, wastewater and mine water).

Investigations have identified water supply options with sufficient water flows and reliable yield. Further detail of these surface water supply options is provided in *Chapter 4 (Project description)* and will be subject to negotiation and agreement with the owners of the supply. A review of market depth and existing entitlement for the relevant surface water sources has also been analysed, indicating that there is sufficient depth in the trading market to secure the allocation necessary for the project.

The feasibility of surface water extraction locations would be confirmed as part of the detailed design and construction planning for the project.

17.4 Potential impacts – operation

17.4.1 Water quality

Surface water quality impacts have the potential to occur during operation of the project. These impacts may result from:

- soil erosion and sedimentation from vegetation removal, maintenance activities and operation of permanent access tracks
- accidental spills of chemicals, fuels and heavy metal from refuelling and operation of equipment and vehicles
- gross pollutants such as paper and plastic packaging brought by maintenance and operational crew that are not properly disposed of
- an increase in stormwater runoff carrying additional nutrients and chemicals to watercourses.

Similar to construction, the potential magnitude of impact, sensitivity of receiving environment and mitigated risk to surface water quality would vary and would be highly dependent on the location of the work or permanent infrastructure to watercourses and the type of watercourse potentially impacted.

Vegetation removal as part of maintenance of the transmission line easement has the potential for erosion and sedimentation impacts on water quality. The magnitude of impact is considered low due to the likelihood that groundcover would be maintained (as much as practicable) and soils would not be exposed for most maintenance requirements.

Other water quality impacts related to spills of fuels and chemicals and other pollutants from the maintenance of transmission line structures, the switching stations and operation of permanent access tracks are likely to be minor, localised and temporary. All maintenance works would be conducted in accordance with approved handling and safety measures. The switching stations and

existing substations incorporate bunding and spill capture measures to reduce the likelihood of any fuel and chemical spills reaching watercourses.

Due to the infrequent nature of maintenance works and the installation of any required permanent stormwater management infrastructure, the WQOs would be achieved during operation.

The management of potential water quality impacts would occur through the environmental management strategy to be implemented for the project, as detailed in *Chapter 24 (Environmental management).*

17.4.2 Streamflow regime

Potential impacts to streamflow regime have the potential to occur during operation of the project. These impacts may result from:

- watercourse crossings, if not constructed at bed level, can have the effect of detaining flows upstream. This has the impact of restricting flows to the downstream watercourse, particularly during low flows
- permanent hardstand areas, resulting in increased runoff compared to existing conditions
- permanent infrastructure located in the riparian corridor or watercourse.

Impacts to streamflow regime during operations will be minimised through implementation of the mitigation measures provided in *section 17.5* Additional impacts to streamflow regime are not anticipated during operation.

17.4.3 Watercourses and riparian corridors

The operation of the project does not require additional infrastructure in watercourses or riparian corridors.

Works in watercourses and riparian corridors during operations would be limited to:

- managing vegetation in and around the transmission line easement
- maintenance of access tracks, particularly drainage conveyance structures, as necessary.

Impacts to watercourses and riparian corridors would be minor during operation of the project. Vegetation management during operation would have minimal impacts on the watercourses or riparian corridors.

17.5 Mitigation and management

17.5.1 Environmental management

Potential impacts to surface water will be minimised through design principles that are tailored to local conditions and the sensitivity of the receiving environment. Impacts to surface water would be minimised through the application of mitigation and management measures that would be incorporated into the design and the implementation of a soil and water management plan (SWMP) for the project.

Soil and Water Management Plan

Environmental management for the project would be carried out in accordance with the approach as detailed in *Chapter 24 (Environmental Management).*

A project specific SWMP would provide mitigation measures to minimise impacts on soils and water. The SWMP would identify foreseeable risks relating to soil erosion and water pollution during construction and describe how these risks would be managed. It would include a description of soil and water management approaches, methods for impact assessment and monitoring, and mitigation measures. At the completion of construction, appropriate measures would be carried into the network operator's environmental management strategy (EMS).

The SWMP would include the following sub-plans, which would be prepared in accordance with Table 17.10 and *Chapter 8 (Biodiversity)* and *Technical Report 10 - Surface water impact assessment*:

- erosion and sediment control plans (ESCPs), prepared by the construction contractors and focus on managing potential erosion and sedimentation impacts. An ESCP will be developed and implemented in consultation with a Certified Professional in Erosion and Sediment Control for activities and areas that are considered higher risk. The plan will detail the processes, responsibilities and measures to manage potential soil and water quality impacts and include additional considerations for areas of high risk (e.g. high slopes) and located upstream of sensitive biodiversity areas (i.e. State forest areas) including Olney switching station
- a water quality monitoring program (WQMP) to describe the monitoring to be conducted during certain construction activities to facilitate a response to a potential water quality impact event. The WQMP objectives and guideline values would be specific to the major catchments and consider relevant legislation and include surface water and groundwater monitoring depending on the construction activity
- a stormwater management plan which would include general stormwater management principles as well as measures specific to access tracks, concrete batching plants, areas of spoil and bulk earthworks, excavations and stockpiles.

17.5.2 Mitigation measures

Mitigation measures to avoid or minimise potential impacts to surface water quality from the construction and operation of the project are listed in Table 17.10.

Mitigation measures in other chapters that are relevant to the management of soils and contamination include:

- *Chapter 20 (Soils and contamination), Technical Report 9 – Soils and land impact assessment* and *Technical Report 13 – Contamination preliminary site investigation* provides specific measures for effective erosion and sediment control for the project and measures relating to the storage of fuel and oil within the construction disturbance area and accidental disturbance of contaminated material
- *Chapter 19 (Flooding)* and *Technical Report 12 - Flooding impact assessment* – provides specific measures to minimise the impacts of the project on flooding and hydraulic regime

- *Chapter 8 (Biodiversity)* and *Technical Report 1 - Biodiversity development assessment report* – provides measures to manage activities in vegetated riparian corridors and minimise impacts to aquatic environments
- Chapter *18 (Groundwater)* and *Technical Report 11 - Groundwater impact assessment* – provides measures to ensure incidental water take during construction is in accordance with regulatory conditions.

It should be noted that some environmental impacts assessed in this EIS are relevant to multiple technical aspects and therefore will share common mitigation measures. Where this occurs, the mitigation measure has not been duplicated but rather one ID number has been provided for the particular measure and a cross reference to that ID number has been included in other related environmental aspects. In line with this approach, reference has been made to the management of the storage of chemicals, fuels and other hazardous substances in line with mitigation measures DG1, DG2, DG3 and DG4 in Table 17.10.

Table 17.10 Proposed mitigation and management measures – surface water

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW1	Impacts to surface water	A project specific Soil and Water Management Plan (SWMP) will be prepared, which provides mitigation measures to minimise impacts on soils and water. The SWMP will be prepared in accordance with the management approach outlined in *Chapter 8 (Management)* of *Technical Report 10 - Surface water impact assessment* and will: • identify foreseeable risks relating to soil erosion and water pollution during construction and describe how these risks will be managed • include a description of soil and water management approaches, methods for impact assessment and monitoring, and mitigation measures • include ESCPs • include surface water quality monitoring requirements • include stormwater management plans. At the completion of construction, appropriate measures will be carried into the network operator's Environmental Management System (EMS).	Detailed design Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW2	Water quality and geomorphology	Scour protection will be considered for any infrastructure within a watercourse. Design will incorporate features that minimise impact on flow conditions and natural function of the watercourse, where feasible and reasonable. Works within or near watercourses will consider and adhere to the following guidelines: • *Controlled activities - Guidelines for watercourse crossings on waterfront land* (DPE 2022b) • *Controlled activities - Guidelines for instream works on waterfront land* (DPE 2022c) • *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Watercourse Crossings* (DPI 2003) • *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI 2013).	Detailed design Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW3	Erosion and sedimentation	Erosion and sediment control plans (ESCPs) will be developed, prior to construction, and implemented in consultation with a Certified Professional in erosion and sediment control for all disturbance activities. ESCPs will include additional considerations for areas of high risk (e.g. high slopes) and located upstream of sensitive biodiversity areas (i.e. State forest areas) including at Olney switching station. The plans will detail the processes, responsibilities and measures to manage potential soil and water quality impacts in accordance with the principles and requirements in: • *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom 2004), *Volume 2A* (DECC 2008a) and *2C* (DECC 2008b), commonly referred to as the 'Blue Book' • *Best Practice Erosion and Sediment Control* (IECA 2008) • *Guidelines for controlled activities* (Riparian corridors (DPE Water 2022a) and Watercourse crossings (DPE Water 2022b).	Detailed design Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW4	Water quality monitoring	As part of a Soil and water management plan (SWMP), a water quality monitoring program will be developed and implemented to establish baseline water quality conditions in watercourses of high sensitivity that may be impacted by nearby construction and to detect changes in water quality that may be attributable to the project during construction. The frequency, location and duration of sampling will be detailed in a monitoring program. Monitoring will: • be positioned upstream and downstream of project disturbance areas, focusing on locations with sensitive receiving environments. Where upstream and downstream monitoring is not possible, pre-construction water quality conditions will be established through baseline monitoring • be carried out in accordance with water quality objectives and criteria for the project and in accordance with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000).	Detailed design Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW5	Stormwater management – general	General stormwater management principles within the project impact area will include: • appropriate siting of proposed infrastructure within the project impact area, which will minimise (and avoid where possible) disturbance to existing drainage lines, riparian vegetation and overland flow paths • grading of earthworks to minimise changes to existing catchments and flow paths • surface drainage infrastructure that diverts upslope runoff around infrastructure and excavations to receiving drainage lines • infrastructure areas that contain oil and/or grease will include suitable containment measures • scour protection will be considered downstream of areas that increase runoff into receiving watercourses • consideration of appropriate water quality and stormwater controls (for ancillary areas) upstream of sensitive receiving environments, such as at Olney switching station.	Detailed design Construction	All locations
SW6	Stormwater management – concrete batching plants	Stormwater management measures for concrete batching plants (both mobile and temporary) will include: • the separation of clean and potentially contaminated runoff by a bunded cementitious areas • the collection of first flush runoff from cementitious areas • offsite disposal of contaminated water not suitable for reuse to a licenced waste facility.	Detailed design Construction	All locations
SW7	Stormwater management – excavations	• Stormwater management measures for excavations (particularly for transmission towers) will include bunding around excavations to prevent runoff into excavations.	Detailed design Construction	Excavations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW8	Stormwater management – spoil	Runoff from spoil piles, topsoil stockpiles and other excavated material will be managed through: • minimising the number of stockpiles, stockpile areas and the time they are exposed • locating stockpiles away from drainage lines and natural watercourses and from where they will be susceptible to erosion • bunding stockpiles in accordance with *Managing Urban Stormwater – Soils and Construction, Volume 1, 4th Edition* (Landcom 2004) • stabilising stockpiles, establishing sediment controls and suppressing dust as required.	Detailed design Construction	All locations
SW9	Water supply	Water supply management will be undertaken in accordance with agreements between the construction contractors, relevant landowners and relevant water users and suppliers. Groundwater and surface water allocations purchased from existing registered bores/users must be extracted in accordance with the conditions stated in the associated water access license(s) and water supply works approval(s).	Prior to and during construction	Water extraction locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW10	Dewatering	In the event that dewatering is required: • the management of discharge water will be documented in the SWMP and will consider options for containment, reuse, application to grassed areas and transport to licensed waste facilities. In the event that discharge water is discharged to grassed areas: • application will be limited to grassed areas within the project impact area, away from watercourses. If the discharge water if highly turbid, dewatering through a filter sock (or similar) or via transportable sedimentation tanks will be considered, where appropriate, to minimise sedimentation.	Detailed design Construction	Excavations
SW11	Construction impact area – clearance (general)	Clearance practices will include: • immediate laying of mulch where ground disturbance has occurred (except in riparian corridors) • stabilisation of mulch where mobilisation by wind or runoff is possible • management of mulching activities and stockpiles to minimise tannin production and avoid discharge to watercourses • ground stabilisation using felled vegetation placed across the slope to minimise the concentration of flows, especially upstream of riparian corridors.	Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SW12	Construction impact area – clearance (riparian buffer areas)	Riparian buffer areas include 5 m from the top of bank of any mapped or unmapped watercourse. Clearance practices in riparian buffer areas will include: • hand clearing methods that minimise ground disturbance and disturbance of the understorey • no placement of mulch (and measures to avoid the transport of mulch into watercourses) • stabilisation of the watercourse bed and banks will be installed as soon as practical, where disturbance to the understorey or ground has occurred. Where vegetation clearance is oblique or parallel to the watercourse (i.e. not perpendicular), stabilisation works with minimal impact will be designed prior to disturbance and installed as soon as practical.	Construction	Riparian corridors
-	Hazardous chemicals	Store chemicals, fuels and other hazardous substances in accordance with mitigation measures DG1, DG2, DG3 and DG4.	Construction Operation	All locations

17.6 Summary and conclusion

Impacts to surface water have been considered and minimised through the project design and would be a key consideration throughout project construction and operational management. Potential impacts to surface water as a result of construction and operation were assessed and included consideration of potential impacts to water quality, streamflow regime, watercourses and riparian corridors.

Risks to surface water environments are higher in the State forests where the topography is steep, there is a greater presence of vegetation and disturbance activities are located upstream of sensitive biodiversity areas. Risks to surface water environments are substantially lower in areas of the Hunter Valley of low to moderate grades where the receiving environment is highly modified as a result of land clearing, coal mining, and energy generation.

Residual impacts to the streamflow regime during construction are expected to be localised, confined to the period of active disturbance, and dissipate within a short distance downstream. Residual impacts to streamflow during operation may result in localised increases to runoff as a result of increased impervious areas and stormwater diversions. Similar to construction, these impacts would be localised and dissipate within a short distance downstream.

With the implementation of mitigation measures, predicted impacts to water quality, watercourses and riparian corridors during construction are considered low to moderate, depending on the sensitivity of the receiving environment. Predicted impacts to streamflow regime are localised and largely associated with stormwater control measures.

An assessment of the impact of the project on surface water resources of the study area, anticipates the project will maintain the existing status of NSW *Water Quality Objectives and River Flow Objectives* (DECCW 2006).

A SWMP will be developed for the project, including detailed ESCPs, a water quality monitoring plan and a stormwater management plan. These management plans will outline site specific surface water measures implemented to prevent potential negative impacts to surface water resources during the construction and operational phases.

Groundwater

18

18 Groundwater

This chapter provides a summary of the potential impacts of the Hunter Transmission Project (HTP, the 'project') on groundwater during construction and operation and identifies mitigation and management measures to be implemented to minimise and manage these impacts.

This chapter is based on a groundwater impact assessment, which is provided in full in *Technical Report 11 – Groundwater impact assessment*.

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to groundwater, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance)*.

18.1 Assessment approach

18.1.1 Legislation, policies, plans and guidelines

Legislation, policies and guidelines relevant to the assessment of groundwater include:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *NSW Water Management Act 2000* (WM Act)
- NSW Water Management (General) Regulation 2018
- *NSW Protection of the Environment Operations Act 1997* (POEO Act)
- relevant water sharing plans made under the WM Act, including:
  - *North Coast Fractured and Porous Rock Groundwater Sources 2016*
  - *Hunter Unregulated and Alluvial Water Sources 2022.*

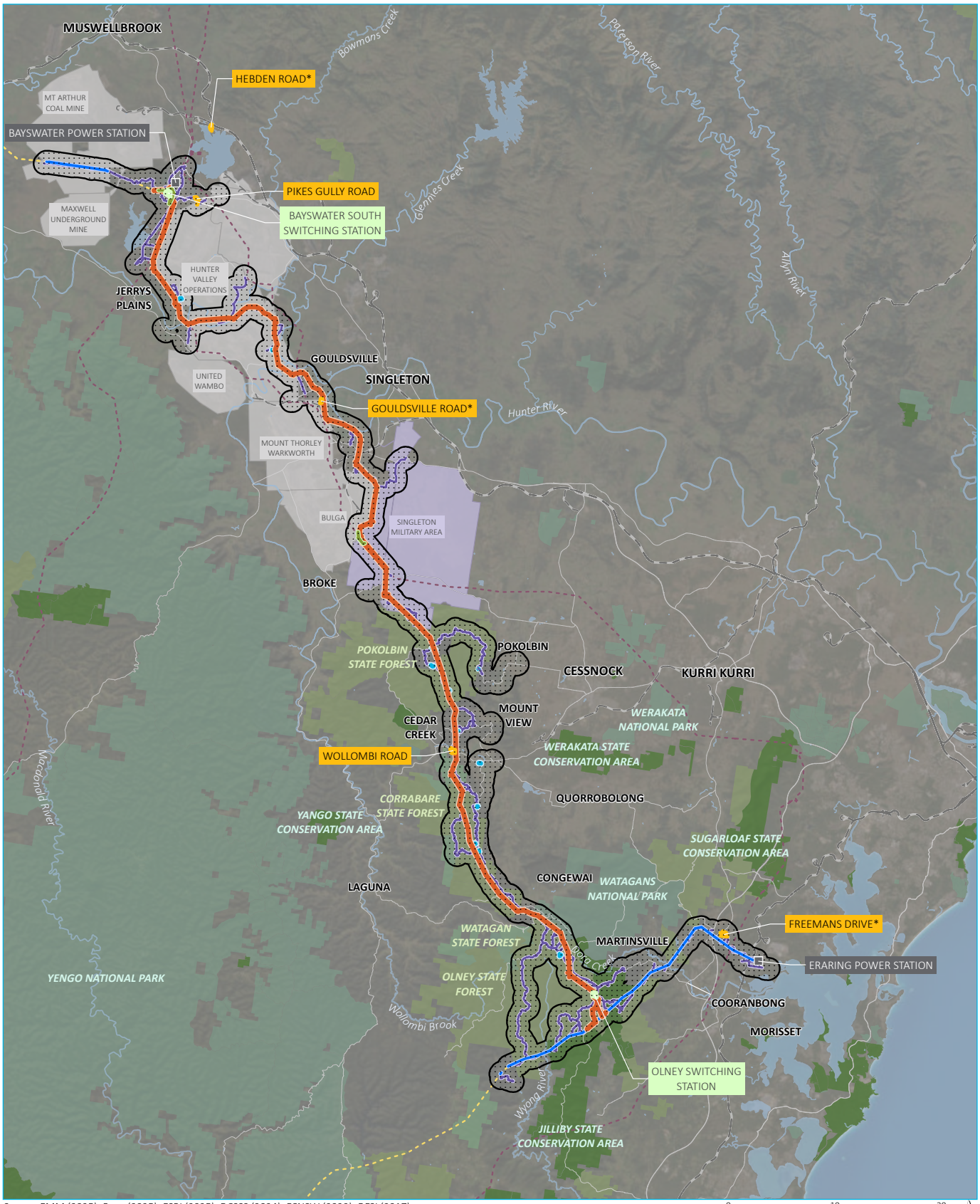
The groundwater impact assessment was prepared with reference to the following policies and guidelines:

- *NSW Aquifer Interference Policy (AIP)* (NSW Department of Primary Industries – Office of Water (DPI Water) 2012a)
- *Groundwater Assessment Toolbox for Major Projects in NSW* (NSW Department of Planning and Environment (DPE) 2022k)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Water Quality Guidelines) (ANZG 2018)
- *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (DPI Water 2012b).

Additional discussion on the legislation and policies relevant to the assessment of groundwater are provided in *Technical Report 11 – Groundwater impact assessment.*

18.1.2 Study area

The groundwater study area encompasses the project impact area with a one km buffer. This is a suitable area to characterise the existing hydrogeological environment and is wider than the predicted extent of any potential impacts of the project on local groundwater sources or groundwater sensitive receivers. Sensitive groundwater receivers include groundwater dependent ecosystems (GDEs), culturally significant sites and groundwater users. The groundwater study area is shown on Figure 18.1.



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

0 10 20 km

GDA2020 MGA Zone 56

N

KEY

- Groundwater study area

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

Groundwater study area

Hunter Transmission Project
Environmental Impact Statement
Figure 18.1

EMM creating opportunities

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18.1.3 Assessment methodology

The groundwater impact assessment for the project was undertaken using the methodology outlined in the *Groundwater Assessment Toolbox for Major Projects in NSW* (DPE 2022k). The assessment methodology for the groundwater impact assessment involved:

- a desktop review of existing and available information to describe the existing groundwater environment within the groundwater study area, including publicly available databases relevant to climate, geology, groundwater systems, hydrogeology, registered groundwater bores and GDEs to characterise groundwater quality, levels and flows
- development of a site conceptual model, characterising the existing hydrogeological and groundwater conditions in the groundwater study area. The hydrogeological conceptual site model describes the key processes and mechanisms in the hydrological and hydrogeological environment
- assessment of potential risks to sensitive groundwater environments including GDEs, culturally significant sites and groundwater users from construction and operation of the project (see *section 18.3.2* for more information)
- qualitative assessment of potential impacts to sensitive receivers from the construction and operation of the project relying on the assessment criteria documented in the *NSW Aquifer Interference Policy* (DPI Water 2012a) (AIP) and the *Groundwater impact assessment criteria* (DPE Water 2023) (see *section 18.3.2* for more information)
- identifying mitigation measures to avoid, mitigate and manage the potential impacts identified.

Further detail on the assessment of groundwater is provided in *Technical Report 11 – Groundwater impact assessment.*

Risk assessment

Potential risks to sensitive groundwater receiving environments were characterised by identifying the water-affecting activities during construction and operation, and the potential adverse effects on sensitive receivers.

The risk management standard AS/NZS ISO 31000:2018 characterises risk as a function of the likelihood and consequence of an outcome, where the consequences (impacts) should be characterised with related likelihoods (uncertainties). The qualitative risk assessment has examined the groundwater system in the context of potential impacts to the groundwater environment during construction and operation of the project.

Impact assessment

The aim of the impact assessment is to identify potential impacts on the existing groundwater sensitive receivers from the project. Direct effects encompass the changes to physical and/or quality aspects of groundwater. These changes would be due to aquifer interference activities, or the changes to the physical characteristics of aquifers.

The assessment of potential impacts to groundwater identifies water-affecting activities, assesses the potential consequences in terms of direct effects (e.g. altered water resource condition) and potential receiver responses (such as reduced water access). The approach to groundwater impact

assessment follows the workflow outlined in the *Groundwater Assessment Toolbox for Major Projects in NSW* (DPE 2022k).

Although the project impact area is large in extent, the potential for the project to intercept groundwater is minor given the types of infrastructure that would be constructed, the proposed construction methodology and the varying depth to the water table within the study area.

The potential for groundwater interception and water take to occur during construction from activities such as piling and shallow excavations has been assessed in accordance with the minimal impact considerations outlined in the AIP (DPI Water 2012a). The assessment criteria for the aquifer interference assessment are outlined below.

Assessment criteria

The AIP clarifies the requirements for obtaining water licences and the assessment processes for aquifer interference activities under the WM Act and other relevant legislative frameworks.

For each lithological category of water source, the AIP identifies thresholds for minimal impact considerations. These thresholds relate to impacts on the water table, water pressure and water quality (water table or pressure declines or water quality degradation), and are ranked as being either 'level 1 minimal impact' or 'level 2 exceeding minimal impact'. The definition of 'minimal impact' is outlined in a series of tables (see *Technical Report 11 – Groundwater impact assessment*), which demonstrate how the criteria are applied for different types of water sources and for different sensitive receivers such as other users and ecosystems.

The AIP defines water sources as being either 'highly productive' or 'less productive' based on levels of salinity and average available yields. Based on the NSW Government's mapped areas of groundwater productivity in NSW, the project impact area is predominantly within 'less productive' porous rock and alluvial sources. This is relevant for the porous and fractured rock Permian groundwater systems, the porous and fractured rock Triassic groundwater systems and most of the alluvial groundwater systems. There is some alluvial groundwater mapped as 'highly productive' immediately adjacent to the Hunter River, however based on yield data this may be erroneous. Reference to groundwater yield data indicates that the groundwater systems in the study area would be considered 'less productive' based on the criteria outlined in *Chapter 3 (Alternatives and options)*, noting there may be areas in the alluvium considered to be 'highly productive.' For the purpose of this assessment, the alluvial groundwater sources have been assessed against the highly productive minimal impact considerations.

The applicable minimal impact considerations for relevant water sources have been developed for impacts on groundwater sources, connected water sources and their dependent ecosystems, culturally significant sites and water users. If the impact of an activity is assessed as being level 1 minimal impact, then the project's impacts are considered acceptable. Where the predicted impacts exceed the level 1 minimal impact thresholds then impacts are outside the range of acceptability, and extra monitoring or mitigation or remediation would be required during construction or operation. Where impacts are predicted to be 'greater than minimal impact' and the long-term viability of the water-dependent asset is compromised, the impact is subject to 'make good provisions'.

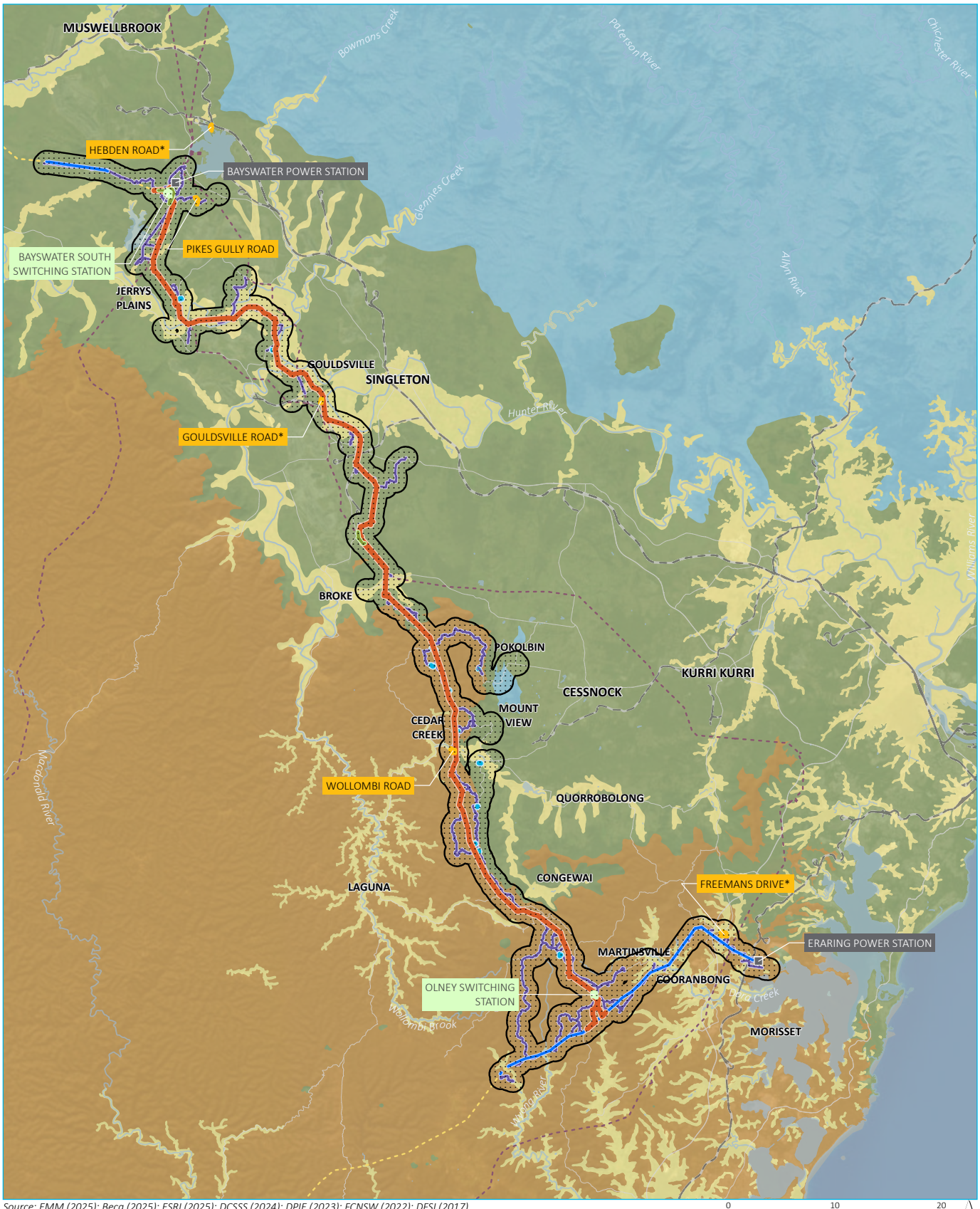
18.2 Existing environment

18.2.1 Groundwater systems

The groundwater study area is in the Hunter Region of the Permo-Triassic Sydney Geological Basin, which includes the following main groundwater systems that are generally defined by their host geology and hydrogeological properties:

- local, shallow groundwater hosted by Unconsolidated Quaternary Alluvium associated with the Hunter River and its tributaries in the Hunter Valley floor. 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 State forests, forming the south-western boundary of the Hunter Valley
- 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 southwest, and in parts by local shallow alluvium in association with the Hunter River and its tributaries.

The approximate location of these groundwater systems within the groundwater study area is shown on Figure 18.2.



Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); DPIE (2023); FCNSW (2022); DFSI (2017)

0 10 20 km
GDA2020 MGA Zone 56
N

KEY

Groundwater study area

Geological outcrop
- Quaternary
- Triassic
- Permian
- Carboniferous

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

Groundwater systems in the study area

Hunter Transmission Project
Environmental Impact Statement
Figure 18.2

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18.2.2 Hydrogeology

The groundwater study area covers 3 groundwater sources managed under 2 water sharing plans (see Table 18.1).

Table 18.1 Water sharing plan and groundwater sources within the study area

Water Sharing Plan	Groundwater source	Management zone	Aquifer type	Productivity
Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022	Hunter Regulated River Alluvial Water Source	Upstream Glennies Creek Downstream Glennies Creek	Alluvial	High
	Lower Wollombi Brook Water Source	N/A	Alluvial	High
Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016	Sydney Basin-North Coast Groundwater Source	N/A	Porous	Less

Groundwater throughout the study area is a mixture of both high and low (less) productivity and exists in alluvial and porous rock aquifers. Highly productive groundwater is defined by the AIP based on the following criteria:

- has total dissolved solids of less than 1500 milligrams per litre
- contains water supply works that can yield water at a rate greater than 5 litres per second.

Where an aquifer fails to meet these criteria, it is classified as less productive.

Groundwater in shallow alluvial aquifers generally flows in a similar direction to the surface water through sediments consisting of gravel, sand, silt or clay. Flow of groundwater in porous rock aquifers is directed by voids within the rock and rock joints.

18.2.3 Conceptual groundwater model

To help understand the groundwater environment during and after construction of the project, a conceptual groundwater model was developed as described in Table 18.2 and shown on Figure 18.3. A conceptual groundwater model incorporates the interpretation of the geological and hydrological conditions. Further detail is provided in *Technical Report 11 – Groundwater impact assessment.*

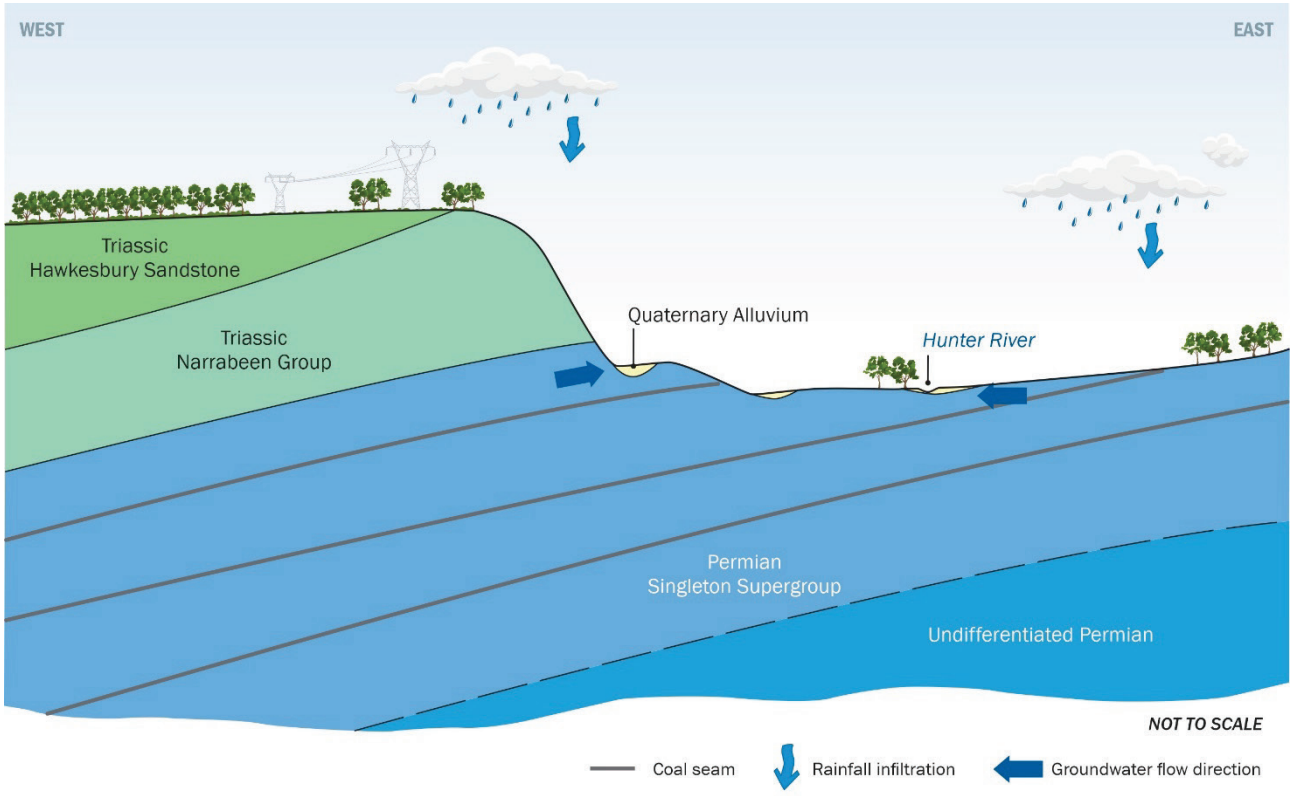


Figure 18-3 Hydrogeological conceptual site model

Table 18.2 HTP conceptual site model

Component	Alluvial groundwater system	Triassic and Permian sedimentary rock groundwater systems
Aquifer description	Unconsolidated alluvial deposits, adjacent to Hunter River and tributaries. Local groundwater system with variable depth and thickness.	Permian and Triassic sedimentary rock, regional systems.
Recharge	• Loss from watercourses • Overland flow and direct rainfall recharge • Upwards vertical discharge from underlying groundwater systems	Predominantly via direct rainfall recharge at outcrop and sub-crop.
Discharge	• Groundwater baseflow contributions to connected watercourses • Landholder abstraction	• Seep/spring discharge • Landholder abstraction • Leakage to overlying alluvium
Hydraulic characteristics	• Hydraulic conductivity: 8×10^{-7} to 8×10^{5} m/d • Average yield: 2.2 L/s	• Hydraulic conductivity: 8×10^{-7} to 8×10^{-3} m/d • Average yield: 1.8 L/s (Triassic) to 2.7 L/s (Permian)

Component	Alluvial groundwater system	Triassic and Permian sedimentary rock groundwater systems
Groundwater levels	• Highly responsive to direct rainfall recharge • Up to 3 m fluctuation due to direct rainfall recharge • Declines during drought conditions	• Declines in response to mine dewatering • Muted, gradual response to rainfall recharge
Groundwater flow	Intergranular primary permeability.	Groundwater is predominantly associated with fracture (secondary) permeability and porosity, with groundwater flow in the Permian also occurring in the rock mass pore spaces.
Groundwater flow directions	• Muted reflection of topography • Largely to the southeast, consistent with the Hunter River	Local groundwater flow towards alluvium/watercourses and regional flow towards the southeast.
Groundwater quality	Marginal to brackish but can be fresh near watercourses.	• Triassic: fresh in recharge areas to marginal brackish in downgradient areas • Permian: brackish to moderately saline, particularly for coal seams
GDEs	Low, medium and high potential GDEs mapped in the high ecological values aquatic ecosystems (HEVAE) dataset predominately associated with the Hunter River and its tributaries.	Minor occurrences of GDEs mapped in the lower lying reaches of the Triassic units.
Landholder bores	Registered landholder bores targeting the alluvial groundwater for stock and domestic purposes.	Registered bores mainly associated with mine compliance monitoring.

18.2.4 Sensitive groundwater receiver

Sensitive groundwater receivers or groundwater users utilise groundwater. These can include registered bores, GDEs, or culturally significant sites. Sensitive groundwater receivers within the groundwater study area are shown in Figure 18.4 and Figure 18.5.

Registered bores

A registered bore is considered a sensitive groundwater receiver as the groundwater resource is important as a water supply source. The number and type of registered groundwater bores within both the groundwater study area and project impact area are presented in Table 18.3.

Based on the *National Groundwater Information System database* (BoM 2022b), accessed in July 2025, there are 232 groundwater bores listed within the groundwater study area described as active, in use, functioning, non-functioning, proposed or unknown (conservatively assumed to be active for the purpose of this groundwater assessment). Of the 232 groundwater bores listed within the groundwater study area, 24 are within the project impact area (including 2 exploration bores listed as abandoned (GW030737 and GW030731)). Groundwater bores within the project impact area are shown on Figure 18.4.

Table 18.3 Registered bores and licence types within the groundwater study area and project impact area

Licence type	Number of bores within the groundwater study area	Number of bores within the project impact area
Commercial and Industrial	3	0
Dewatering	2	1
Exploration	4	2*
Irrigation	30	4
Monitoring	140	15
Stock and Domestic	11	1
Unknown	18	1
Water Supply	24	0
Total	232	24

*listed as abandoned on the National Groundwater Information System database (BoM 2022b)

Groundwater dependent ecosystems

The *Groundwater Dependent Ecosystem Altas* (BoM GDE Atlas) (BoM 2024), and the HEVAE GDE atlas (DEECCW 2024b) indicates that several vegetation formations within the study area have a high or moderate potential to be GDEs.

High potential GDEs include forested wetlands that may rely on surface expression of groundwater, as well as rainforest vegetation likely dependent on subsurface groundwater, located within the Hunter Valley floor environment (near the Hunter River and Wollombi Brook).

Moderate potential GDEs include some areas of wet and dry sclerophyll forests associated located in Watagan State Forest, Jilliby State Conservation Area and Eraring. All remaining vegetation formations are low potential GDEs.

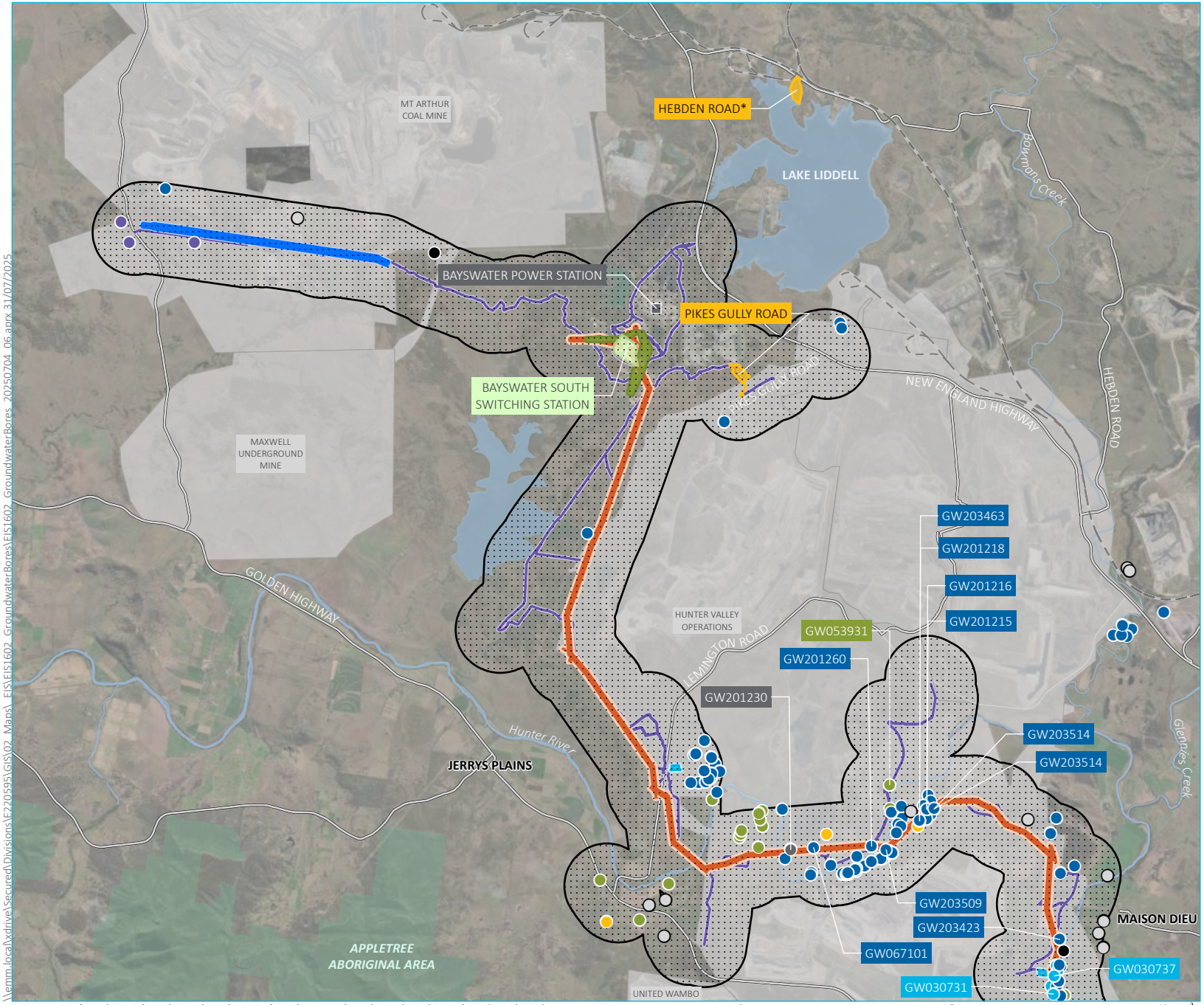
Additional detail regarding GDEs is provided in *Chapter 8 (Biodiversity)* and *Technical Report 1 – Biodiversity development assessment report.*

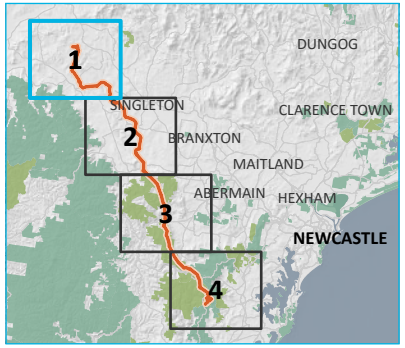
GDEs that form part of the water sharing plans within the groundwater study area are shown on Figure 18.5.

Culturally significant sites

There are no high priority culturally significant sites listed in the schedules of the Hunter Unregulated and Alluvial Water Sources water sharing plan (WSP) and North Coast Fractured and Porous Rock Groundwater Sources WSP.

One groundwater-related culturally significant site was identified within the project area: 'The Wishing Well' listed on the NSW National Parks and Wildlife Service's (NPWS) Historical Heritage Information Management System (HHIMS) site, Osf 26. The Wishing Well is located at a major bend in Martinsville Hill Road at the western end of main gully in Wishing Well Forest Park. Further information is provided in the *Chapter 15 (Historic heritage)* and the *Technical Report 7 – Historic heritage impact statement*.





KEY

- Groundwater study area

Landholder borehole

- Commercial and industrial
- Dewatering
- Exploration
- Irrigation
- Monitoring
- Stock and domestic
- Water supply
- Unknown

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
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining

Registered groundwater bores within the groundwater study area Map 1 of 4

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Figure 18.4

EMM
creating opportunities

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

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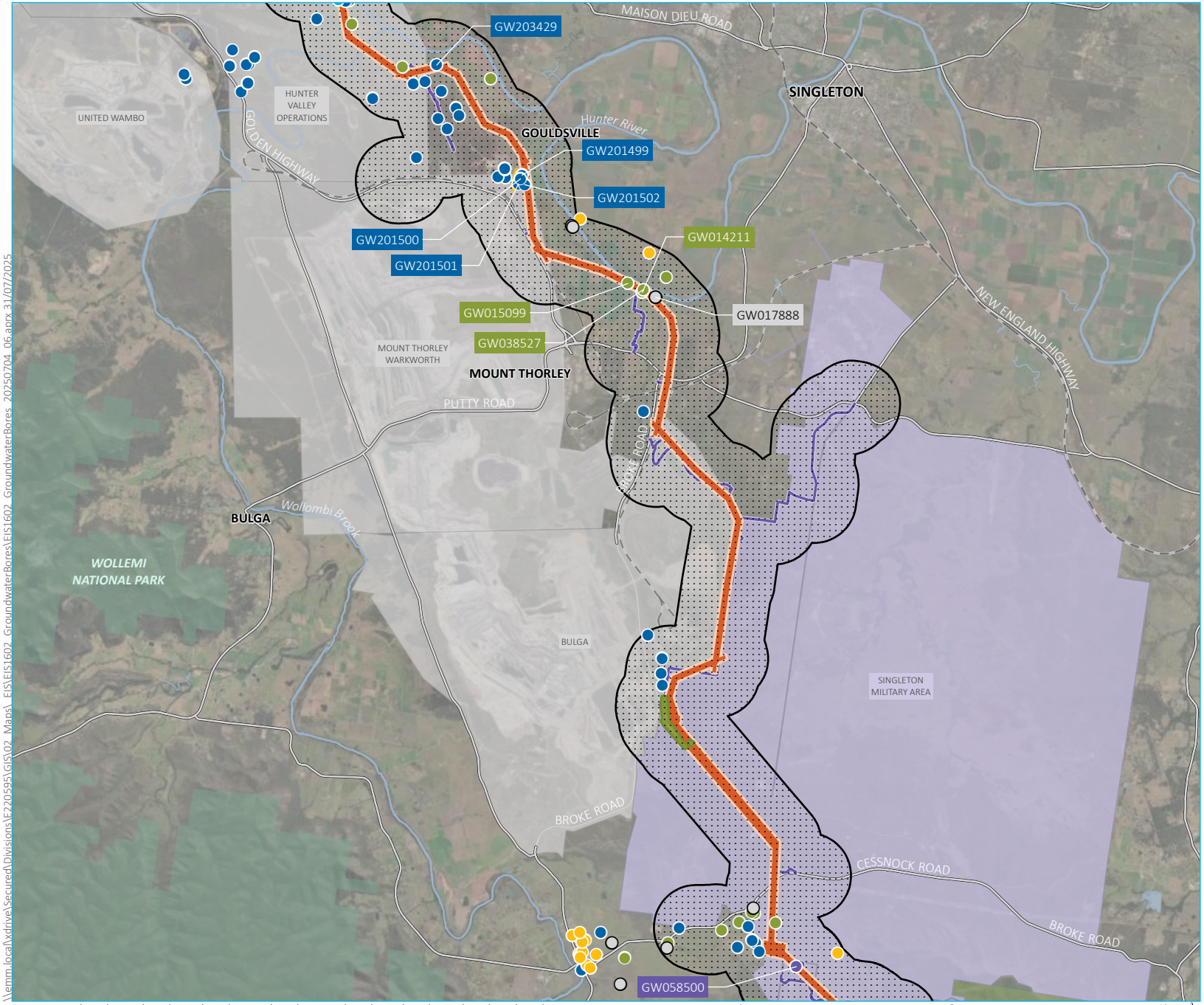

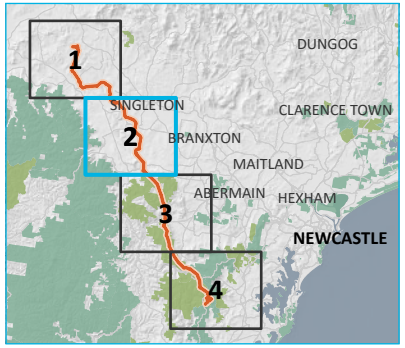

KEY

- Groundwater study area

Landholder borehole

- Exploration
- Irrigation
- Monitoring
- Stock and domestic
- Water supply
- Unknown

Project impact area

- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Adjustment to existing transmission line (line 81)
- Access track

Existing environment

- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

Registered groundwater bores within the groundwater study area
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 18.4

EMM
creating opportunities

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

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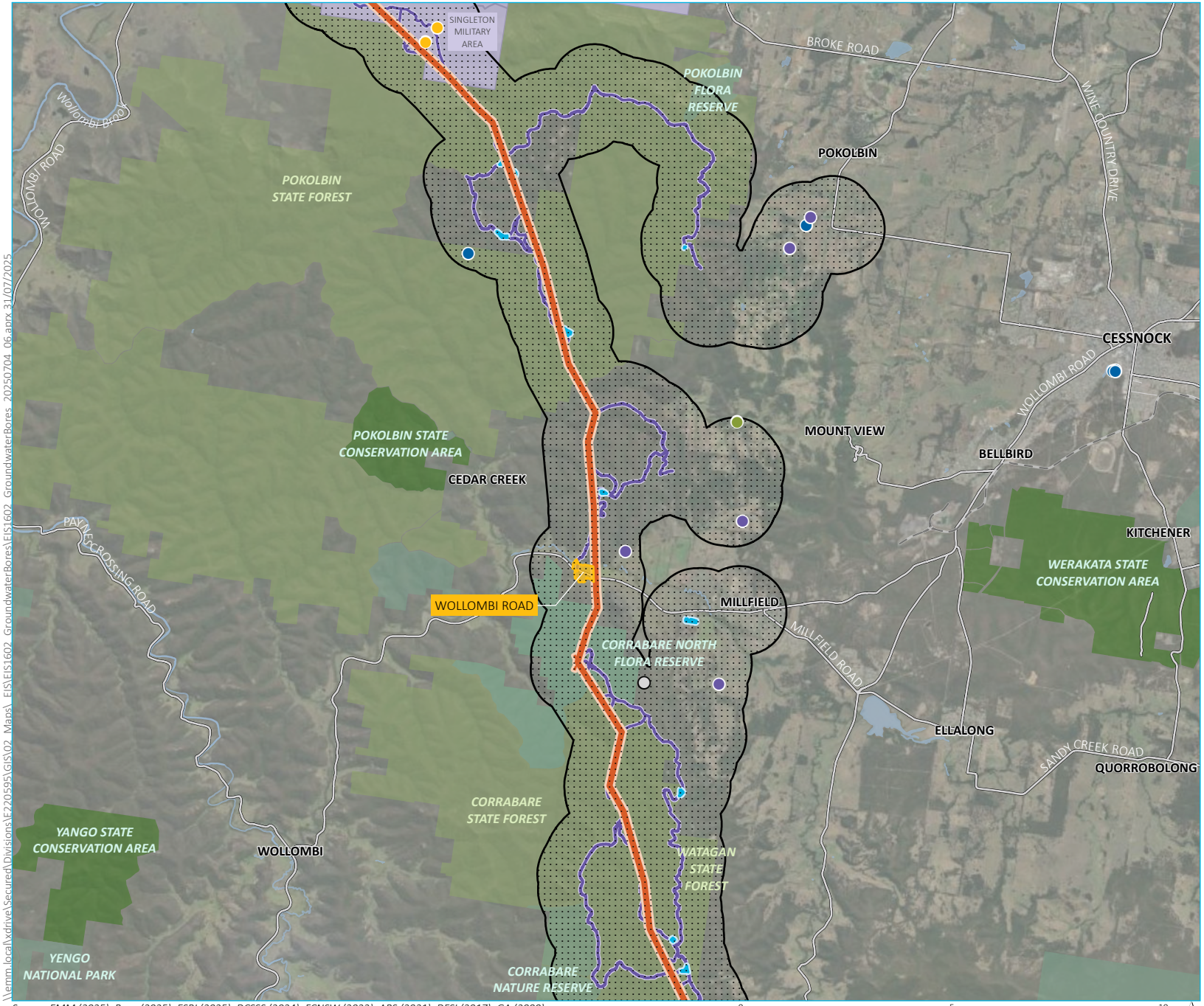

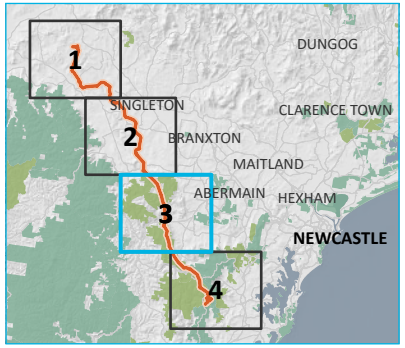

KEY

- Groundwater study area

Landholder borehole

- Irrigation
- Monitoring
- Stock and domestic
- Water supply
- Unknown

Project impact area

- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Laydown area
- Access track

Existing environment

- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence

Registered groundwater bores within the groundwater study area
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 18.4

EMM
creating opportunities

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

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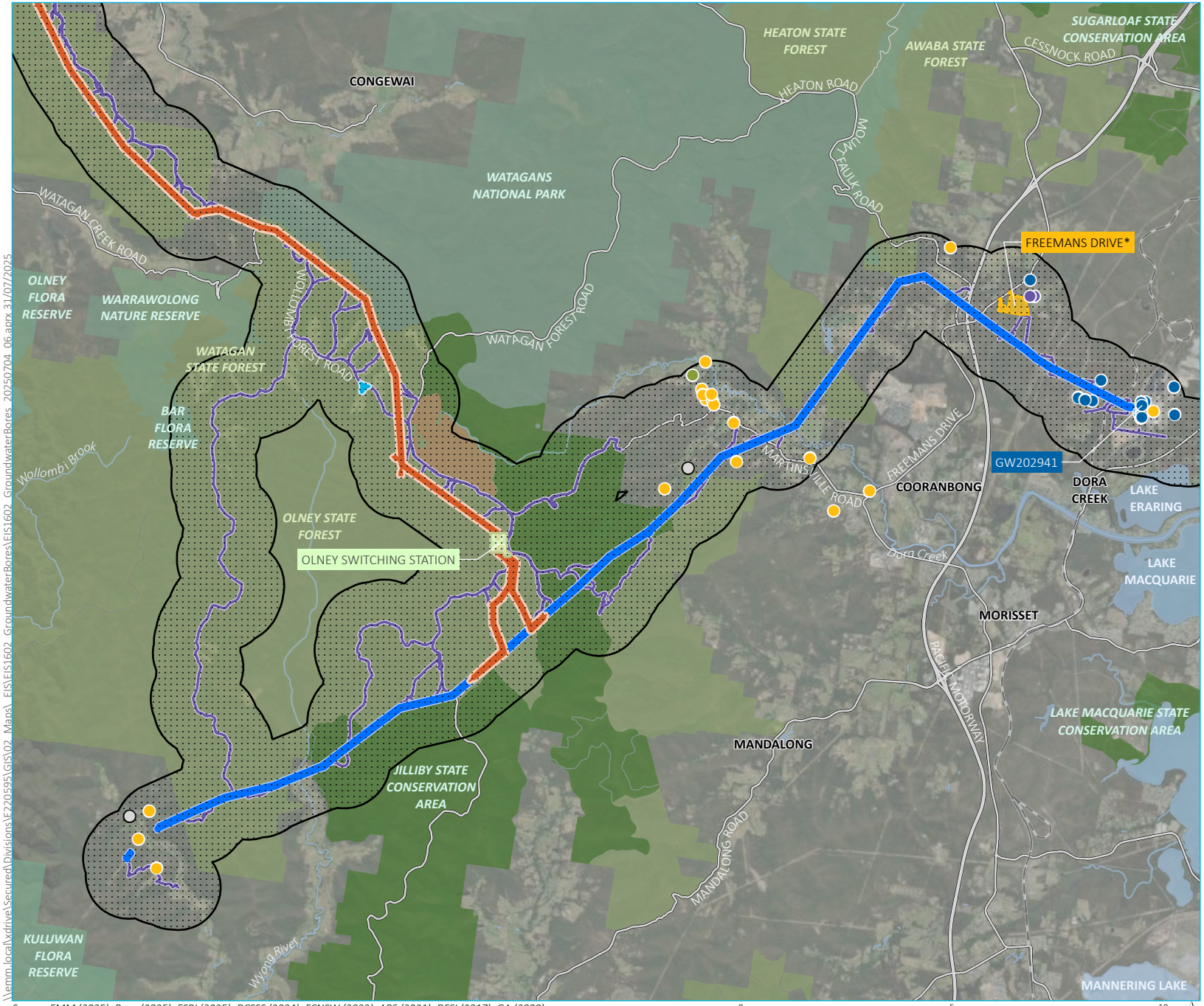

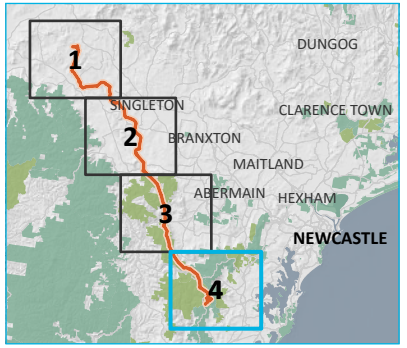

KEY

- Groundwater study area

Landholder borehole

- Irrigation
- Monitoring
- Stock and domestic
- Water supply
- Unknown

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
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Recreation area

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

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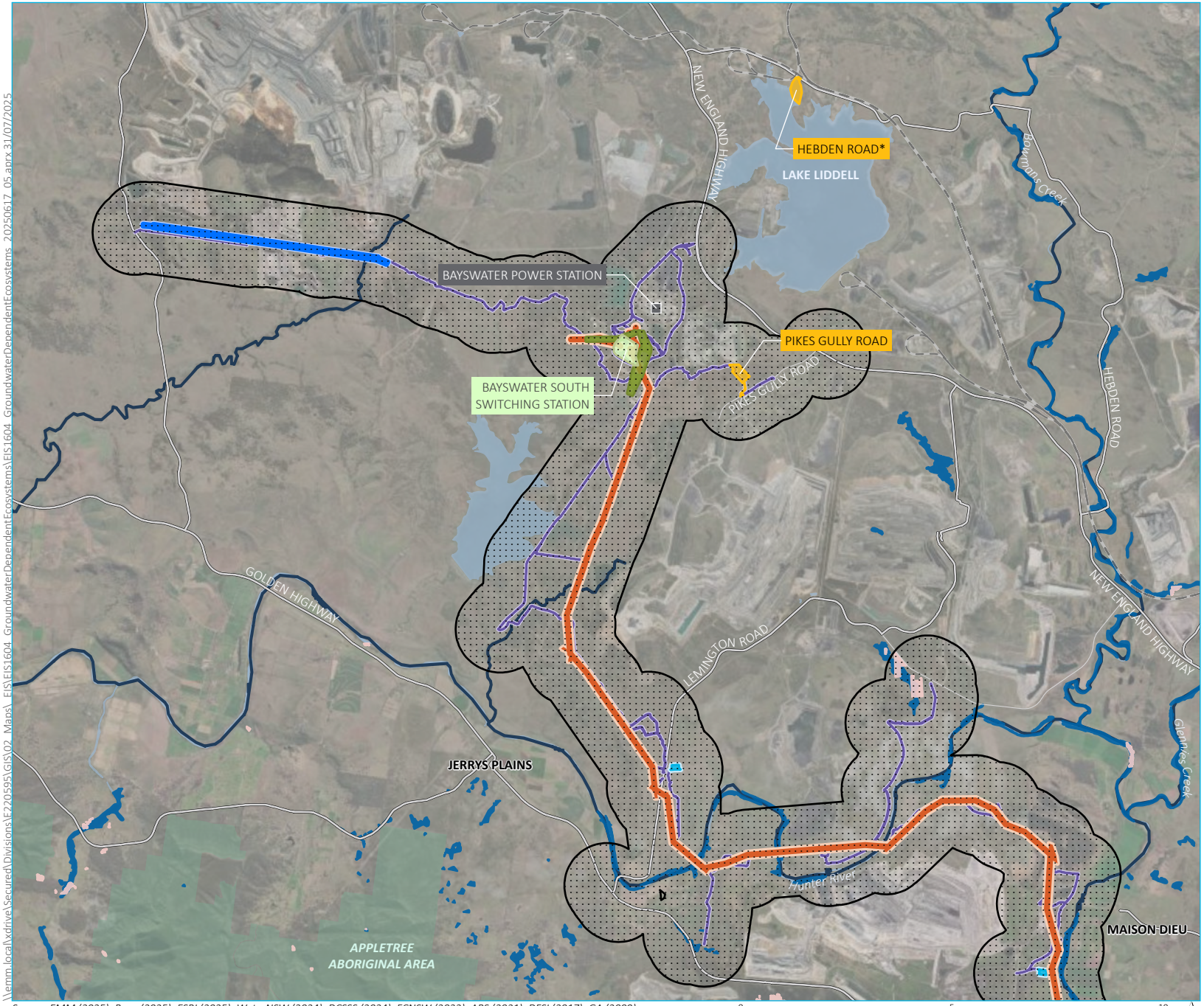
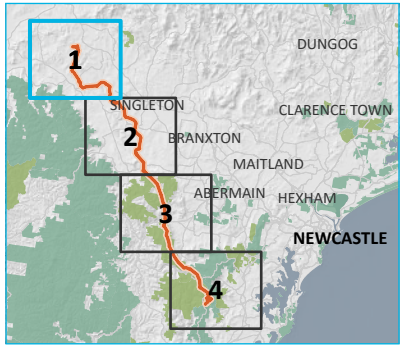
Registered groundwater bores within the groundwater study area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 18.4

EMM
creating opportunities





KEY

- Groundwater study area

Groundwater dependent ecosystem

- High priority HEVAE GDE
- Medium and high potential terrestrial GDE
- Medium and high potential aquatic GDE

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
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve

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

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GDE's within the groundwater study area Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 18.5

EMM creating opportunities

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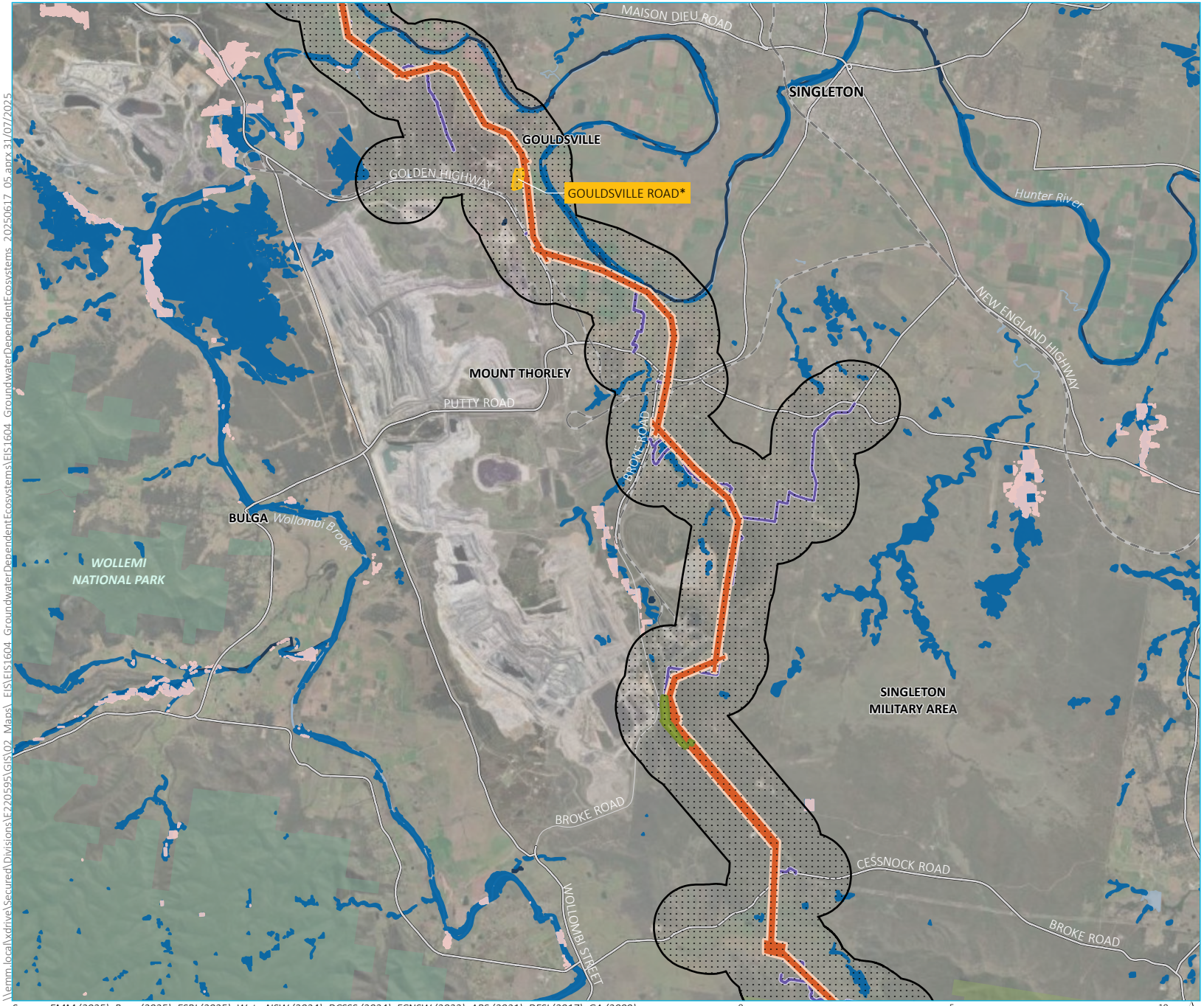

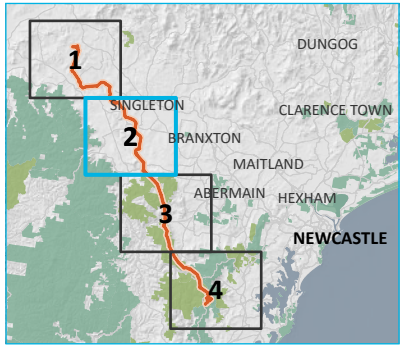

KEY

Groundwater study area

Groundwater dependent ecosystem

- High priority HEVAE GDE
- Medium and high potential terrestrial GDE
- Medium and high potential aquatic GDE

Project impact area

- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Adjustment to existing transmission line (line 81)
- Access track

Existing environment

- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

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

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GDE's within the groundwater study area Map 2 of 4

Hunter Transmission Project
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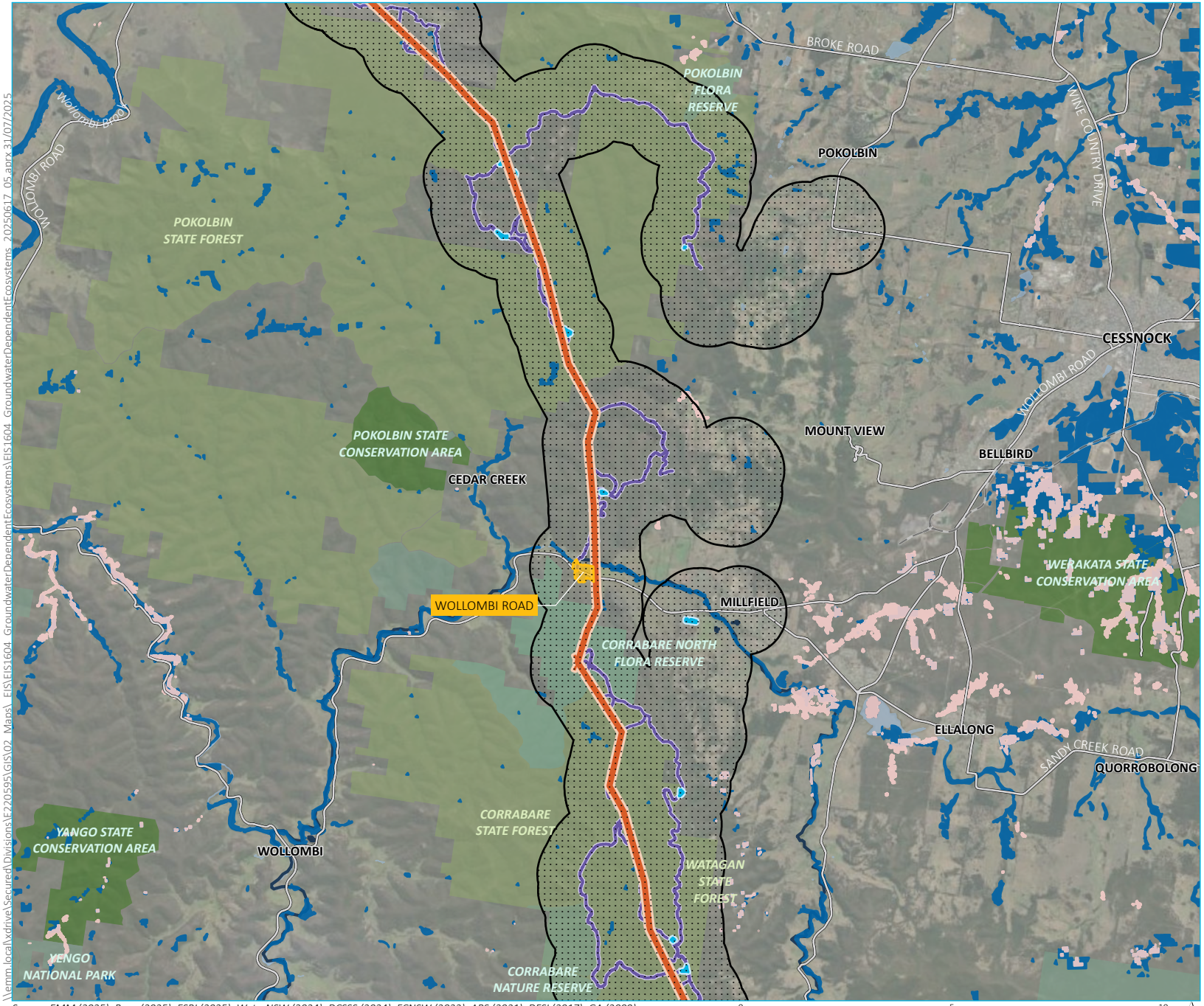
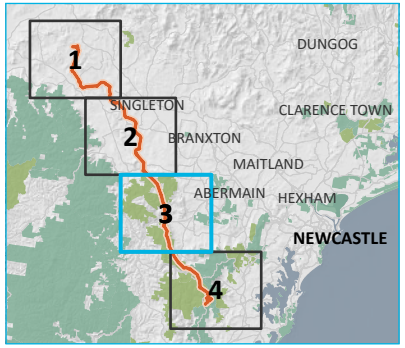
Figure 18.5

EMM
creating opportunities





KEY

- Groundwater study area

Groundwater dependent ecosystem

- High priority HEVAE GDE
- Medium and high potential terrestrial GDE
- Medium and high potential aquatic GDE

Project impact area

- HTP corridor
- Construction support site (*with temporary worker accommodation)
- Laydown area
- Access track

Existing environment

- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest

GDE's within the groundwater study area
Map 3 of 4

Hunter Transmission Project
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Figure 18.5

EMM
creating opportunities

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

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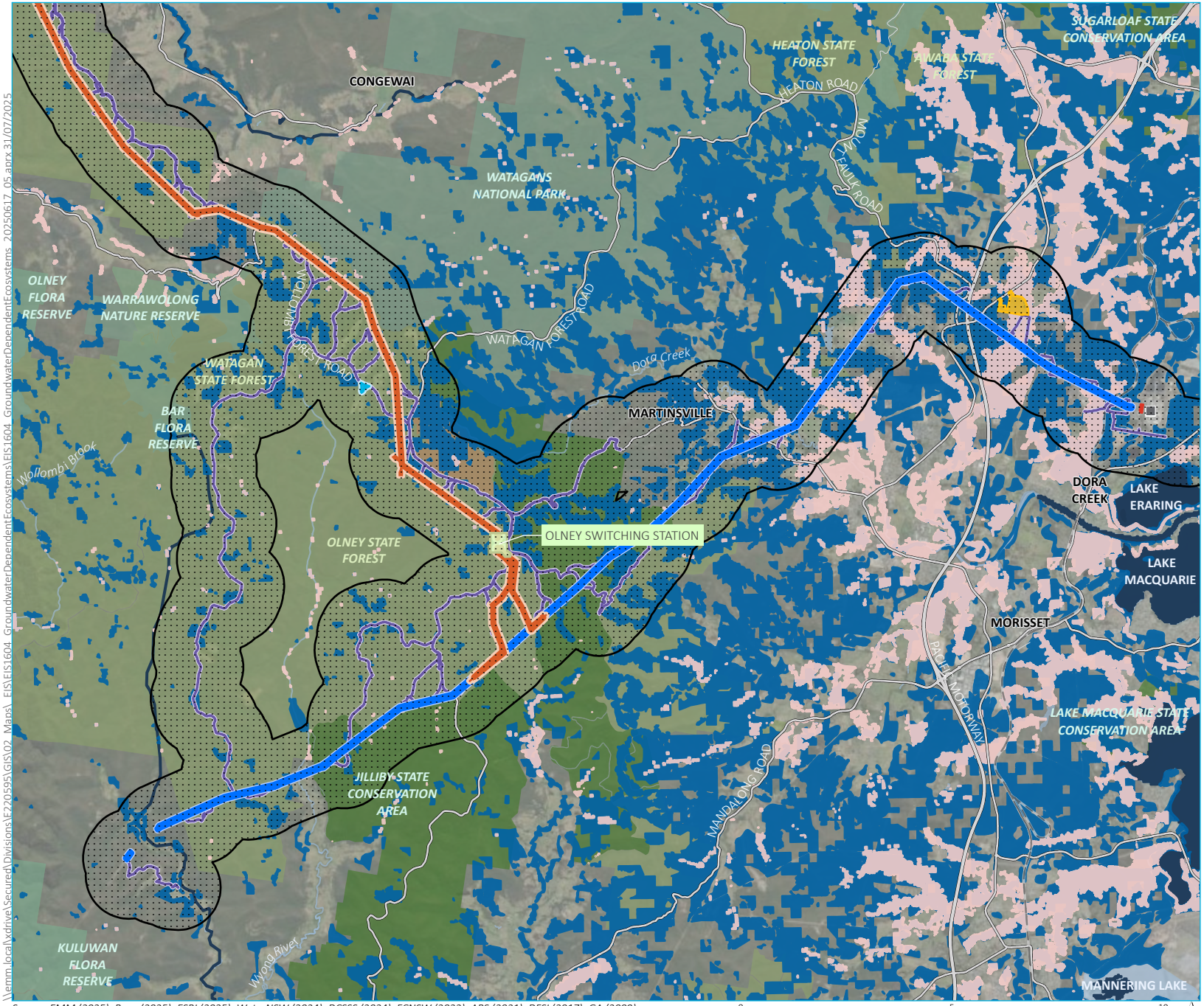

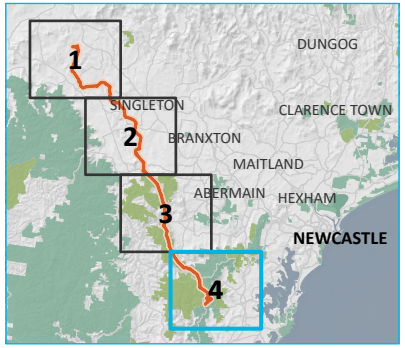

KEY

- Groundwater study area

Groundwater dependent ecosystem

- High priority HEVAE GDE
- Medium and high potential terrestrial GDE
- Medium and high potential aquatic GDE

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
- Railway
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Recreation area

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

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GDA2020 MGA Zone 56

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GDE's within the groundwater study area Map 4 of 4

Hunter Transmission Project
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Figure 18.5

EMM creating opportunities

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18.3 Potential impacts - construction

Potential impacts to groundwater during construction would occur via:

- incidental groundwater take during the construction of the transmission line tower footings at locations that intercept the water table
- changes to groundwater quality, with potential localised changes to groundwater quality from:
  - accidental spills of hazardous materials/chemicals and/or the generation of liquid waste resulting in the contamination of groundwater
  - disturbance of existing contaminated groundwater and/or soils
- reduced, short-term availability of groundwater at existing groundwater bores from the lowering of groundwater caused by construction of the transmission line tower footings
- accidental damage to landowner bores within the project impact area during construction.

Potential risks to the groundwater environment as a result of the construction of the project are presented in Table 18.4.

Table 18.4 Potential risks to the groundwater environment during construction

Risk	Groundwater affecting activity	Consequence	Likelihood
Changes to groundwater quantity	Excavations and dewatering below the water table and where there is localised, incidental interception of groundwater (e.g. tower footings).	Localised, temporary groundwater drawdown	Likely
	Other project excavations below the water table where there may be interception of shallow groundwater, including construction support sites and switching stations.	Localised, temporary groundwater drawdown	Unlikely
	General construction of large hardstand areas or compaction of underlying soils which reduces potential groundwater recharge (i.e. construction support sites, laydown areas, switching stations) and/or vegetation clearing causing a reduction in groundwater recharge.	Reductions in groundwater recharge	Unlikely, given the size of the construction activities relative to the groundwater recharge areas
Changes to groundwater quality	Chemical and fuel spills or leaks at construction sites, along access roads and at laydown areas causing short-term release of contaminants.	Reduction in quality of groundwater	Unlikely
Changes to groundwater flow	Construction of transmission tower foundations or other infilled excavations have the potential to change groundwater flow directions.	Changes to groundwater flow direction	Unlikely

Risk	Groundwater affecting activity	Consequence	Likelihood
Physical disruption or removal of aquifers	Construction of transmission tower foundations or other infilled excavations have the potential to change groundwater flow directions.	Changes to groundwater flow directions	Unlikely

Potential impacts to groundwater systems and groundwater users resulting from the project are presented graphically in Figure 18.6.

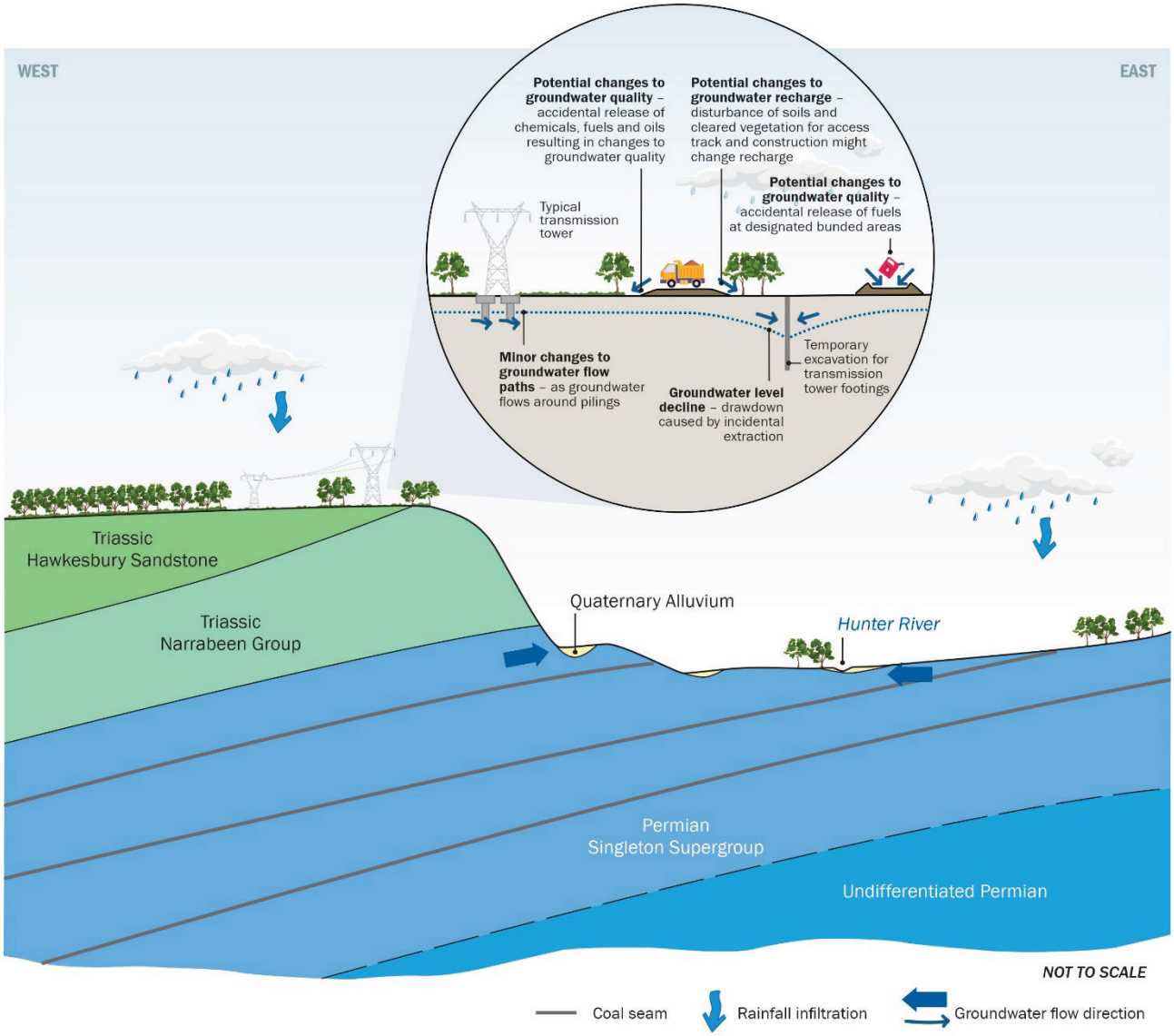


Figure 18-6 Hydrogeological conceptual site model – with construction of the project

18.3.1 Impacts to groundwater quantity

Impacts to groundwater quantity from construction

Potential impacts to groundwater quantity from construction of the project may occur where the depth of piling for transmission line towers is required below the water table resulting in the interception of groundwater and dewatering. Other project related excavations (e.g. construction support sites and/or switching stations) are not expected to intercept groundwater based on the publicly available depths to groundwater.

Groundwater level decline from dewatering could cause less water to be available to groundwater sensitive receivers. Conservative estimations of piling depths for each transmission tower are expected to range between 9.5 metres to 16.5 metres below ground level, depending on ground conditions. Based on these conservative estimates, desktop-based calculations of groundwater inflows have been undertaken for each transmission tower (provided in detail in *Technical Report 11 – Groundwater impact assessment*), for the following 2 scenarios and summarised in Table 18.5:

- the base case, being the average groundwater levels specific to the water source
- the sensitivity case, being the 10th percentile (i.e. shallower) groundwater levels specific to the water source.

Table 18.5 Estimated groundwater inflow volumes for construction of transmission line towers

WSP	Water source	Management zone	Estimated groundwater take (ML)	
			Base case	Sensitivity case
Unregulated and Alluvial WSP	Hunter Regulated River Alluvial Water Source	Downstream Glennies Creek	0.3	0.5
		Upstream Glennies Creek	0.4	0.8
	Lower Wollombi Brook Water Source	N/A	0.1	0.2
Fractured and Porous Rock WSP	Sydney Basin-North Coast Groundwater Source	N/A	0.5	7.0
Total			1.3	8.5

Impacts to groundwater quantity and levels from construction water supply

There is potential to use existing registered groundwater bores for non-potable uses during construction, including dust suppression, landscaping and surface compaction. Any water extracted (taken) from an existing groundwater source, would be undertaken through a private agreement with the licence holder and in accordance with the terms of the existing approval and water access licence (WAL).

Any use of groundwater for construction water supply would be undertaken in line with the existing licensed water take volumes for each groundwater bore. Given no additional water take is proposed,

no additional assessment is required. The licence purpose of any groundwater bore(s) intended for use would be updated to construction water supply through application with DCCEEW Water.

18.3.2 Groundwater drawdown

Groundwater drawdown at registered bores from incidental take

The calculated predicted maximum drawdown spatial extent from the predicted inflows associated with the construction of transmission line structures is:

- around 18 metres in the alluvium (within the Hunter Regulated River Alluvial Water Source and Lower Wollombi Brook Water Source)
- 2 metres in the Permian and Triassic rock units (within the Sydney Basin-North Coast Groundwater Source).

There are 4 existing landholder bores within 16 metres of the closest transmission tower, all located within the alluvium. These landowners are summarised in Table 18.6, and shown on Figure 18.4.

The amount of drawdown is estimated to be minor and in the case of the transmission line structures where they are located in alluvial groundwater systems, the groundwater would recover quickly due to the inherent higher hydraulic conductivity and the very short duration of the incidental take.

Table 18.6 Landowner bores within the potential extent of groundwater drawdown from transmission line construction

Groundwater bore ID	Bore purpose/use	Distance to closest transmission line tower (m)	Groundwater source
GW201230	Dewatering, Hunter Valley Operations (HVO) owned	10	Alluvium
GW201502	Monitoring bore, privately owned	3	Alluvium
GW203429	Monitoring bore, mine (unknown) owned	6	Alluvium
GW201215	Monitoring, HVO owned	16	Alluvium

Groundwater drawdown within groundwater dependent ecosystems

A review of potential drawdown associated with incidental groundwater take during construction indicates there are no drawdown impacts expected at any high priority listed GDEs within the WSPs that intersect the project impact area (see *section 18.2.4* for location of high-priority GDEs relative to the project impact area).

Potential drawdown impacts to terrestrial vegetation are discussed in the *Technical Report 1 - Biodiversity development assessment report*.

Impacts to culturally significant sites

One groundwater-related culturally significant site (the Wishing Well) was identified within the project impact area, located at a major bend in Martinsville Hill Road at the western end of main gully in Wishing Well Forest Park. The site has cultural significance to local stakeholders and historically was a well-used spring (see *Chapter 15 (Historic heritage)*). The project would require the permanently removal of the Wishing Well structure to accommodate access track widening for

construction. Removal of the structure is not expected to impact on the underlying groundwater source.

The assessment of the potential impacts to this item have been considered in *Chapter 15 (Historic heritage)* and *Technical Report 7 - Historic heritage impact statement*.

18.3.3 Changes to groundwater flow paths

Where concrete footings for transmission line structures intercept the groundwater table, small scale changes in flow paths may occur, up to a maximum 2.1 metres, which is the diameter of straight sided and undercut footings. This is not expected to obstruct or alter local and regional groundwater flow paths. The construction and use of ancillary above ground facilities (such as construction support sites, switching stations and laydown areas) would not impact the groundwater systems as they are above the water table.

Furthermore, any potential reductions in recharge from the creation of temporary work accommodation, office buildings and laydown areas would be insignificant given the scale of the regional groundwater systems.

18.3.4 Groundwater quality

Construction could impact groundwater quality as a result of:

- accidental spills of hazardous materials/chemicals and/or the generation of liquid waste resulting in the contamination of groundwater
- disturbance of existing contaminated groundwater and/or soils.

Areas of potential contamination concern within 500 metres of the construction impact area are outlined in *Chapter 20 (Soils and contamination).* Three areas of contamination concern with a medium to high potential contamination risk were identified in the contamination assessment. These include the mining sites, Bayswater Power Station and the Singleton Military Area. Groundwater volumes encountered at the identified areas of contamination concern pose a low risk to the environment as the volumes of groundwater that would potentially be intercepted are low. However, there remains a medium risk of encountering contamination in these areas, should dewatering be required during piling activities.

The Singleton Military Area is also listed in the NSW Environment Protection Authority (EPA) per- and poly-fluoroalkyl substances (PFAS) investigation program. A PFAS Management Area Plan for the Singleton Military Area and the surrounding area has been completed by the Department of Defence. The defined PFAS Management Area is around 3 kilometres to the northeast, and outside of the project impact area. Groundwater flow direction from the PFAS Management Area is inferred to the north northeast, and away from the project impact area. Interaction with areas of PFAS is not expected during construction. Further information on potential contamination at the Singelton Military Area is provided in *Chapter 20 (Soils and contamination).*

Potential adverse impacts on groundwater quality from construction of the project are unlikely to occur due to the nature of the project construction activities. Any impacts would be managed through the implementation of standard procedures near areas of known soil contamination, adequate chemicals and hazardous materials storage, and staff training.

18.3.5 Direct impacts to existing bore infrastructure

There are 24 registered bores, including 2 abandoned bores, within the construction impact area, consisting of a mixture of mine-owned and privately-owned bores. The type and number of bores are summarised in Table 18.3.

An assessment of the potential drawdown at registered bores is provided in *section 18.3.2*.

To minimise the risk of damage to existing groundwater bores from project construction activities (such as vehicle and plant movement and earthworks), existing registered bores within the construction impact area will be clearly demarcated to protect the infrastructure from any accidental damage.

Bore removal is not proposed as part of the project construction.

18.4 Potential impacts – operation

The risk assessment identified 3 potential impacts to groundwater during operation of the project, although considered unlikely, which are summarised in Table 18.7.

Table 18.7 Potential risks to the groundwater environment during operation

Risk	Groundwater affecting activity	Consequence	Likelihood
Changes to groundwater quantity	Use of large hardstand areas (for permanent infrastructure such as switching stations) or compaction of underlying soils which reduces potential groundwater recharge and/or vegetation clearing causing a reduction in groundwater recharge during construction and operation.	Reductions in groundwater recharge	Unlikely
Changes to groundwater quality	Chemical and fuel spills or leaks causing short-term release of contaminants.	Reduction in quality of groundwater	Unlikely
Physical disruption or removal of aquifers	Transmission tower foundations or other infilled excavations have the potential to change groundwater flow directions.	Changes to groundwater flow directions	Unlikely

18.4.1 Impacts to groundwater levels

No ongoing groundwater take is proposed for the project during operation. Therefore, no impacts to groundwater levels and groundwater sensitive receivers are predicted during operation.

18.4.2 Changes to groundwater recharge and flow

The project would include the establishment of permanent infrastructure that would result in changes to surface infiltration, from new switching stations and transmission line structure footings.

The increase in impervious areas due to the permanent infrastructure would result in a negligible decrease in surface infiltration. Infiltration may also increase in areas with reduced vegetation due to maintenance within transmission line easements.

Where concrete piles for transmission line structures intercept groundwater, localised small-scale changes in flow paths may occur. The concrete piles beneath the water table would not obstruct groundwater flow or reduce the available water at sensitive environments, as the piling diameter would be negligible compared to the overall extent of regional groundwater flow. None of the structures within the operation impact area would result in any permanent groundwater take that would alter the groundwater flow in the study area.

18.4.3 Impacts to groundwater quality

Changes to groundwater quality can occur from the accidental release of chemicals used during maintenance activities, such as cleaning solvents, fuel and oils. However, due to the small volumes stored and used in the operation impact area, the potential impact to groundwater from hazardous chemicals would be low.

18.5 AIP – minimum impact considerations

As noted in *section 18.1.1* the AIP and groundwater impact assessment criteria provide a framework to assess groundwater impacts of aquifer interference activities and water supply infrastructure on groundwater resources. They define minimal impact considerations to ensure no more than minimal harm occurs to key water-dependent assets.

An assessment of the potential impacts of the project during construction and operation has been completed having regard to the minimal impact considerations for less and highly productive groundwater sources (for further information see *Technical Report 11 – Groundwater impact assessment).*

Assessment of the project against the AIP and groundwater impact assessment criteria concluded that:

- the potential project groundwater level drawdown is less than the AIP level 1 minimal impact considerations
- there is no drawdown expected at high priority GDEs
- there are no high priority culturally significant sites listed in the relevant WSPs that would require assessment against the AIP minimal impact considerations
- there is not expected to be any change to the existing groundwater quality or beneficial use category.

Therefore, these impacts are assessed as being negligible and acceptable level 1 minimal impacts under the AIP.

Additional groundwater impacts considered as part of this groundwater assessment, but not required to be assessed under the AIP and the groundwater impact assessment criteria, include:

- potential, negligible short-term drawdown at HEVAE and Bureau of Meteorology (BoM) GDE locations
- potential, negligible short-term drawdown at mine monitoring and dewatering bores.

Any accidental damage to private and/or mine-owned bores would be compensated and, in the case of water supply and irrigation bores, further make good provisions may be implemented (see *Chapter 25 (Justification of the project)* for more information).

18.6 Mitigation and management

18.6.1 Environmental management

Mitigation and management measures to avoid or minimise potential impacts to groundwater and groundwater users from the construction and operation of the project are listed in Table 18.8. These mainly focus on the project construction phase and would be included in environmental management plans as part of the HTP environmental management strategy. Specifically, a soil and water management plan will be developed for the project, outlining site specific surface water and groundwater measures to be implemented to prevent potential negative impacts to water resources during the construction and operational phases.

Mitigation and management measures in other technical reports that are relevant to the management of groundwater include:

- *Chapter 17 (Surface water)* and *Technical Report 10 – Surface water impact assessment* – surface water, specifically measures which address surface water quality impacts and captured groundwater from excavations
- Chapter 20 (Soils and contamination), Technical Report 9 - Soils and land impact assessment and Technical Report 13 – Contamination preliminary site investigation – hazards, specifically measures relating to the storage of fuel and oil within the construction impact area and accidental disturbance of contaminated material.

18.6.2 Groundwater licencing

Existing groundwater bores

Should the construction contractor (once appointed) enter negotiations for the temporary use of any existing groundwater bores with the licence holder(s), the authorised use of these existing licenced groundwater bores would be converted to cover the intended use for water supply. The existing water entitlements associated with the respective WALs would be available for use as part of construction water supply, should they become available for use.

While ordinarily a change in the water use purpose would require approval from the NSW Department of Climate Change, Energy, the Environment and Water, the project has been declared State significant infrastructure (SSI) under section 5.12(4) and section 5.13 of the New South Wales

(NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act) by the NSW Minister for Planning and Public Spaces in July 2022. By virtue of the SSI declaration, a water use approval under section 89 of the *NSW Water Management Act 2000* is not required for the project in the event that this water supply option is pursued.

Incidental groundwater take

The project is exempt from requiring a WAL for the incidental water take under the WM Regulation. This includes the inflow of groundwater into transmission tower excavations and any other potential temporary excavations that extend below the water table. The project will be required to record and report the water take as per the WM Regulation; this includes reporting the take within 28 days of each water year finishing.

18.6.3 Mitigation measures

The mitigation measures that would be implemented to avoid or minimise potential impacts to groundwater are listed in Table 18.8.

Table 18.8 Proposed mitigation and management measures – groundwater

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
GW1	Damage and/or removal of existing landholder bores	Bores within the construction impact area will be clearly demarcated to protect the infrastructure from accidental damage. In the instance that accidental damage does occur, make good provisions will apply in accordance with the minimal impact criteria listed in the AIP. This will likely include replacement of a bore in a similar nearby location in consultation with landowners.	Construction	Construction impact area
GW2	Lowering of groundwater levels	All groundwater allocations will be extracted in accordance with the conditions of project approval and where required, associated water access licence(s). Where groundwater is encountered during excavations, any dewatered volumes will be recorded and managed in accordance with the requirements of the WM Act, WM Regulation and project consent conditions.	Construction	In locations of incidental groundwater take

18.7 Summary and conclusion

Within the project impact area there are 3 groundwater systems defined by their host geology and hydrogeological properties. These include the local, shallow groundwater hosted by Unconsolidated Quaternary Alluvium, local to regional groundwater systems associated with the Triassic aged porous sedimentary rock units, and the Permian aged porous sedimentary rock units.

The majority of potential groundwater impacts would take place during construction of the project, including the following possible direct impacts to groundwater:

- incidental groundwater take during the construction of the transmission line tower footings at locations that intercept the water table
- changes to groundwater quality, with potential localised changes to groundwater quality from:
  - accidental spills of hazardous materials/chemicals and/or the generation of liquid waste resulting in the contamination of groundwater
  - disturbance of existing contaminated groundwater and/or soils
- reduced, short-term availability of groundwater at existing groundwater bores from the lowering of groundwater caused by construction of the transmission line footings.

During the operation of the project operation there would be no groundwater take and minimal potential for interaction with groundwater.

Assessment of the project against the AIP and *Groundwater impact assessment criteria* concludes the potential project groundwater level drawdown is less than the AIP level 1 minimal impact considerations. Therefore, these impacts are assessed as being negligible and acceptable level 1 minimal impacts under the AIP and the *Groundwater impact assessment criteria.*

Additional groundwater impacts, not assessed under the AIP include:

- potential, negligible short-term drawdown at HEVAE and BoM GDE locations, discussed further in the *Technical Report 1 - Biodiversity Development Assessment Report*
- potential, negligible short-term drawdown at mine monitoring and dewatering bores.

To minimise the risk of damage to existing groundwater bores from project construction activities (such as vehicle and plant movement and earthworks), existing registered bores within the construction impact area will be clearly demarcated to protect the infrastructure from any accidental damage. In the unlikely event that any accidental damage or physical removal of private and/or mine owned bores occurs, make-good provisions would be applied in accordance with the minimal impact criteria listed in the AIP.

Flooding

19

19 Flooding

This chapter provides a detailed summary of the assessment of potential hydrology and flooding impacts of the Hunter Transmission Project (HTP, the 'project'). The full assessment is provided in *Technical Report 12 – Flood impact assessment*.

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to hydrology and flooding and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance)*.

19.1 Assessment approach

19.1.1 Legislation, policies, plans and guidelines

The assessment considered relevant State legislation, policies and guidelines, including:

- *Australian Rainfall and Runoff (2019) Guideline* (ARR 2019) (Australian Government: Geoscience Australia, 2019)
- *NSW Water Management Act 2000* (WM Act)
- *Floodplain Risk Management Manual* (Department of Planning and Environment, 2023d)
- *Muswellbrook Shire Local Flood Plan* (NSW SES, 2022a)
- *Singleton Local Flood Plan* (NSW SES, 2018)
- *Cessnock LGA Local Flood Emergency Sub Plan* (NSW SES, 2022b)
- *Wyong Shire Local Flood Plan* (NSW SES, 2013) (covering the northern portion of the Central Coast local government area within which the project is located)
- *Lake Macquarie LGA Flood Emergency Sub Plan* (NSW SES, 2022c).

19.1.2 Flood frequency terminology

The frequency of flood events is generally referred to in terms of their annual exceedance probability (AEP) or average recurrence interval (ARI). For example, for a flood magnitude having 5% AEP, there is a 5% probability (or one in 20 chance) that there would be floods of greater magnitude each year. As another example, for a flood having a 20-year ARI, there would be floods of equal or greater magnitude once in 20 years on average.

The assessment of flooding impacts as part of this EIS has been referred to in terms of AEP, for example, a 1% AEP. A summary of the equivalence between the AEP and ARI is provided in Table 19.1.

Table 19.1 Approximate equivalence between AEP and ARI descriptions of flooding

Annual exceedance probability (AEP) (%)	Average recurrence interval (ARI) (years)
0.05	2000
0.1	1000
0.2	500
0.5	200
1	100
5	20
10	10
20	5
50	2
1 EY*	1
2 EY*	0.5

* Floods more frequent than 50% AEP are expressed in terms of the number of exceedances per year (EY).

The assessment of flooding also refers to the probable maximum flood (PMF). The PMF occurs as a result of the probable maximum precipitation (PMP) on the catchments within the study area. The PMP is the result of the optimum combination of the available moisture in the atmosphere and the efficiency of the storm mechanism as regards rainfall production. The PMP is used to estimate PMF discharges using a catchment hydrologic model that simulates the conversion of rainfall to runoff. The PMF is defined as the upper limiting value of floods that could reasonably be expected to occur and defines the extent of flood prone land (i.e. the floodplain).

19.1.3 Assessment methodology

The hydrology and flooding assessment involved:

- a desktop review of publicly available resources to gain an understanding of the existing environment and assessment criteria relevant to the study area
- development of a set of hydraulic and hydrologic flood models of the catchments within the study area to model existing flood behaviour for the 10%, 1%, 0.5%, 0.2%, 0.05% AEP and the PMF
- for construction, a qualitative assessment of flood risks to the project and potential impact on existing flood behaviour during the 1% AEP event. This included impacts to mainstream flooding and localised overland flooding. The 1% AEP event has been adopted for the purpose of the preliminary assessment. The management of flood impacts during the construction of the project will need to consider the period of risk exposure in establishing an appropriate flood standard or operation, a quantitative assessment of the impacts of the Eraring substation extension, Bayswater South switching station and Olney switching station on flood

behaviour for a range of flood events, with AEPs between 10% and 0.2%, and the PMF. For other components of the project, a qualitative assessment was completed

- an assessment of climate change on flood behaviour and risks to the project for sites subject to quantitative assessment. The 0.5% and 0.2% AEP events were adopted as being representative of an increase in rainfall intensity of between 10% and 30% in a 1% AEP event in accordance with the NSW Government's *Floodplain Risk Management Guideline: Practical Considerations of Climate Change* (NSW DECC 2007b)
- identification of mitigation measures for the project to minimise and manage potential impacts.

19.1.4 Study area

The flooding study area consists of the catchments within which the project is located, which can be broadly divided into those draining to the Hunter River in the north, Lake Macquarie in the southeast and the Wyong River in the southwest.

The study area is relevant to the catchments contributing flow to the watercourses that cross the project impact area. However, the assessment of flood behaviour has only been carried out in the vicinity of the project impact area, and not the full extent of the study area.

19.2 Existing environment

The project is located within the Hunter River, Lake Macquarie River and Wyong River catchments. Each catchment comprises a number of sub-catchments, which are described in Table 19.2 and shown in
Figure 17.1 in *Chapter 17 (Surface water).*

Table 19.2 Catchments relevant to the project

Major river system	Catchments	Description
Hunter River	Hunter River	• Several open cut coal mines are to the north and south of the Hunter River in the vicinity of the project impact area and include a network of levees which manage potential risks associated with riverine type flooding • Remainder of the catchment in the vicinity of the project impact area has largely been cleared for agricultural purposes

Major river system	Catchments	Description
	Wollombi Brook (including its tributaries and sub-tributaries Monkey Place Creek, Peach Tree Creek, Potholes Gully, Cedar Creek, Deep Creek, Congewai Creek, Sweetmans Creek, Peach Tree Gully and Watagan Creek)	• Congewai Creek and Wollombi Brook are typically steep-sided and forested • Floodplain of the catchment corresponds to large extents cleared for pastoral use that extends to confluence with Hunter River • Open cut coal mines present in lower parts of the catchment near Warkworth
	Sandy Hollow Creek	• The lower reaches of the catchment have been cleared for pastoral use
	Loder Creek (including its tributaries Doctors Creek and Nine Mile Creek)	• Headwaters in Broke flowing in a northerly direction through Mount Thorley
	Mudies Creek	• Large portion of the catchment cleared for military or agricultural use however sections of remnant bushland remain in upper reaches and along the riparian corridor • Project impact area crosses Mudies Creek within the Singleton Military Area
	Black Creek (including its tributaries and sub-tributaries Pokolbin Creek and Muggyrang Creek)	• Large portion of the catchment has been cleared due to urbanisation near Cessnock and Branxton and agricultural uses; however, remnant bushland remains in upper reaches and along the riparian corridor
	Bayswater Creek (including its tributaries Pikes Creek and Maidswater Creek)	• Contains several online dams, the largest being Lake Lidell which has been constructed on Bayswater Creek • Lower reaches have been significantly modified where it runs through Ravensworth Coal Mine
	Parnells Creek	• Upper reaches of the catchment have been significantly modified where it runs through the Hunter Vally Operations Coal Mine and contains several online dams used for mine-water management
	Saltwater Creek (including its tributary Wisemans Creek)	• Lower reach of the catchment has been significantly modified where it runs through the Ravensworth Coal Mine

Major river system	Catchments	Description
	Saddlers Creek	• Upper reach of the catchment has been significantly modified where it runs through the Mount Arthur Coal Mine and contains several online dams used for mine-water management • A significant portion of the lower reach of the catchment has been cleared for pastoral use but still contains some sections of remnant vegetation along the riparian corridor
Lake Macquarie	Dora Creek (including its tributaries Jigadee Creek, Blarney Creek, Merchants Creek and Felled Timber Creek)	• Upper reaches of the catchment area in its natural forested state • Floodplain of the catchment widens in the vicinity of Martinsville which corresponds to an increase in the extent of clearing for pastoral use • A human-made channel crosses under Dora Creek via a concrete lined tunnel around 2.5 km west of where it flows into Lake Macquarie. The channel draws water from Bonnells Bay that is then pumped to the Eraring Power Station
	Lake Eraring (including its tributary Muddy Lake)	• Lake Eraring and Muddy Lake are tidal lakes joined by the abovementioned channel that join Lake Macquarie north of the mouth of Dora Creek • Upper reaches of the catchment are dominated by native vegetation in the north of the catchment
Tuggerah Lake	Wyong River (including its tributaries Cedar Brush Creek and Jilliby Creek)	• Upper reaches of the catchment are predominantly forested, while cleared pastoral land is present along the floodplain of the Wyong River between Ravensdale and Alison

19.2.1 Existing flood behaviour

The nature of flooding over the project impact area varies significantly based on the prevailing weather conditions. Flash flooding may occur briefly during localised bursts of intense local rainfall. This flooding is typical of the minor drainage lines and tributaries in the upper reaches of the catchments draining to the project impact area. In contrast, widespread storms over the larger catchments like Wollombi Brook and Dora Creek cause slower rising but higher peak flood levels and velocities. Major floods on the Hunter River can lead to prolonged inundation lasting several days.

The largest flood plain crossed by the project impact area is the Hunter River. Based on the hydraulic modelling during a 1% AEP event, the downstream area of the Hunter River experiences widespread flood flow. The flood extent is about 1.1 kilometres wide where it is crossed by the project impact area with depths in the river to a maximum of about 15 metres, increasing to a width

of 1.4 kilometres and depth of 19 metres during the PMF. Backwater flooding from the Hunter River also influences flood behaviour along the sections of the project where it crosses the Wollombi Brook, Sandy Hollow Creek and Loder Creek.

The flood conditions within the sub-catchments of the Hunter River, Lake Macquarie and Tuggerah Lake catchments relevant to this assessment are detailed in Table 19.3. The modelled existing flood conditions are described according to the project elements located within these catchments. The indicative extent and depth of flooding within these sub-catchments in the vicinity of the project are shown in Figure 4.2 to Figure 4.7 in *Technical Report 12 – Flood impact assessment*.

Table 19.3 Modelled existing flood conditions in sub-catchments in study area

Project element	Description of existing flood conditions	Sub-catchment
Hebden Road construction support site and access road upgrade	The eastern fringe of the Hebden Road construction support site floods when water levels in Lake Lidell overtop the spillway on the outlet to the human-made lake. During a 10% AEP event, flood depths along the western fringe of the site would reach up to one metre but would be confined to an asset protection zone (APZ). During a 1% AEP event, flood depths beyond the APZ would reach up to 1.4 m and 0.4 m within the area of the construction support site where a perimeter road is proposed. The access road upgrade area would experience flooding by local catchment runoff from an upslope area to its east.	Hunter River
Pikes Gully Road construction support site and access road upgrade	A local overland flow path runs along the northern and eastern boundaries of the Pikes Gully Road construction support site where flood depths would reach up to 0.4 m during a 10% AEP event, increasing to 0.5 m during a 1% AEP event. The extent of flooding is mainly confined to the APZ with some localised areas in the northern portion of the construction support where a perimeter road is proposed. The access track to the Pikes Gully Road construction support site crosses a tributary of Pikes Creek where flooding depths occur up to 0.7 m and over a width of 25 m during a 10% AEP event, increasing up to 0.8 m depth and a width of about 30 m during a 1% AEP event. The access track would experience flooding by local catchment runoff from an upslope area to its southeast.	Pikes Creek
Gouldsville Road construction support site	The eastern portion of the Gouldsville Road construction support site is impacted by mainstream flooding from the Hunter River during a 1% AEP event and confined to the APZ with flood depths up to 0.5 m. A minor tributary of the Hunter River runs across the southern portion of the Gouldsville Road construction support site where flooding depths occur up to 0.6 m during a 10% AEP event and 0.7 m during a 1% AEP event. The extent of inundation is mainly confined to the asset protection zone that surrounds the construction support site, with the exception of some localised areas in the northern portion of the site that is proposed for a perimeter road where depths of inundation are less than 0.2 m during a 1% AEP event.	Hunter River

Project element	Description of existing flood conditions	Sub-catchment
Wollombi Road A (north of Wollombi Road) construction support site and access road upgrade	The northern portion of the Wollombi Road A construction support site is impacted by mainstream flooding from Congewai Creek during a 10% AEP event but confined to the APZ. During a 1% AEP event, flooding would impact an area of site up to 80 m beyond the APZ with depths up to 3 m. Drainage lines that run through the western portion of the Wollombi Road A construction support site convey overland flows, with flood depths up to 0.4 m during a 10% AEP event, and up to 0.5 m during a 1% AEP event.	Congewai Creek
Wollombi Road B (south of Wollombi Road) construction support site and access road upgrade	Drainage lines that run through the western portion of the Wollombi Road B construction support site convey overland flows, with flood depths typically less than 0.3 m during a 1% AEP event.	Congewai Creek
Freemans Drive construction support site and access road upgrade	The eastern portion of the Freemans Drive construction support site is impacted by flooding from Jigadee Creek during a 10% AEP event but confined to the APZ. During a 1% AEP event, floodwaters originating from Jigadee Creek would impact an area of the site that that extends between 20 m and 100 m to the west of the APZ. Depths of inundation within the site would occur to a maximum of one metre, which would be hazardous to construction personnel and machinery. Drainage lines that run through the southwestern portion of the Freemans Drive construction support site convey overland flows. During a 10% AEP event, the south-western portion of the site would be inundated over width of 180 m and to a maximum depth of 0.2 m, increasing to a width of 200 m and to a maximum depth of 0.3 m during a 1% AEP event. Areas where access road upgrades would be required to access the Freemans Drive construction support site would experience flooding from the local catchment runoff from the upslope area to its southwest.	Jigadee Creek
Old Lemington Road laydown area	The Old Lemington Road laydown area is not impacted by mainstream flooding or major overland flow; however, it is impacted by local catchment runoff from upslope areas to its east with flood depths typically less than 0.1 m during a 1% AEP event.	Hunter River

Project element	Description of existing flood conditions	Sub-catchment
Hayes Road laydown area	The Hayes Road laydown area is not impacted by mainstream flooding or major overland flow; however, drainage lines that run through the western portion of the Hayes Road laydown area convey overland flows. During a 10% AEP event, the western portion of the site would be inundated over a width of 35 m and to a maximum depth of 0.4 m, increasing to a width of 40 m and to a maximum depth of 0.5 m during a 1% AEP event.	Congewai Creek
North Road laydown area	These laydown areas are not impacted by mainstream flooding or major overland flow; however, are impacted by local catchment runoff from upslope areas to the east with flood depths typically less than 0.1 m during a 1% AEP event.	Wollombi Brook
Trig Road laydown area		
Wollombi Road laydown area		
Bayswater South switching station	The project impact area, where it Is located within the Bayswater South switching station is impacted by flow that is conveyed along a tributary of Saltwater Creek in a westerly direction. Flows will pond at the inlet of a culvert located under an existing access track that runs through the western portion of the project impact area, where it Is located within the Bayswater South switching station in depths up to 1.8 m during a 10% AEP event, and 2.5 m during a 1% AEP event. Depths of flow through the work area are typically between 0.2 to 0.5 m during a 10% AEP event and between 0.3 to 0.5 m during a 1% event. Drainage lines that run through the northern portion of the area convey overland flows, with flood depths typically between 0.2 to 0.4 m during a 10% AEP event, and typically between 0.3 to 0.5 m during a 1% AEP event.	Saltwater Creek
Olney switching station	Drainage lines that run in a westerly direction through the project impact area at the Olney switching station site convey overland flows. Widths of flow along the drainage lines typically between 10 and 20 m, and flood depths typically up to 0.2 m during a 10% AEP event, and typically up to 0.8 m during a 1% AEP event.	Lake Macquarie

Project element	Description of existing flood conditions	Sub-catchment
Eraring substation upgrade	Drainage channels that run in a southerly direction through the Eraring substation upgrade site convey major overland flows, with flood depths along the channel in the eastern portion of the Eraring substation upgrade site typically between 0.4 to 0.7 m during a 10% AEP event, and typically between 0.7 to 1.1 m during a 1% AEP event. A catch drain that runs in a southerly direction through the western portion of the Eraring substation upgrade site conveys overland flows from the existing substation, with flood depths up to 0.4 m during a 10% event and 0.5 m up to a 1% event.	Lake Macquarie
Transmission corridor	The northern sections of the transmission line corridor in the vicinity of watercourses experience flooding in 1% AEP event, which are summarised as follows: • depths of about one m where it crosses Wisemans Creek • depths of about 2 m where it crosses Parnells Creek • depths of up to 15 m where it crosses the Hunter River at 3 locations (east of Jerrys Plains) and at Wollombi Brook • depths up to 5 m where it crosses Sandy Hollow Creek upstream of its confluence with Hunter River • depths up to 3 m where it crosses the western bank of the Hunter River • depths between one to 6 m in the vicinity of Loder Creek and Nine Mile Creek (Loder Creek sub-catchment) • depths between one to 2.5 m in the vicinity of Monkey Place Creek. The central sections of the transmission line corridor in the vicinity of watercourses experience flooding in 1% AEP event with depths between 4 to 7 m in the vicinity of Deep Creek, Cedar Creek, Congewai Creek and Sweetmans Creek. The southern sections of the transmission line corridor in the vicinity of watercourses experience flooding in 1% AEP event with depths up to 3 m where it crosses Watagan Creek.	Wisemans Creek, Parnells Creek, Wollombi Brook, Hunter River, Loder Creek
Archerfield Road and laydown area access road upgrade	The access road upgrade work area would experience flooding by local catchment runoff from an upslope area to its northeast.	Hunter River

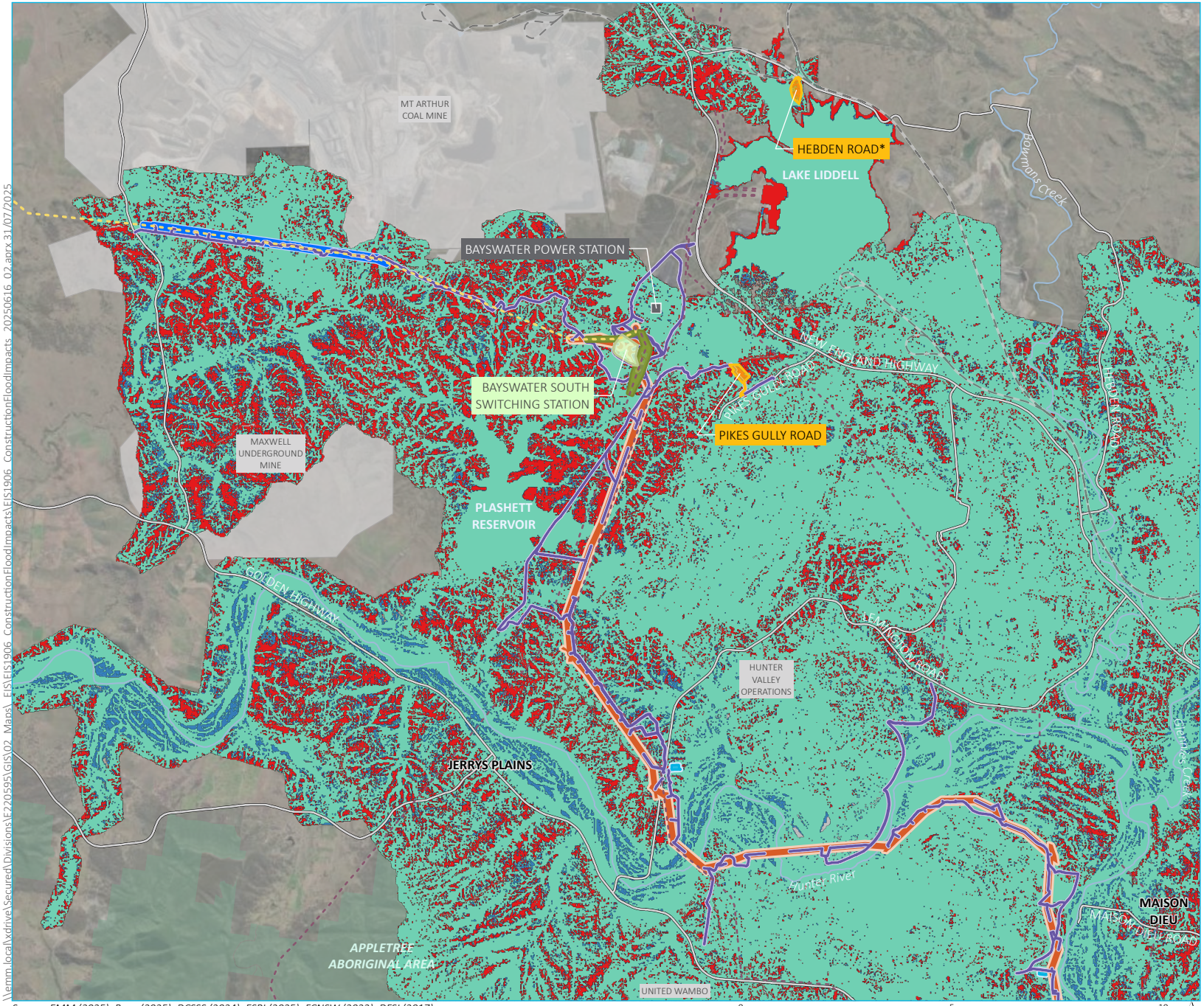
Project element	Description of existing flood conditions	Sub-catchment
Bayswater South transmission line realignment	This section of the transmission line is not impacted by mainstream flooding; however, drainage lines convey overland flows, with flood depths less than 0.2 m during a 1% AEP event.	Saltwater Creek
Singleton Military Area transmission line realignment	The middle portion of the site is impacted by flooding from a tributary of Nine Mile Creek that runs in a northerly direction, with flood depths in a 10% AEP event typically between 0.2 to 0.5 m, and between 0.3 to 0.6 m during a 1% AEP event. Drainage lines that run cross the site to the north and south convey overland flows, with flood depths less than 0.3 m during a 1% AEP event.	Loder Creek

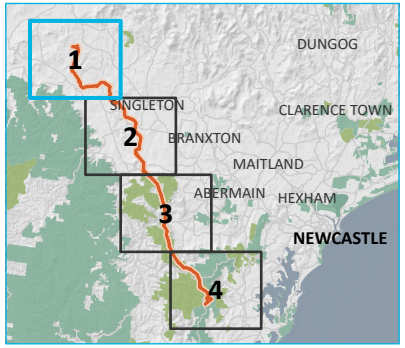
19.3 Potential impacts – construction

Construction activities and associated construction sites on flood-prone land, including earthworks, material storage and stockpiling, workforce accommodation sites and construction support sites, have potential to temporarily affect flooding behaviour. Without the implementation of appropriate management measures, flooding of the construction impact area has potential to:

- detrimentally impact the downstream watercourses through the transport of sediments and construction materials by floodwater
- obstruct the passage of floodwater and overland flow, which in turn could exacerbate flooding conditions in areas outside the construction impact area
- cause damage to the proposed works resulting in project delays and safety risks to the construction workforce.

As outlined in *section 19.2.1,* parts of the construction impact area are subject to flooding under existing conditions and without the project. The extent to which the 10% and 1% AEP flood events would affect each project element across the extent of the construction impact area are shown in Figure 19.1.





KEY

Indicative flood extent
- 10% AEP
- 1% AEP
- PMF

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

Potential flood impacts during construction of the project- 10% AEP and 1% AEP
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 19.1

EMM creating opportunities

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

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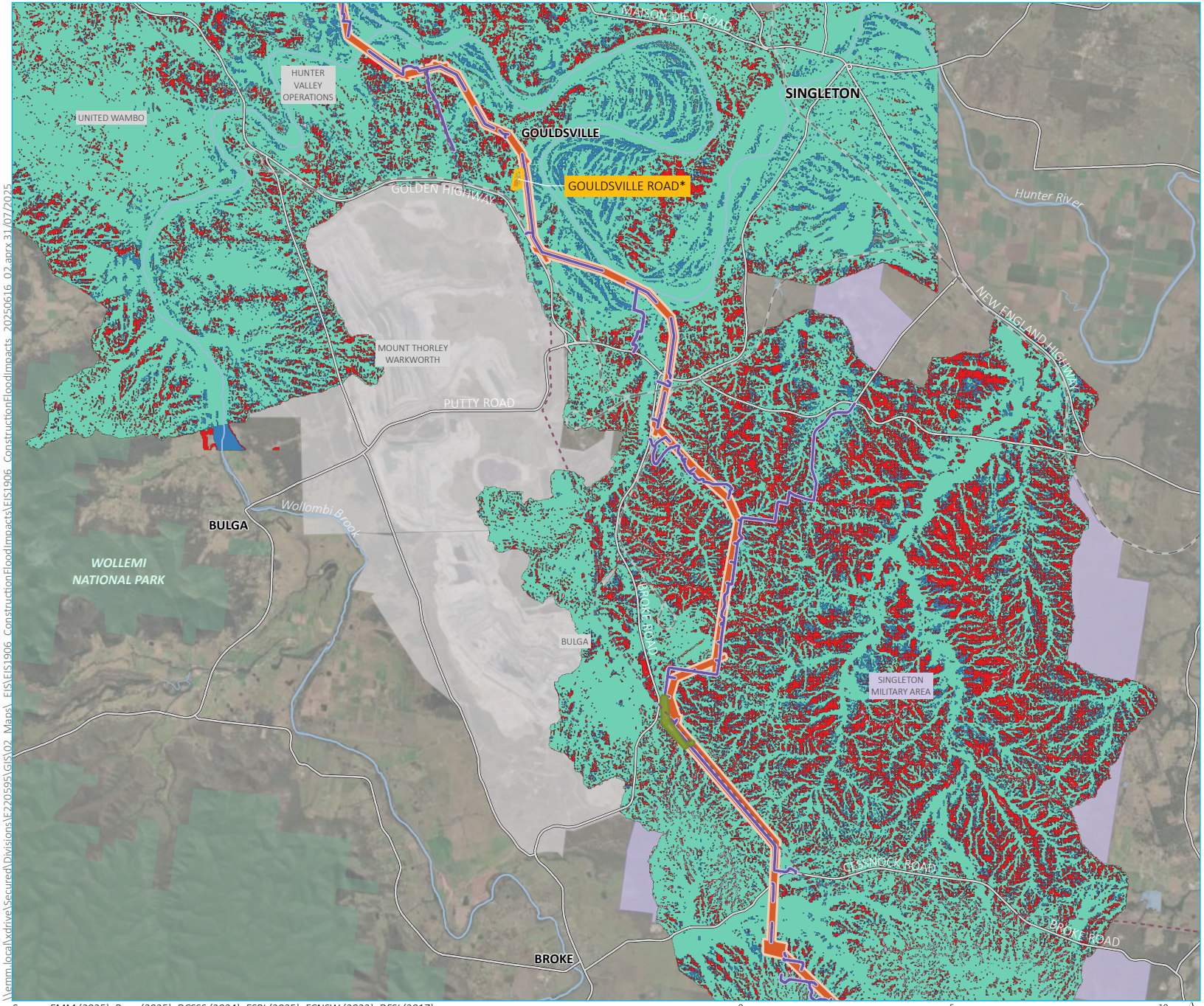

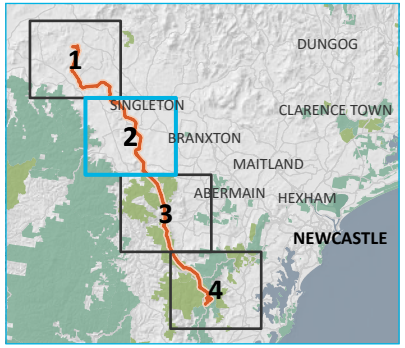

KEY

Indicative flood extent
- 10% AEP
- 1% AEP
- PMF

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

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

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Potential flood impacts during construction of the project- 10% AEP and 1% AEP Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 19.1

EMM
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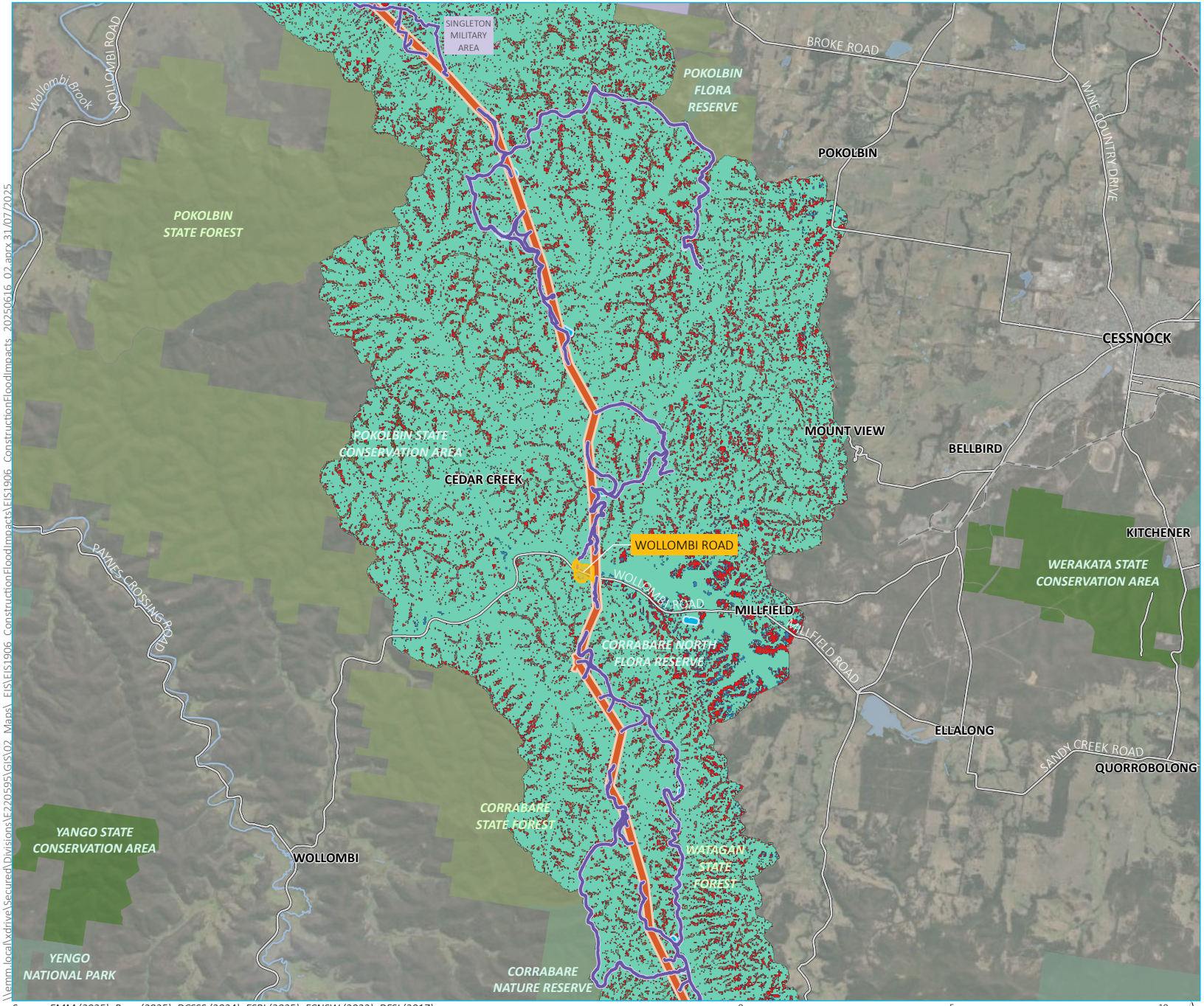

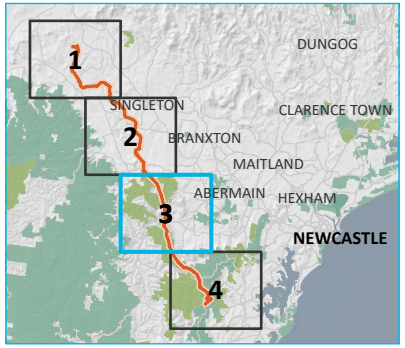

KEY

Indicative flood extent
- 10% AEP
- 1% AEP
- PMF

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

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

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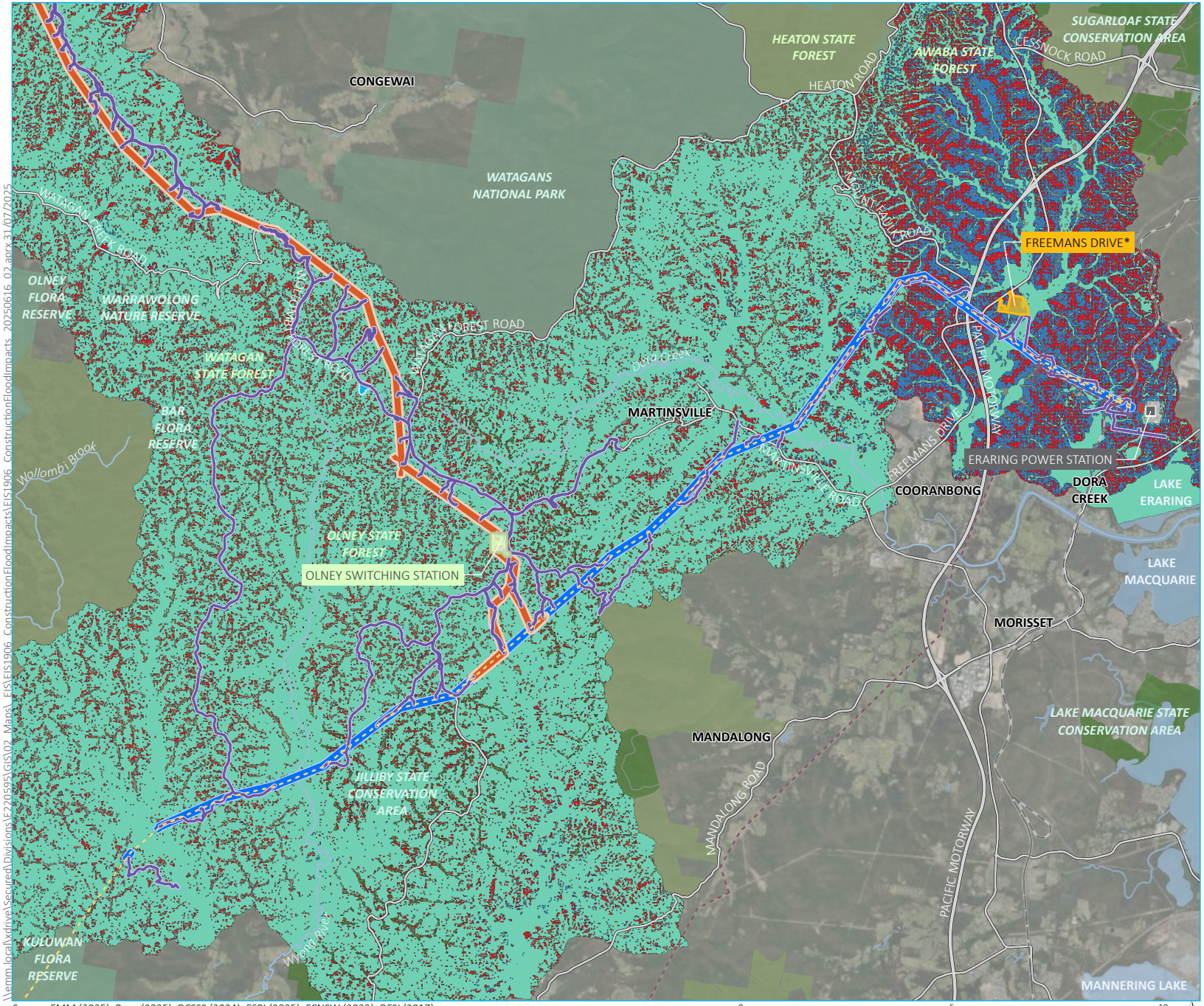
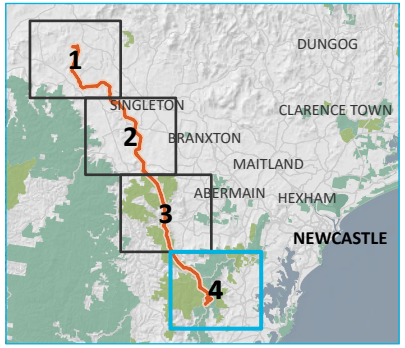
Potential flood impacts during construction of the project- 10% AEP and 1% AEP Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 19.1

EMM
creating opportunities





KEY

Indicative flood extent
- 10% AEP
- 1% AEP
- PMF

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

Potential flood impacts during construction of the project- 10% AEP and 1% AEP
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 19.1

EMM
creating opportunities

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

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19.3.1 Potential impacts on flood behaviour

During construction, the project would generally have a minimal impact on flood behaviour for events up to 1% AEP in intensity. Construction activities that would have an impact on flood behaviour are summarised in Table 19.4.

Table 19.4 Potential impacts on flood behaviour from construction of the project

Project construction element	Description of potential impact on flood behaviour
Construction support sites	During a storm event of 10% AEP or greater: • construction activities within the northern portion of the Wollombi Road construction support site have the potential to obstruct the conveyance of flow in Congewai Creek, while activities across the western portion of the site have the potential to impact on major overland flow due to local catchment runoff • construction activities within the eastern portion of the Freemans Drive construction support site have the potential to obstruct the conveyance of flow in Jigadee Creek, while activities across the southwestern portion of the site have the potential to impact on major overland flow due to local catchment runoff • construction activities within the western portion of the Wollombi Road A and Wollombi Road B construction support site have the potential to impact on local catchment flooding by obstructing and diverting overland flow, leading to a redistribution of flow in surrounding areas.
Laydown areas	Construction activities within the western portion of the Hayes Road laydown area have the potential to obstruct the conveyance of flow in a drainage line that presently runs through the site.
Switching stations and substations	Construction activities within the Bayswater South and Olney switching station and Eraring substation have the potential to impact on local catchment flooding in the various overland flowpaths and drainage lines that they cross.
Transmission corridor	Construction activities along the new and existing transmission line corridors have the potential to obstruct the conveyance of flow in the various creeks, watercourses and local drainage lines that they cross.
Access tracks	The crossing of watercourses by access tracks that would be required to construct the new 500 kV transmission lines or upgrade and realign the existing transmission lines have the potential to obstruct the conveyance of flow, which in turn may impact on the extent and depth of inundation and flow velocities in the watercourses and their overbank areas.

Construction ancillary facilities (including temporary workforce accommodation, workshops and staff facilities) would be located to manage the risk of construction personnel and machinery being exposed to hazardous flooding conditions during floods up to 1% AEP in magnitude based on the flood hazard vulnerability thresholds set out in *Flood Risk Management Guideline FB03 – Flood Hazard* (DPE, 2023). Detailed construction planning would identify how safe evacuation routes are provided for the workforce during a flood event.

Mitigation measures proposed to manage the risk of flooding to construction activities and facilities are outlined in *section 19.5*. Further investigation would need to be undertaken during continued design development and detailed construction planning, as layouts and staging diagrams are further developed.

19.4 Potential impacts – operation

Sections of the transmission line easement and access tracks would be inundated by mainstream flooding or overland flow paths during operation. Where transmission line towers are within flood-affected areas, the footings and legs of the structures would obstruct floodwater and potentially lead to an increase in the depth and velocity of floodwaters. The design of transmission line towers would consider flood conditions within detailed design and seek to avoid or minimise any adverse impacts in flood-affected areas.

Any change in the depth and velocity of flood flows is likely to be confined to a relatively localised area around the footings and tower legs of each tower. Scour protection measures would be incorporated into the design of the transmission line towers where required, to manage localised increases in flow velocities and scour potential. Permanent access tracks would also be designed with appropriate drainage control measures to manage runoff and scour potential.

During operation, the new switching stations would have potential to impact flooding and overland flows due to:

- increases in the rate and volume of runoff due to the increase in impervious areas
- displacement of floodwater that currently ponds at the inlet to the culvert that runs under the access track at the Bayswater south switching station
- redistribution of flows as a result of diversion channels and culverts that are proposed to control runoff and to manage the impact of flooding on electrical infrastructure during a 0.5% (or greater) AEP event (at Bayswater South and Olney switching stations)
- obstruction of flows that are presently conveyed through the site of the proposed Eraring substation extension, which in turn has potential to increase flood levels upstream and/or alter existing flooding patterns in the receiving drainage line.

The changes to overland flows have the potential to result in an increase in peak flood levels, peak velocities and/or an increase in the duration or extent of flooding at the substation and switching stations. Changes at these sites are discussed further in the following sections.

Overall, the operation of the project is expected to have only a minor and localised impact on peak flood levels and flow velocities during the 1% AEP flood events, as well as the PMF. As a result, the project:

- is not expected to have a significant impact on the extent of the flood planning area, as defined in the applicable Local Environmental Plans (LEPs)
- would not increase the overall flood hazard for existing developments for events up to the 1% AEP

- would not have an adverse impact on NSW State Emergency Services' emergency response arrangements as set out in the local flood plans for each local government area (LGA).

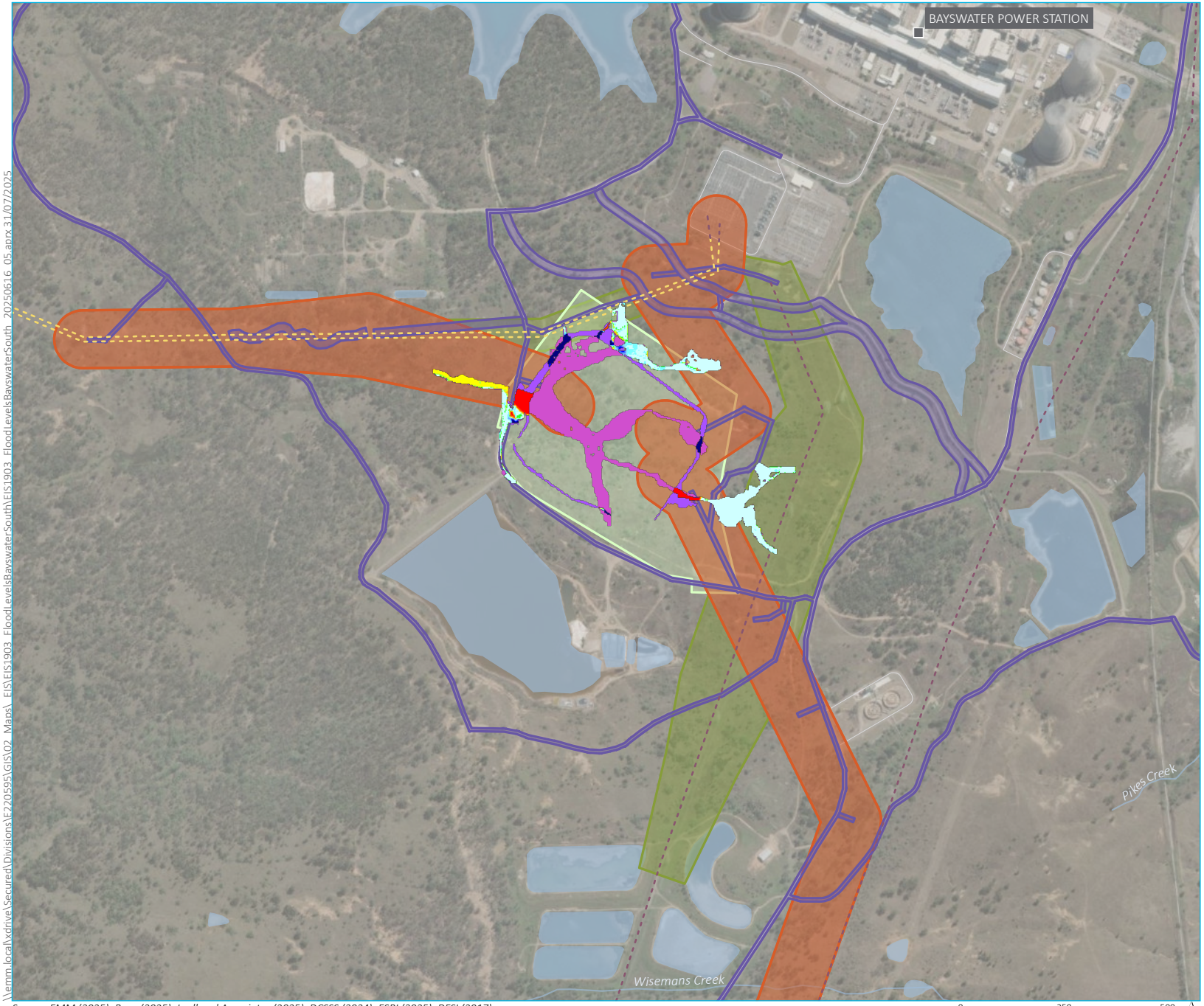
19.4.1 Bayswater South switching station

Changes in flood levels at the proposed Bayswater South switching station during the 1% AEP and PMF events are summarised in Table 19.5. The change in peak flood levels during the 1% AEP event is depicted in Figure 19.2.

Table 19.5 Changes in flood behaviour at Bayswater South switching station

Flooding feature	Change in flood behaviour
Peak flood levels	During the 1% AEP event, flood levels would increase at the inlet to the culvert that runs under the access track to the west (downstream) of the site by up to 0.9 m. The resulting flood levels would still be about one m below the level of the access road. During the 10% AEP event, there would be an increase in the flooding depth along the drainage line to the west of the access track by up to 0.11 m on an existing depth of 0.6 m. During the 1% AEP event, there would be an increase in the flooding depth along the drainage line by up to 0.10 m on an existing depth of 0.7 m. The increase is flooding depth would not impact on any structures or lead to a significant increase in the flooding extent. During the PMF, peak flood levels would increase along the access by up to 0.03 m, on an existing peak flood level of 0.8 m. There would also be an increase in peak flood levels along the drainage line to the west of the access track by up to 0.06 m on an existing depth of more than one m. These increases in PMF levels are minor.
Peak flow velocities	Increases in peak flow velocities in the receiving drainage lines downstream of the switching station and next to the access track would be increased by 20% over a relatively localised area during a 10% AEP event. During a 10% AEP event, peak flow velocities would be increased from 1.1 m per second to 1.3 m per second, while during a 1% AEP design storm peak flow velocities would be increased from 1.2 m per second to 1.4 m per second. These increases have potential to increase scour along the drainage line. Opportunities to reduce these changes would be considered during detailed design.

Flooding feature	Change in flood behaviour
Duration and extent of inundation	There would be a localised increase in the extent of inundation along the drainage line that runs to the west (downstream) of the switching station and next to access track. Changes in the duration of inundation along the drainage line would be less than one hour for AEPs of 10% and 1% AEP events. Changes in the duration of inundation along the drainage line would be less than one hour during a 1% AEP design storm. During a 10% AEP design there would be an increase in the duration of inundation along localised sections of the drainage line by a maximum of 1.3 hours on an existing duration of more than 6 hours. The affected areas would be confined to the in-bank area of the drainage line that would experience prolonged inundation during frequent rainfall events under existing conditions. On this basis, the increases in duration of inundation attributable to the project during rarer storm events would not result in an increase in the long-term wetting up of land.



KEY

Afflux (m)

- <-0.50
- -0.50 to-0.40
- -0.40 to-0.30
- -0.30 to-0.20
- -0.20 to-0.10
- -0.10 to-0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Land rendered flood free as a result of change
- Additional area of land flooded as a result of change

Project impact area

- HTP corridor
- Bayswater South switching station
- Adjustment to existing transmission line (lines 31 and 32)
- Access track

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Minor road
- Named watercourse
- Waterbody

Change in flood levels (Bayswater South switching station)- 1% AEP event

Hunter Transmission Project
Environmental Impact Statement
Figure 19.2

Source: EMM (2025); Beca (2025); Lyall and Associates (2025); DCSSS (2024); ESRI (2025); DFSI (2017)

0 250 500 m

GDA2020 MGA Zone 56

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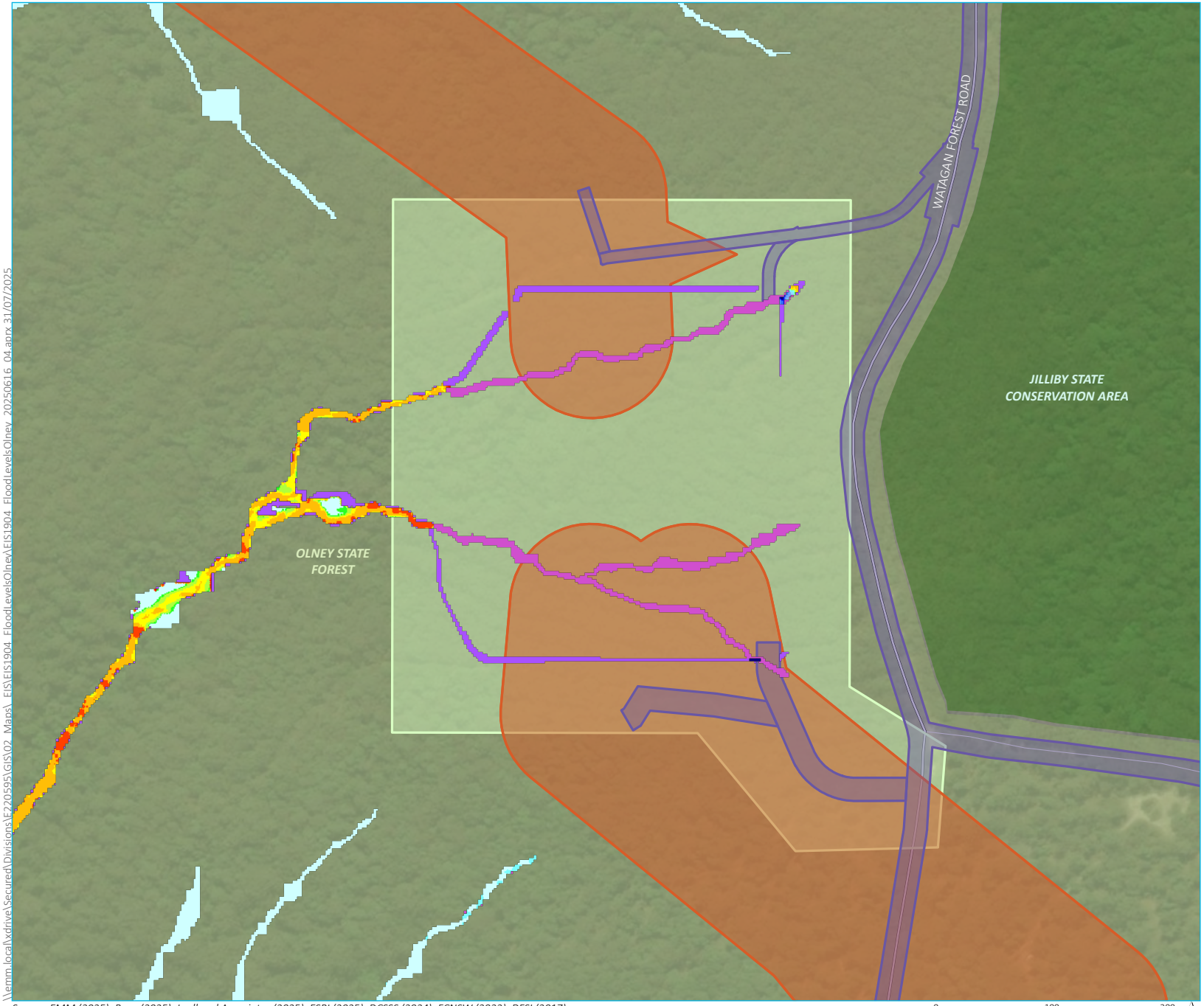
creating opportunities

19.4.2 Olney switching station

Changes in flood levels at the proposed Olney switching station during the 1% AEP and PMF events are summarised in Table 19.6. The change in peak flood levels during the 1% AEP event is depicted in
Figure 19.3.

Table 19.6 Changes in flood behaviour at Olney switching station

Flooding feature	Change in flood behaviour
Peak flood levels	During the 10% AEP event, flood levels would increase at the northern and southern drainage line where they run to the west (downstream) of the switching station by up to 0.19 m on an existing depth of 0.45 m. During a 1% AEP event, the flooding depth would increase by up to 0.25 m on an existing depth of about 0.6 m. During the 1% AEP event, there would be an increase in the flooding depth around 200 m downstream of the switching station by up to 0.1 m on an existing depth of one m. Around one km downstream, flooding depths would be increased by less than 0.03 m on an existing depth of 2 m. While the increases in the depth of inundation that are described above would not impact on any structures, there would be an increase in the flooding extent immediately downstream of the Olney switching station. During the PMF, peak flood levels would increase along the southern drainage line by up to 0.4 m, on an existing peak flood level of 0.2 m, which is considered to be a minor impact.
Peak flow velocities	Increases in peak flow velocities along the northern and southern drainage lines downstream of the switching station would be increased by up to 50% during a 10% AEP event and 35% during a 1% AEP event. During a 10% AEP event, the peak velocities would be more than one metre per second in several locations, occurring up to 2.1 m per second and 2.7 m per second during a 1% AEP event. These increases have potential to increase scour along the drainage line. Opportunities to reduce these changes would be considered during detailed design.
Duration and extent of inundation	There would be a localised increase in the extent of inundation along the southern drainage line that runs to the west (downstream) of the switching station. Changes in the duration of inundation along the drainage line would be less than one hour for AEPs of 10% and 1% AEP events.



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Afflux (m)

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- -0.30 to-0.20
- -0.20 to-0.10
- -0.10 to-0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Land rendered flood free as a result of change
- Additional area of land flooded as a result of change

Project impact area

- HTP corridor
- Olney switching station
- Access track

Existing environment

- Major road
- Minor road
- State conservation area
- State forest

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

0 100 200 m

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Change in flood levels (Olney switching station)- 1% AEP event

Hunter Transmission Project
Environmental Impact Statement
Figure 19.3

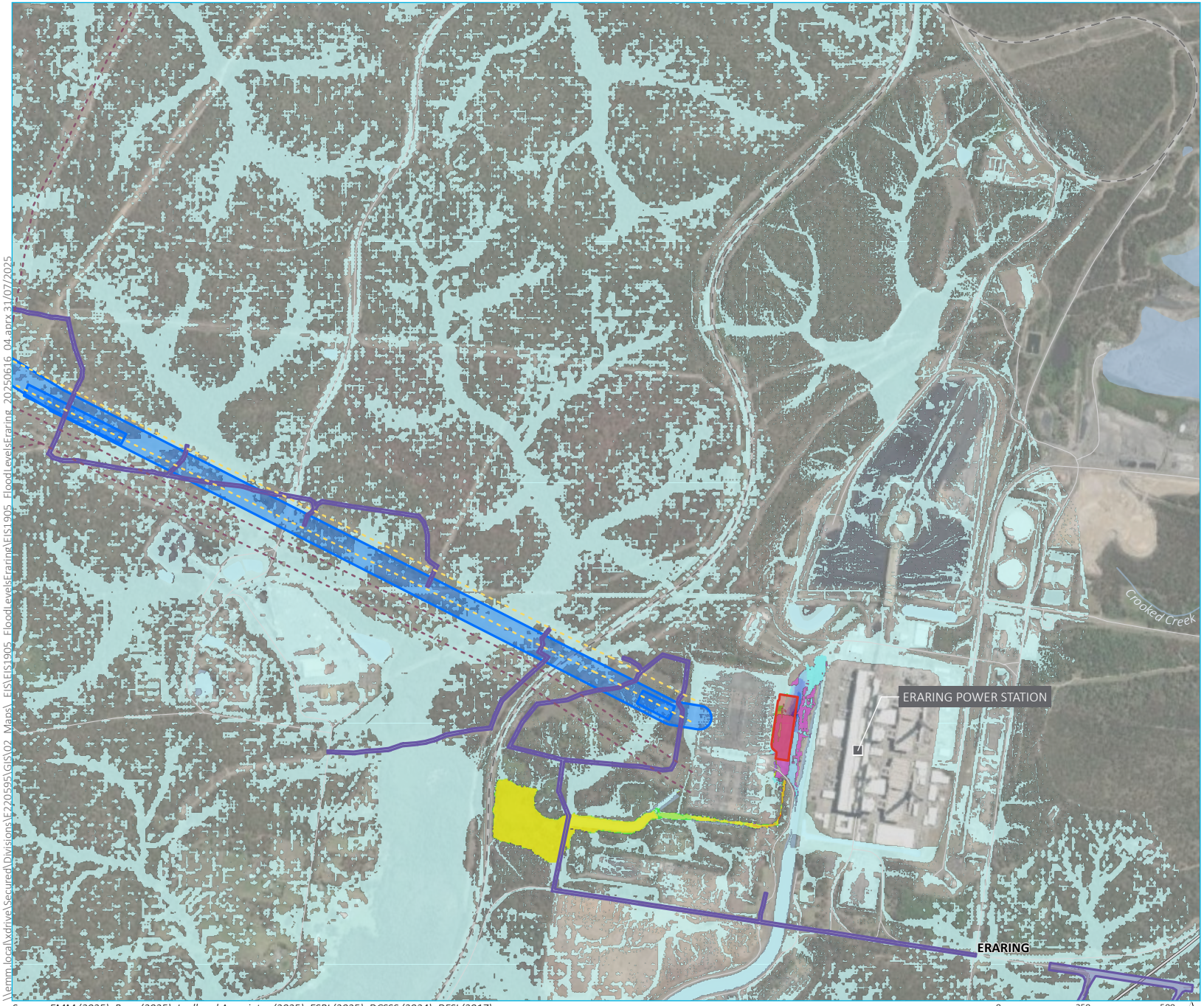
EMM creating opportunities

19.4.3 Eraring substation extension

Changes in flood levels as a result of the upgrade works at the Eraring substation during the 1% AEP and PMF events are summarised in Table 19.7. The change in peak flood levels during the 1% AEP event is depicted in Figure 19.4.

Table 19.7 Changes in flood behaviour at Eraring substation extension

Flooding feature	Change in flood behaviour
Peak flood levels	During storms with AEPs of 10% and 1%, there would be a reduction in the depth of inundation along the section of the eastern overland flowpath where it runs to the north (upstream) of the Eraring substation extension. This can be attributed to the increased efficiency of the culvert that is proposed to run under the eastern portion of the substation extension, which in turn would also lead to an increase in the rate and depth of flow in areas downstream of the Eraring substation extension as outlined below. During the 10% AEP event, flood levels would increase along the section of the eastern overland flowpath where it runs north (upstream) of the substation extension by up to 0.06 m on an existing depth of 0.8 m. During a 1% AEP event, the flooding depth would increase by up to 0.17 m on an existing depth of about 0.9 m. In both AEP events, the depth of inundation would extend downstream to the inlet of the culvert that runs under the Main Northern Railway. During the 1% AEP event, there would be an increase in the flooding depth at the inlet to the culvert under the Main Northern Railway to the west (downstream) of the substation extension by up to 0.06 m, however the post-project flood level would still be about one m below the level of the rail line. During the PMF, peak flood levels would increase along the eastern overland flowpath immediately north (upstream) of the substation extension by up to 0.2 m, on an existing depth of 1.8 m, which is considered minor. Peak flood levels would increase along the eastern overland flowpath immediately next to the Eraring power station by up to 0.15 m, on an existing depth of 1.5 m. During detailed design, all efforts will be made to engage with Origin Energy to confirm the impact that an increase in the depth of inundation could have on the operation of the Eraring Power Station and to inform the scope of mitigation measures that may be required.
Peak flow velocities	Increases in peak flow velocities in areas upstream and downstream of the substation extension would be increased by less than 10% during both 10% and 1% AEP events. The peak velocities would be less than one m per second. On this basis, the substation extension would not have a significant impact on scour potential in the drainage lines and overland flowpaths upstream and downstream of the Eraring substation extension.
Duration and extent of inundation	Changes in the duration of inundation along the eastern overland flowpath where it runs to the south (downstream) of the substation extension would be less than one hour for AEPs of 10% and 1% AEP events.



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Afflux (m)

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- -0.30 to-0.20
- -0.20 to-0.10
- -0.10 to-0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Land rendered floor free as a result of change
- Additional area of land flooded as a result of change

Project impact 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
- Minor road
- Named watercourse
- Waterbody

Change in flood levels (Eraring substation)- 1% AEP event

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Figure 19.4

EMM creating opportunities

Source: EMM (2025); Beca (2025); Lyall and Associates (2025); ESRI (2025); DCSSS (2024); DFSI (2017)

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19.4.4 Transmission corridor

Where possible, transmission towers have been positioned outside of flood prone areas as part of the development of the concept design. Transmission towers, where they are located in areas of high depth and velocity of floodwater pose a risk of damage to the tower and transmission line unless appropriate measures are incorporated into their design. In flood prone areas, a concrete column would be constructed to support each tower leg that would be up to 2.5 metres in diameter and would extend up to 8 metres above the tower footing.

While the legs and footings of the transmission towers have the potential to obstruct floodwater and lead to an increase in the depth and velocity of flow, impacts would occur over a relatively localised area given their relatively small footprint. Scour protection would be provided to manage localised increases in flow velocities around the transmission towers.

19.4.5 Access tracks and road upgrades

An increase in the extent of road pavement associated with the road and intersection upgrades has the potential to obstruct floodwaters and/or alter overland flow patterns, which in turn may impact on the extent, depth and duration of inundation, as well as flow velocities in areas outside the road corridor.

Where the proposed road and intersection upgrades involve changes in existing road levels, a 3-dimensional layout would be developed during detailed design, which would inform the layout of the associated drainage measures that are aimed at controlling external catchment runoff. These measures would include table drains along the upslope side of the road that would discharge to existing and new transverse drainage structures.

These detailed layouts of the proposed road and intersection upgrades would also be used to undertake a detailed assessment of the impact that the proposed works would have on flooding patterns and to identify the scope of additional drainage measures that would be required to manage any resulting adverse impacts due to changes in the depth, velocity and duration of inundation external to the road corridor. These additional drainage measures may include:

- the augmentation of existing transverse drainage structures where required to offset the impact that raising existing road levels would have on obstructing floodwaters and overland flow
- the provision of additional drainage crossings and level spreaders to manage the impact of the proposed road upgrade on a redistribution of flow discharging to downstream areas
- energy dissipation and scour protection to manage localised increases in flow velocities at the outlets to drainage culverts and channels.

The upgraded or new access tracks would generally follow existing ground levels as close as possible so as not to impede the movement of overland flow and floodwaters.

Drainage control measures such as cross banks, level spreaders and lined watercourse crossings would be incorporated into the upgraded or new access tracks to manage runoff and the impact it could have on scour to the tracks and surrounding areas. These drainage control measures would be implemented in accordance with:

- *Guidelines for the Planning, Construction and Maintenance of Tracks* (Department of Land & Water Conservation, 1994)
- *Managing Urban Stormwater: Soils and Construction – Volume 2C Unsealed Roads* (Department of Environment and Climate Change, 2008c).

Access tracks would be lined or stabilised where required to manage scour of the track and the impact this could have on the displacement of sediment into the downstream watercourse.

19.4.6 Impacts under future climate change conditions

Climate change is expected to lead to an increase in flood-producing rainfall intensities, which would increase flood risks to the project due to:

- an increase in flooding risk to the switchyards, transformers, control buildings and associated infrastructure
- an increase in the frequency and extent to which the drainage systems proposed to control runoff from the switching stations would be surcharged
- an increase in flood levels, affecting the requirement of clearance of transmission line conductors
- an increase in the frequency and depth of flooding of access roads and access tracks used to access the substation, switching stations and transmission line infrastructure.

Appendix C of *Technical Report 12 – Flood impact assessment* contains a series of figures that show the indicative extent and depth of inundation in the vicinity of the existing substations and new switching stations for the 0.2% and 0.05% AEP flood events. These events have been selected to represent future climate change conditions (see *section 19.1.3*).

The project would be designed so that the bench level of substation upgrades and new switching stations are located 0.5 metres above the 1% AEP flood level and so that the functioning of substations and new switching stations are not impeded during a 0.5% AEP flood level. This allows for potential increases in peak flood levels due to a range of factors including future climate change.

The project would be designed to ensure that the function of the switching stations, substation extension and transmission infrastructure is not impacted by flooding under future climate change conditions.

19.5 Mitigation and management

19.5.1 Environmental management

Flooding impacts during the construction of the project would be managed in accordance with an environmental management strategy (EMS) with supporting management plans. The EMS and its supporting management plans would set out:

- how the layout of the construction support sites will be designed to manage the risk of construction personnel, facilities and equipment being exposed to hazardous flooding conditions
- procedures to monitor accurate and timely weather data, and disseminate warnings to personnel of impending floods during construction of the project
- procedures for the evacuation of construction personnel working in flood prone areas should a severe weather warning be issued.

19.5.2 Mitigation measures

The mitigation measures that would be implemented to avoid or minimise potential impacts to flooding are listed in Table 19.8.

Table 19.8 Proposed mitigation and management measures – flooding

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
FL1	Risk of flooding to construction support sites	Detailed construction planning would consider flood risk at construction support sites, including: • reviewing construction site layouts and staging construction activities in order to avoid or minimise obstruction of overland flow paths and limiting the extent of flow diversion required • designing the layout of construction ancillary facilities and implementing stormwater management controls during their establishment to manage the impact of flooding on construction personnel, equipment and materials • identifying and applying measures to not worsen flood impacts on the community and on other property and infrastructure during construction up to and including the 1% AEP event where reasonable and feasible. Where warranted by the scale and nature of the proposed works this would include flood modelling and assessment to assess the extent of potential impacts and therefore the scope of mitigation measures that may be required • measures to mitigate alterations to local runoff conditions due to construction activities.	Detailed design Construction	All locations
FL2	Risk of flooding to stockpiles	Spoil stockpiles would be located in areas that are not subject to frequent inundation by floodwater, ideally outside the 10% AEP flood extent. The level of flood risk accepted at stockpile sites would depend on the duration of stockpiling operations, the type of material stored, the nature of the receiving drainage lines and also the extent to which it would impact flooding conditions in adjacent development.	Detailed design Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
FL3	Flood risks during construction	Construction ancillary facilities (including temporary workforce accommodation, workshops and staff facilities) would be located to manage the risk of construction personnel and machinery being exposed to hazardous flooding conditions during floods up to 1% AEP in magnitude based on the flood hazard vulnerability thresholds set out in *Flood Risk Management Guideline FB03 – Flood Hazard* (DPE, 2023d).	Detailed design Construction	All locations
FL4	Flood risks during construction	Flood emergency management measures for construction of the project would be prepared and incorporated into relevant environmental and/or safety management documentation. This would include: • contingency planning for construction ancillary facilities that are located in areas that are inundated by mainstream flooding or major overland flow during a 1% AEP event • for construction facilities located within the floodplain (i.e. within the PMF extent) the identification of how flood related risks to personal safety and damage to construction facilities and equipment will be managed • procedures to monitor accurate and timely weather data and disseminate warnings to construction personnel of impending flood producing rain.	Detailed design Construction	All locations
FL5	Impact on existing flood behaviour	The impact of the project on flood behaviour would be confirmed during detailed design. This would include consideration of future climate change.	Detailed design	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
FL6	Impact on existing flood behaviour	The project would be designed to minimise changes in the frequency, depth, velocity and duration of inundation that would lead to adverse flood related impacts on: • surrounding development for storms up to 1% AEP in intensity • critical infrastructure, vulnerable development or increases in risk to life due to a significant increase in flood hazard for floods up to the PMF.	Detailed design	All locations
FL7	Impact on existing flood behaviour	The substation extension and new switching stations would be designed to manage adverse impacts on the receiving drainage lines as a result of changes in the depth, velocity, extent and duration of flow during storms up to 1% AEP event in intensity.	Detailed design	Substations and switching stations
FL8	Impact on existing flood behaviour	The impact of the Eraring substation extension on flood behaviour at the existing Eraring Power Station would be confirmed during detailed design. Consultation would continue to be carried out with Origin Energy to confirm the effect that any residual flood impacts could have on the operation of the Eraring Power Station for all floods up to the PMF, and to inform the scope of mitigation measures that may be required.	Detailed design	Eraring substation extension
FL9	Impact on existing flood behaviour	The substation and switching stations, including their access road connections to existing roads, would be designed to ensure that the existing level of flood immunity of the road network is maintained and increases in flood depths and hazards along the road network are minimised.	Detailed design	Substations and switching stations
FL10	Impact on existing flood behaviour	Localised increases in flow velocities around transmission line towers, at drainage outlets from the substation and switching stations, and at watercourse crossings along access tracks will be mitigated through the provision of scour protection and energy dissipation measures.	Detailed design	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
FL11	Flooding impacts at transmission corridor	Transmission towers located on the floodplain (i.e. within the PMF extent) will be designed to manage the risk of failure of the transmission line network due to damage from flooding.	Detailed design	HTP corridor
FL12	Flood impacts at access tracks	Drainage control measures would be incorporated into the upgraded access tracks or and new access tracks to manage runoff and the impact it could have on scour to the tracks and surrounding areas. These drainage control measures would be implemented in accordance with the following guidelines: • *Guidelines for the Planning, Construction and Maintenance of Tracks* (Department of Land & Water Conservation, 1994) • *Managing Urban Stormwater: Soils and Construction – Volume 2C Unsealed Roads* (Department of Environment and Climate Change, 2008c). Scour protection would be provided to manage localised increases in flow velocities upstream and downstream of watercourse crossings along the upgraded or new access tracks, while the access tracks would be lined or stabilised where required to manage scour of the track and the impact this could have on the displacement of sediment into the downstream watercourse.	Detailed design Construction	Upgraded or new access tracks

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
FL13	Flood impacts at road and intersection upgrades	Further flood modelling would be undertaken during detailed design to assess the impact that road and intersection upgrades would have on flood behaviour. During detailed design, detailed 3-dimensional layouts of the proposed road and intersection upgrades would be developed, which would be used to inform the layout of the associated drainage measures that are aimed at controlling external catchment runoff. The detailed 3-dimensional layouts of the proposed road and intersection upgrades would also be used to undertake an assessment of the impact that the proposed works would have on flooding patterns and to identify the scope of additional drainage measures that would be required to manage any resulting adverse impacts due to changes in the depth, velocity and duration of inundation external to the road corridor.	Detailed design	Road and intersection upgrades

19.6 Summary and conclusion

The project impact area crosses 3 water catchments, including Hunter River, Lake Macquarie River and Wyong River. Flooding within the project area is influenced by varying weather conditions. Flash flooding typically occurs due to localised, intense rainfall in smaller catchments, while more extensive storms over larger catchments, such as Wollombi Brook and Dora Creek, result in slower, yet more substantial floods with higher peak levels and velocities. The Hunter River floodplain represents the most significant flood area within the project impact area.

Construction activities and associated construction sites on flood-prone land, including earthworks, material storage and stockpiling and construction support sites, have potential to temporarily affect flooding behaviour. During construction, the project would generally have a minimal impact on flood behaviour for events up to 1% AEP in intensity.

Overall, the operation of the project is expected to have only a minor and localised impact on peak flood levels and flow velocities during the 1% AEP flood events, as well as the PMF.

Climate change is expected to lead to an increase in flood-producing rainfall intensities, which would increase flood risks to the project. The project will be designed to ensure that the operation of the substation and switching stations would not be impacted by flooding under future climate change conditions.

The findings of the assessment provide an indication of the potential impacts of construction activities and operation on flood behaviour however further investigation will be undertaken during detailed design. Detailed design will consider flood conditions and seek to avoid or minimise any adverse impacts in -flood affected areas. Flooding impacts during construction would be managed in accordance with an environmental management strategy with supporting management plans which would set out flooding objectives to minimise impacts on watercourses.

Soils and contamination

20

20 Soils and contamination

This chapter provides a summary of the potential impacts associated with soils and contamination during construction and operation of the Hunter Transmission Project (HTP, 'the project') and identifies appropriate mitigation and management measures to be adopted to avoid, minimise and manage these impacts.

This chapter is based on a soils and land impact assessment and contamination impact assessment provided in *Technical Report 9 - Soils and land impact assessment* and *Technical Report 13 – Contamination preliminary site investigation* respectively.

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to soils and contamination, and where in the EIS these have been addressed, are detailed in *Appendix A (Assessment requirements compliance*).

20.1 Assessment approach

20.1.1 Legislation, policies, plans and guidelines

Legislation relevant to the assessment of soil and contamination include:

- *NSW Contaminated Land Management Act 1997* (CLM Act)
- *NSW Protection of the Environment Operations Act 1997* (POEO Act)
- Protection of the Environment Operations (General) Regulation 2021
- Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation)
- Work Health and Safety Regulation 2017
- *State Environmental Planning Policy (Resilience and Hazards) 2021*.

The soil and contamination assessment was prepared with reference to the following policies and guidelines:

- *National Environment Protection (Assessment of Site Contamination) Measure 2013 (National Environment Protection Council* (NEPM) 2013)
- *National Water Quality Management Strategy* (NWQMS) (Australian Government 2018)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018)
- *Acid Sulfate Soil Manual* (ASSMAC 1998)
- *Managing Asbestos in or on Soil guide* (SafeWork NSW 2014)
- *Guidelines for the Assessment, Remediation and Management of Asbestos – Contaminated Sites in Western Australia* (WA Department of Health 2009) – widely accepted as a valuable reference in NSW

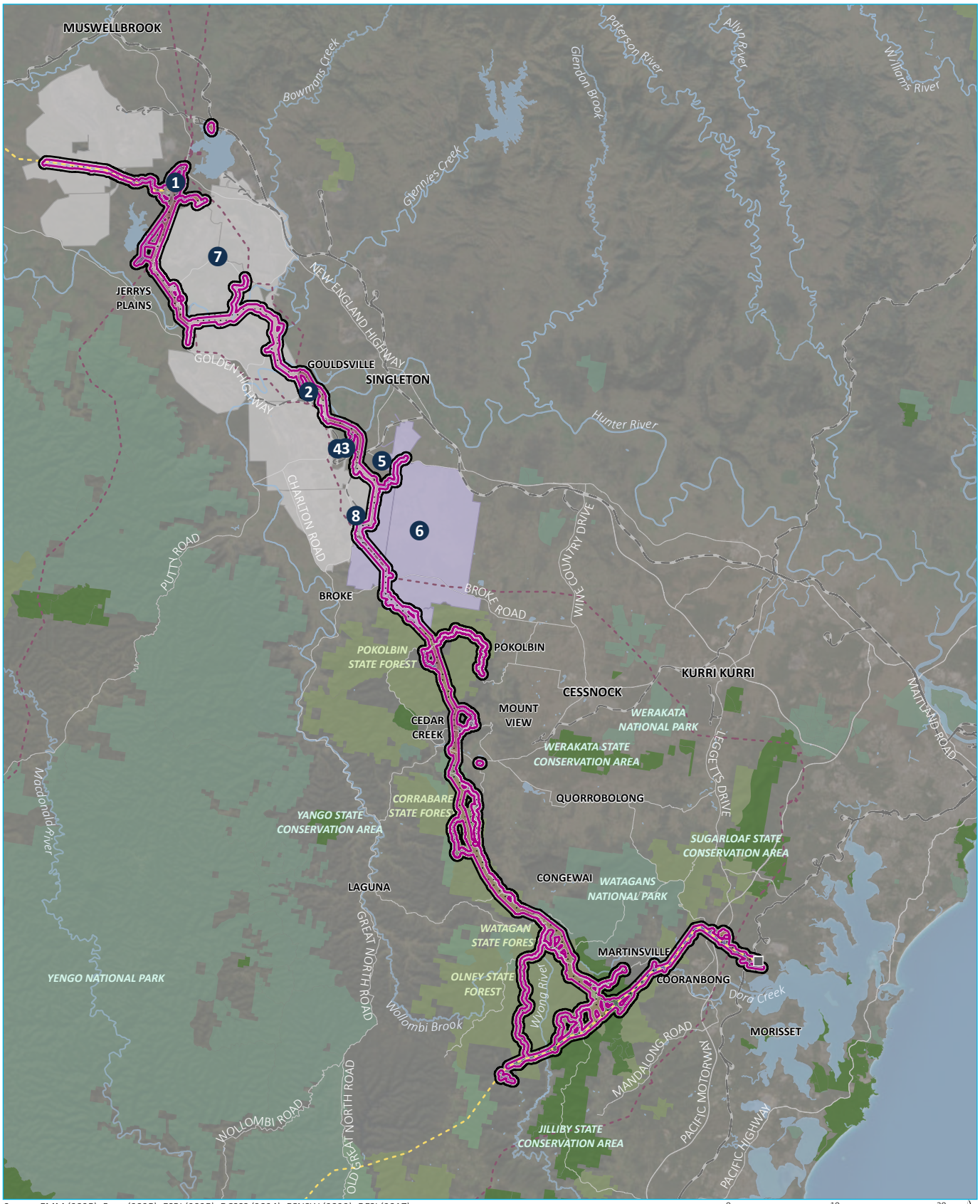
- *Revised Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia* (WA Department of Health 2021) – noting some parts of the 2021 version of the WA Asbestos Guidelines are not wholly consistent with the regulatory framework in NSW.
- *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA 2015)
- *Guidelines for the NSW Site Auditor Scheme* (3rd edition) (EPA 2017b)
- *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom 2004)
- *Per- and Poly-fluorinated Alkyl Substances (PFAS) National Environmental Management Plan 2.0* (Department of Agriculture, Water and the Environment 2020)
- *AS/NZS ISO 31000:2009 Risk management – Principles and guidelines*.

Additional discussion on the legislation and policies relevant to the assessment of soils and contamination are provided in *Technical Report 9 - Soils and land impact assessment* and *Technical Report 13 – Contamination preliminary site investigation*.

20.1.2 Study area

The study area for the assessment of soils and contamination includes:

- the project impact area, for the assessment of potential impacts of the project on soils and land capability
- the project impact area, with a 500-metre buffer for the assessment of potential contamination impacts (contamination study area; see Figure 20.1).



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

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KEY

Site inspection location

ID	Name
1	Bayswater Power Station
2	Dyno Nobel Warkworth
3	Dyno Nobel Mt Thorley
4	Mount Thorley Industrial Estate
5	Mushroom Composters
6	Singleton Military Area
7	Hunter Valley Operation
8	Bulga Coal Mine Deep Pit

Contamination study area

Soil study area

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

Contamination study area and site inspection locations

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Figure 20.1

EMM
creating opportunities

20.1.3 Assessment methodology

Soils

The assessment methodology that was applied to undertake the assessment of potential impacts to soils from construction and operation of the project included:

- a desktop review of available soils and land resource information for the project impact area, including available regional soil mapping including soil landscapes, soil types and potential areas of soil salinity
- identification of Soil Management Units (SMUs) for land within the project impact area by combining soil landscapes, soil types and land and soil capability classes which represent similar soil properties, and susceptibility to project impacts
- identification of erosion and sedimentation risks for each of the SMUs identified within the project impact area. Soil erosion rates were modelled for bare surfaces (i.e. no vegetation) and covered soil surfaces (i.e. vegetated or rock capped) for each of the SMUs using regional data for:
  - slope length, representing the effect of slope length on erosion
  - soil erodibility, representing susceptibility of soil to erosion and the rate of runoff
  - cover management, representing the effects of plants, soil cover, soil biomass and soil disturbing activities on erosion
- the identification of the nature, duration and consequence of potential impacts on soils in the project impact area (based on the established baseline information)
- identification of potential mitigation measures and strategies which may be adopted to mitigate the potential impacts of construction and operation of the project to soils.

The consideration of the project impact area is based on a worst-case scenario, noting that a portion of these areas are already subject to soils and land resource disturbance.

Contamination

Desktop assessment

The contamination impact assessment involved:

- review of publicly available information (previous ground investigation reports, mapping, aerial photography and databases) to identify current or historical potentially contaminating land uses and subsequent identification of potential areas of contamination concern
- identification of area potentially containing acid sulfate soils and naturally occurring asbestos
- 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
- risk assessment identifying potential contamination impacts during construction based on existing contamination and the likely construction methodology

- risk assessment identifying whether any operation or maintenance activities have potential to cause contamination or interact with areas of contamination concern
- development of recommended mitigation measures to avoid, minimise and manage potential contamination impacts from construction and operation of the project.

The contamination assessment comprises a Phase 1 preliminary site investigation and was undertaken in general accordance with the framework for assessment of site contamination outlined in NEPM 2013.

Field survey

Site inspections were undertaken to investigate areas of contamination concern identified during the desktop assessment and to determine the contamination risk during construction and operation.

Site inspections were undertaken at the following locations:

- Bayswater Power Station
- Mount Thorley Industrial Estate
- Mushroom Composters, Mount Thorley
- Dyno Nobel, Mount Thorley
- Dyno Nobel, Warkworth
- Singleton Military Area
- Hunter Valley Operation
- Bulga Coal Mine Deep Pit.

Observations were also made from the boundary of several private properties. The locations of the field surveys are shown in Figure 20.1.

Risk assessment

A risk assessment was undertaken in accordance with *AS/NZS ISO 31000:2009 Risk management* – principles and guidelines, that included a preliminary evaluation of contamination risks, focusing on areas of contamination concern in the absence of controls or remediation measures. This evaluation considered the likelihood of contamination risk occurring and its potential consequences. By combining these factors using a risk matrix the overall level of contamination risk was determined (see Table 20.1 and Table 20.2).

Table 20.1 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.

Likelihood	Description	Basis for ranking
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 potential for contamination The available information indicates 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 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 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.

The consequence/pathway 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.

To provide the overall potential contamination risk for the project, a matrix was used which combines potential likelihood of encountering contamination (see Table 20.2) and the consequence of this disturbance, should it occur (see Table 20.2). Overall risks are defined as:

- 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 20.2 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

20.2 Existing environment

20.2.1 Soils

Soil landscapes

The project impact area lies within the *Soil and Land Resources of the Hunter Region 1:100,000 Sheet* (DPIE 2020f). There are 40 soil landscapes within the project impact area. Of these 40 soil landscapes, 28 are present for only 1% or less of the project impact area, indicating a varied soil profile across the project impact area. Eight soil landscapes are present across 5% or more of the project impact area, and are summarised in Table 20.3.

The northern part of the project impact area is 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 kurosols, sodosols, dermosols and rudosols, with some minor areas of tenosols and chromosols in the south according to the *Australian Soil Classification* (Isbell 2021). The predominant soil types are typically loam and clay or a mixture of the two.

A detailed description (including mapping) of the soil landscapes mapped across the project impact area is provided in *Technical Report 9 – Soils and land impact assessment.*

Table 20.3 Soil landscapes present across more than 5% of the project impact area

Soil Landscape	Proportion of project area	Qualities and limitations
Watagan	23%	Localised shallow soils, widespread complex soils, localised non-cohesive soils, widespread steep slopes, localised rock outcrop hazard, localised rockfall hazard, widespread mass movement hazard, widespread foundation hazard, widespread recharge zone, widespread sheet erosion hazard, localised high run-on.
Dochra	14%	Localised complex soils, localised mass movement hazard, localised foundation hazard, localised complex terrain, localised recharge zone, localised discharge zone, localised salinity hazard, widespread gully erosion hazard, widespread sheet erosion hazard, localised streambank erosion hazard, localised high run-on, localised poor drainage, localised seasonal waterlogging.
Singleton	8%	Localised complex soils, localised non-cohesive soils, widespread foundation hazard, widespread productive arable land, widespread recharge zone, localised wind erosion hazard, localised gully erosion hazard, localised sheet erosion hazard, widespread streambank erosion hazard, localised high run-on, localised poor drainage, localised permanently high water tables, localised permanent waterlogging, localised seasonal waterlogging, widespread flood hazard.
Ravensworth	7%	Widespread complex soils, localised foundation hazard, widespread recharge zone, localised discharge zone, localised salinity hazard, localised gully erosion hazard, widespread sheet erosion hazard.
Sydney Town	7%	Localised rock outcrop hazard, localised recharge zone, localised discharge zone, widespread sheet erosion hazard, localised high run-on, localised permanent waterlogging, widespread seasonal waterlogging.
Wollangambe	6%	Widespread shallow soils, localised non-cohesive soils, localised steep slopes, localised rock outcrop hazard, localised rockfall hazard, localised mass movement hazard, widespread foundation hazard, widespread recharge zone, widespread sheet erosion hazard.
Branxton	5%	Localised foundation hazard, widespread recharge zone, localised discharge zone, localised salinity hazard, localised gully erosion hazard, localised sheet erosion hazard, localised high run-on, localised poor drainage, localised seasonal waterlogging.
Sandy Hollow	5%	Localised recharge zone, localised discharge zone, localised salinity hazard, localised gully erosion hazard, widespread sheet erosion hazard, widespread high run-on, localised poor drainage, widespread seasonal waterlogging, localised flood hazard.

Soil management units

To understand the soil and land characteristics and associated risks due to the project, 4 key SMUs were identified within the project impact area, derived from combining soil landscapes, soil types and land and soil capability classes which represented similar soil properties and susceptibility to project impacts:

- SMU 1: Uncleared Rises, Hills and Escarpments (40% of project impact area)
- SMU 2: Undulating Mid Lands (48% of project impact area)
- SMU 3: Alluvial Plains (7% of project impact area)
- SMU 4: Disturbed and Rehabilitated Land (5% of project impact area).

The SMUs within the project impact area are detailed in Table 20.4 and shown in Figure 20.2.

Soil salinity and sodicity

Dryland salinity is the accumulation of salts in the soil surface and in ground water 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.

Four soil landscapes, all located within SMU 2 (Dochra, Ravensworth, Branxton and Sandy Hollow), are identified as having a localised salinity hazard. These 4 soil landscapes cover about 41% of the project impact area; however, there is a low likelihood of soil salinity within the project impact area based on a review of the *NSW Government eSPADE Online Tool* (DPHI 2024). Evidence of salting has been mapped within the Bayswater Power Station and the Mount Thorley Warkworth and Bulga mining complexes.

Dryland salinity may also be caused by the exposure of naturally saline soils such as hypersaline clays. It can be associated with sodic soils (soils with an exchangeable sodium percentage) of more than 6 per cent. The 4 abovementioned soil landscapes within SMU 2 are identified as potentially containing sodic soils. 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.

The project impact area is generally mapped as an area with localised significant sodicity based on mapping maintained by the *Geological Survey of Australia* (2024).

Soil landscapes commonly associated with sodic soils within the project impact area include Bayswater, Braxton, Bulga, Jerrys Plains and Liddell (in the north) and Mandalong (in the south).

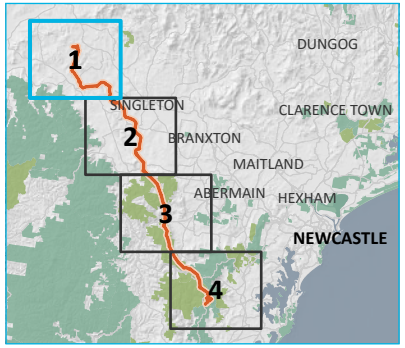
Table 20.4 Soil Management Units within the project impact area

SMU	Relevant soil landscapes	Location	Description	Representative landscape (OEH, 2018)
SMU 1: Uncleared rises, hills and escarpments	• Watagan Soil Landscape • Sydney Town Soil Landscape • Hawkesbury Soil Landscape • Wollangambe Soil Landscape	• 933 ha (40%) of the project impact area • Mostly located in the southern portion of the project impact area associated with State forests, National park reserves, vacant or reserve crown land or freehold lands	• Uncleared rises, hills, and escarpments • Represents a high erosion risk where surface disturbance occurs due to the nature of the terrain	

SMU	Relevant soil landscapes	Location	Description	Representative landscape (OEH, 2018)
SMU 2: Undulating mid lands	• Branxton Soil Landscape • Dochra Soil Landscape • Ravensworth Soil Landscape • Sandy Hollow Soil Landscape	• 1126 ha (48%) of the project impact area • Occurs over a large portion of the northern portion of the project impact area	• Undulating rises, undulating low hills and footslopes • This unit is extensively cleared and generally used for livestock grazing of cattle on native and modified pastures. Some remnant woodland and open woodlands occur, for example within the Singleton Military Area • High erosion risk where surface disturbance occurs, due to the widespread presence of sodic soils which are prone to dispersion and erosion	

SMU	Relevant soil landscapes	Location	Description	Representative landscape (OEH, 2018)
SMU 3: Alluvial Plains	• Singleton Soil landscape • Rothbury Soil Landscape	• 166 ha (7%) of the project impact area • Mostly located in the northern component of the project impact area, associated with the alluvial plains around the Hunter River	• Alluvial Plains, extensively cleared of native vegetation and used for agriculture, supporting cropping activity and improved pastures for livestock grazing • SMU-3 generally represents a low erosion risk where surface disturbance occurs, due to the flat nature of the terrain. There is, however, a high risk of streambank erosion where streambanks are impacted, and an increased risk of erosion where any active gullying is disturbed	

SMU	Relevant soil landscapes	Location	Description	Representative landscape (OEH, 2018)
SMU 4: Disturbed and rehabilitated land	• Disturbed Terrain • Disturbed Terrain variant A • Disturbed Terrain variant B	• 126 ha (5%) of the project impact area • Located in the northern portion of the project impact area, associated with mine owned lands and the Singleton Military Area	• Disturbed and Rehabilitated Land which have been altered, and consist of embankments, mounts, cut and fill features reshaped with mine spoil, and then revegetated • The erosion risk status of this unit is unknown due to variable nature in terrain and soil physiochemical properties. These areas are actively managed, and erosion is likely controlled. Dispersive soils on mine rehabilitation are often ameliorated	



KEY

Soil management unit

- SMU 1: Uncleared rise, hill and escarpment
- SMU 2: Undulating mid land
- SMU 3: Alluvial plain
- SMU 4: Disturbed and rehabilitated land

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
- Minor road
- Named watercourse
- Named waterbody

Soil management units within the project impact area
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.2

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

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creating opportunities

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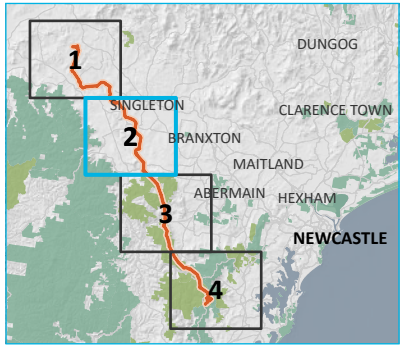

KEY

Soil management unit

- SMU 1: Uncleared rise, hill and escarpment
- SMU 2: Undulating mid land
- SMU 3: Alluvial plain
- SMU 4: Disturbed and rehabilitated land

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
- Minor road
- Named watercourse
- Named waterbody

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

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Soil management units within the project impact area
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.2

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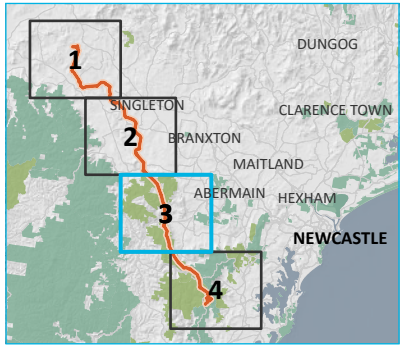
creating opportunities



KEY

Soil management unit

- SMU 1: Uncleared rise, hill and escarpment
- SMU 2: Undulating mid land
- SMU 3: Alluvial plain
- SMU 4: Disturbed and rehabilitated land

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
- Minor road
- Named watercourse
- Named waterbody

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

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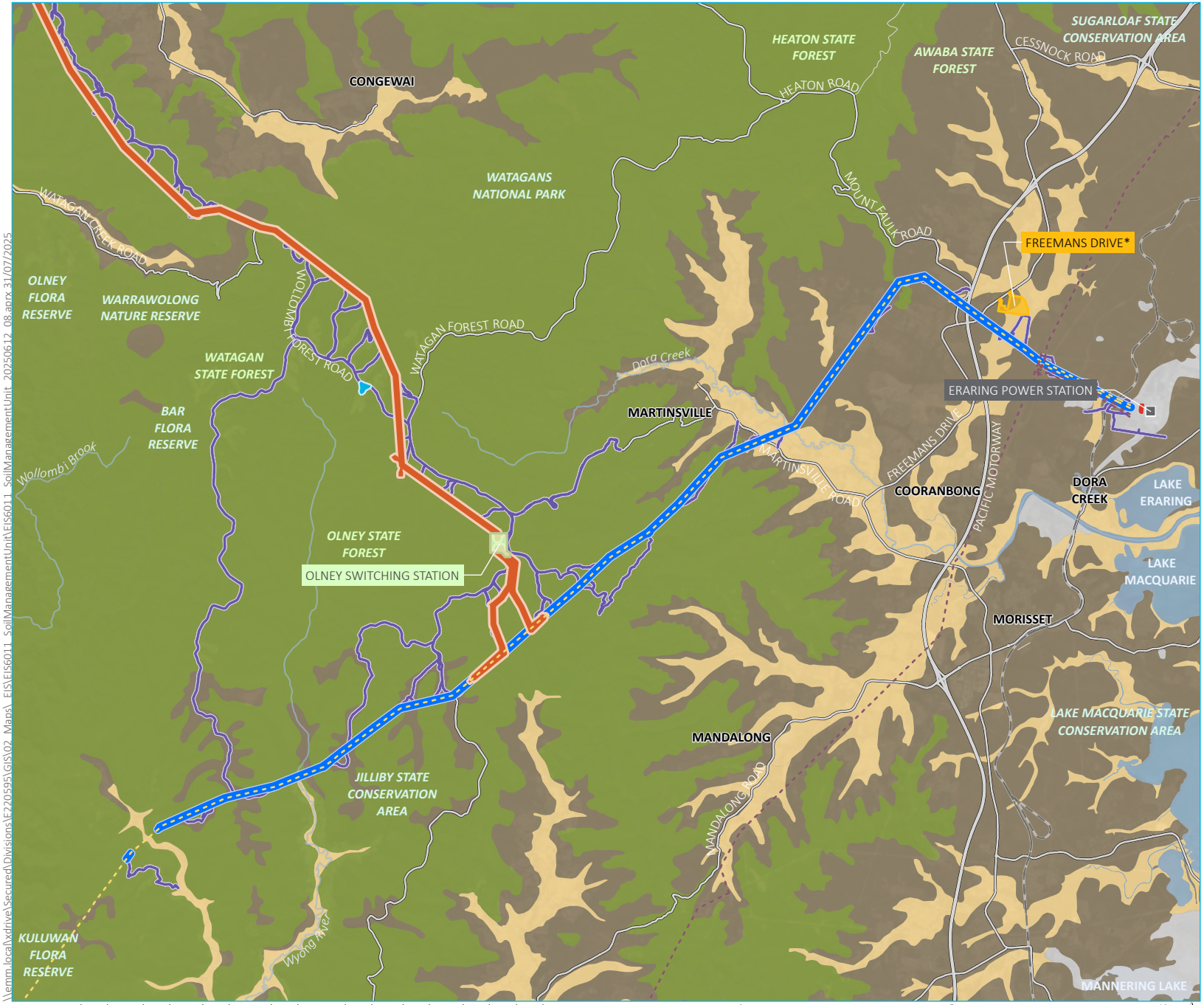
Soil management units within the project impact area
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.2

EMM
creating opportunities



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

Soil management units within the project impact area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.2

EMM
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20.2.2 Contamination

In the northern portion of the project impact area, land clearing and industrial activity can be seen in aerial photography from the early 1960s at mining areas in Warkworth, including mining operations such as Hunter Valley Operations (HVO), United Collieries, Wambo Coal and Mount Thorley Warkworth Mine, with increased intensity of mining activities visible from the mid-1970s, namely at the Wambo Coal site. Mining expansion continued throughout the 1970s and 1980s surrounding the HTP corridor. The Bulga Coal Mine, which comprises Bulga Surface Operations and Bulga Underground and Mount Thorley Operations intersecting/adjacent to the HTP corridor can be seen operating in the mid-1980s; however, the footprint of operations is limited (localised mining only).

The central and southern parts of the project impact area 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.

Database search results

Database search results of potential current and former contaminant sources within the contamination study area are summarised in Table 20.5.

As identified within Table 20.5, the following sites are located within the project impact area and are listed as contaminated sites which are regulated or notified to the NSW Environment Protection Authority (EPA):

- Bayswater Power Station – the environment protection licence (EPL) boundary of the power station is within the contamination study area, and power station infrastructure is present in several locations within the project impact area. This includes a substation switch yard, cooling water reservoir, brine concentrator (contaminated water), effluent ponds and wastewater decanting basin. The eastern boundary of the HTP corridor at this location is adjacent to the Pikes Gully ash dam. The main Bayswater Power Station building is located outside the HTP corridor to the north
- Bulga Coal Mine – the EPL boundary of the Bulga Coal Mine is within the contamination study area; however, no mine infrastructure is located within 1.5 kilometres of the project impact area
- The Emulsion Plant – the eastern edge of the EPL boundary intersects the project impact area, however no plant infrastructure is located within the project impact area.

As identified in Table 20.5, there are 3 current coal mining operations located in the project impact area with mining/plant infrastructure.

There are a number of other NSW EPA licensed activities that are considered as being potential contaminant sources within the contamination study area which are identified in Table 20.5, including mine sites/mine operations, power stations, chemical industries.

The Singleton Military Area is listed in the NSW EPA per- and polyfluoroalkyl substances (PFAS) investigation program and unexploded ordnance (UXO) database. A PFAS Management Area Plan for the Singleton Military Area and the surrounding area has been completed by the Department of Defence. The defined PFAS Management Area is around 3 kilometres to the northeast 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.

There are no records in the contamination study area for former gasworks sites or cattle dip sites.

Table 20.5 Potential current and former contaminant sources within the contamination study area

Item	Detail	Distance from project impact area
List of contaminated sites regulated by or notified to the NSW EPA	Bayswater Power Station (Other Industry)	Within project impact area
	Bulga Surface Operations (Other Industry)	Within project impact area[1]
	Emulsion Plant, Dyno Nobel Asia Pacific Pty Ltd (Chemical Industry), 186 Long Point Road West, Warkworth	Within project impact area[1]
Current NSW EPA licensed activities	Mine Sites/Mine Operations	
	HV Operations Pty Ltd, Lemington Road, Singleton (EPL640)	Within project impact area
	Hunter Valley Energy Coal, Mount Arthur Coal (Coal Mining) (EPL 11457)	Within project impact area
	Bulga Coal Management Pty Ltd, Broke Road, Singleton (EPL563)	Within project impact area
	Ravensworth Operations Pty Ltd, Ravensworth Mine Complex (EPL 2652)	Within project impact area[1]
	Centennial Mandalong Pty Ltd, Mandalong ACC (EPL 365)	Within project impact area[1]
	Centennial Newstan Pty Ltd, Newstan Colliery (EPL 395)	Within project impact area[1]
	Warkworth Mining Ltd, Putty Road, Singleton (EPL1376)	3 m
	Austar Coal Mine Pty Ltd, Wollombi Road, Cessnock (EPL416)	250 m
	Maxwell Ventures (Management) Pty Ltd, Maxwell Underground Coal Mine Project (EPL 1323)	300 m
	Other	
	AGL Macquarie Pty Ltd (Bayswater Power Station), New England Highway, Muswellbrook (EPL779)	Within project impact area

Item	Detail	Distance from project impact area
	Origin Energy (Eraring Power Station), Rocky Point Road, Eraring (EPL 1429)	Within project impact area
	Verdant Earth Technologies Ltd (Redbank Power Station), 112 Longpoint Road, Singleton (EPL 11262)	Within project impact area[1]
	Dyno Nobel Asia Pacific Pty Ltd (Chemical Industry), 186 Long Point Road West, Warkworth (EPL 12158)	Within project impact area[1]
	Dyno Nobel Asia Pacific Pty Ltd (Chemical Industry), 5 Woodlands Road, Mount Thorley (EPL12159)	60 m
	AGL Macquarie Pty Ltd (Lidell Power station), Muswellbrook (EPL 2122) *(decommissioned)*	380 m
National waste management site / National Liquid Fuel Facilities data base	Mushroom Composters Pty Ltd (Organics recycling facility), 333 Broke Road, Mount Thorley (EPL10620)	600 m
NSW EPA PFAS investigation program	Singleton Military Area	Within project impact area
Unexploded ordinance	Singleton Military Area	Within project impact area

1. The EPL boundary intersects the project impact area, however no mine/plant infrastructure is located within the project impact area

Areas of contamination concern

Areas of contamination concern within the contamination study area and the potential contaminants of concern associated with these areas are listed in Table 20.6. The identification of an area of contamination concern does not represent actual contamination incidents or contamination conditions within the project impact area. Rather, 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. The location of the individual areas of contamination concern are shown in Figure 20.3. Bayswater Power Station and mining lease areas are within the project impact area and are identified as having a high likelihood of contamination being present. The Singleton Military Area is also within the project impact area and identified as having a medium likelihood of contamination present.

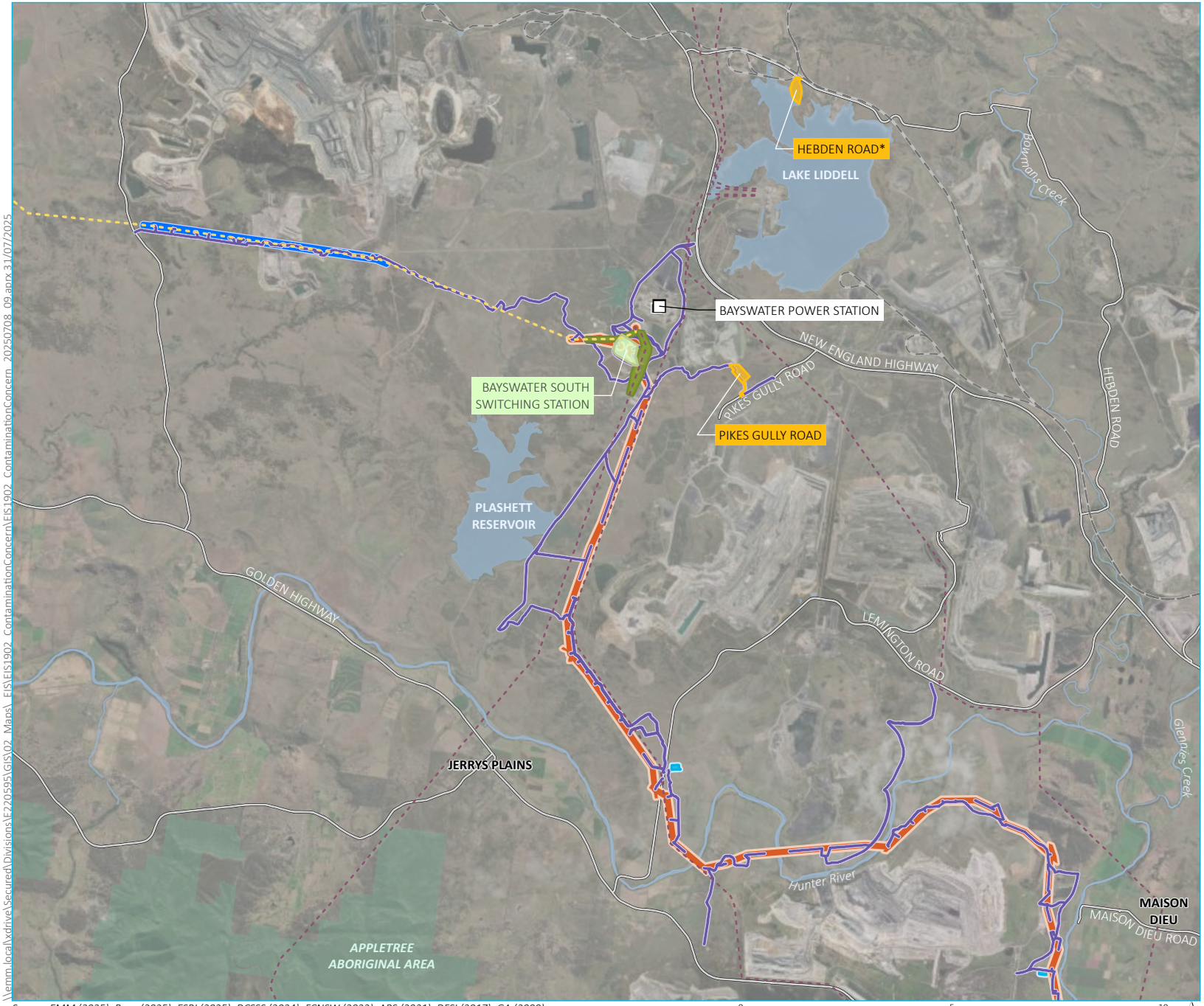
Table 20.6 Areas of contamination concern

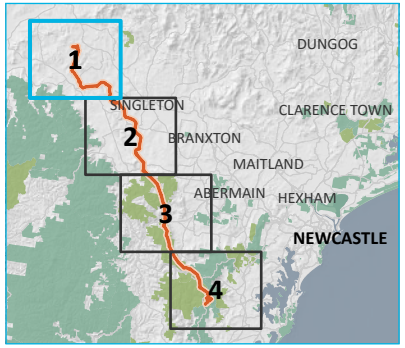
Area of contamination concern	Within project impact area	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see Table 20.1)
Bayswater Power Station Inside/bordering the contamination study area at the northernmost extent and next to the Bayswater south switching station	Yes	• Spills from maintenance activities on-site • Storage of contaminated 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	Polychlorinated biphenyls (PCBs), benzene, toluene, ethylbenzene, xylene, and naphthalene (collectively referred to as BTEXN), total recoverable hydrocarbons (TRH) and PFAS	High
Redbank Power Station Project access track leads into EPL boundary	Yes, however no infrastructure within project impact area	• Spills from maintenance activities on-site • Storage of contaminated 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	PCBs, BTEXN, TRH and PFAS	High
Eraring Power Station Project connection into existing switchyard	Yes	• Spills from maintenance activities on-site • 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 and PFAS	High

Area of contamination concern	Within project impact area	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see Table 20.1)
Mining lease areas - Coal	Yes	• 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, polycyclic aromatic hydrocarbons (PAH), TRH, methane, high carbon materials (HCM)	High
Dyno Nobel Warkworth and Mount Thorley	Yes, however no infrastructure within project impact area	• Explosive manufacture • 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, and heavy metals	High
Singleton Military Area	Yes	• 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	Medium
Mushroom Composters Pty Ltd	No	• Historical uncontrolled earthworks/filling	• Construction/maintenance workers • Aquatic ecosystems • Terrestrial ecosystems • Off-site agricultural users on adjacent farming land.	Fuel, TRH/BTEXN/PAH, heavy metals and asbestos	Medium

Area of contamination concern	Within project impact area	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see Table 20.1)
Farm structures	Yes	• Historical uncontrolled earthworks/filling • Accumulation of nutrients and pesticides from adjacent cropping activities	• Construction/maintenance workers • Aquatic ecosystems • Terrestrial ecosystems • Agricultural users	Heavy metals, asbestos, PAH, pesticides, TRH	Medium
Farm dams	Yes	• 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 and E.Coli (and faecal bacteria)	Medium
Existing towers and transmission line infrastructure	Yes	• Spills from maintenance activities on site • Asbestos paints on tower infrastructure	• Construction/maintenance workers • Terrestrial ecosystems • Aquatic ecosystems • Off-site agricultural users on adjacent farming land	BTEXN, TRH, asbestos and pesticides	Low
Areas of active cropping/ cleared agriculture land	Yes	• Historical uncontrolled earthworks/filling	• Construction/maintenance workers • Terrestrial ecosystems • Aquatic ecosystems • Agricultural users	Heavy metals, pesticides	Low

Area of contamination concern	Within project impact area	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see Table 20.1)
Existing roadways and rail corridors	Yes	• 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 and pesticides	Low





KEY

- Area of contamination concern

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

Note - Mining leases, farm dams and infrastructure are throughout the study area however are not depicted

Areas of contamination concern*
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.3

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

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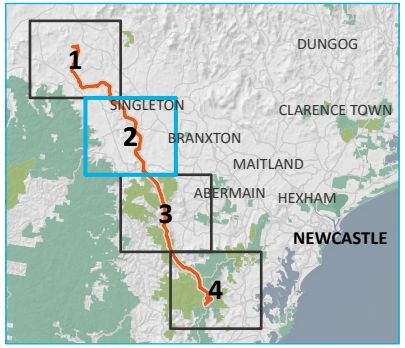

KEY

- Area of contamination concern

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

Note - Mining leases, farm dams and infrastructure are throughout the study area however are not depicted

Areas of contamination concern*
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.3

EMM
creating opportunities

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

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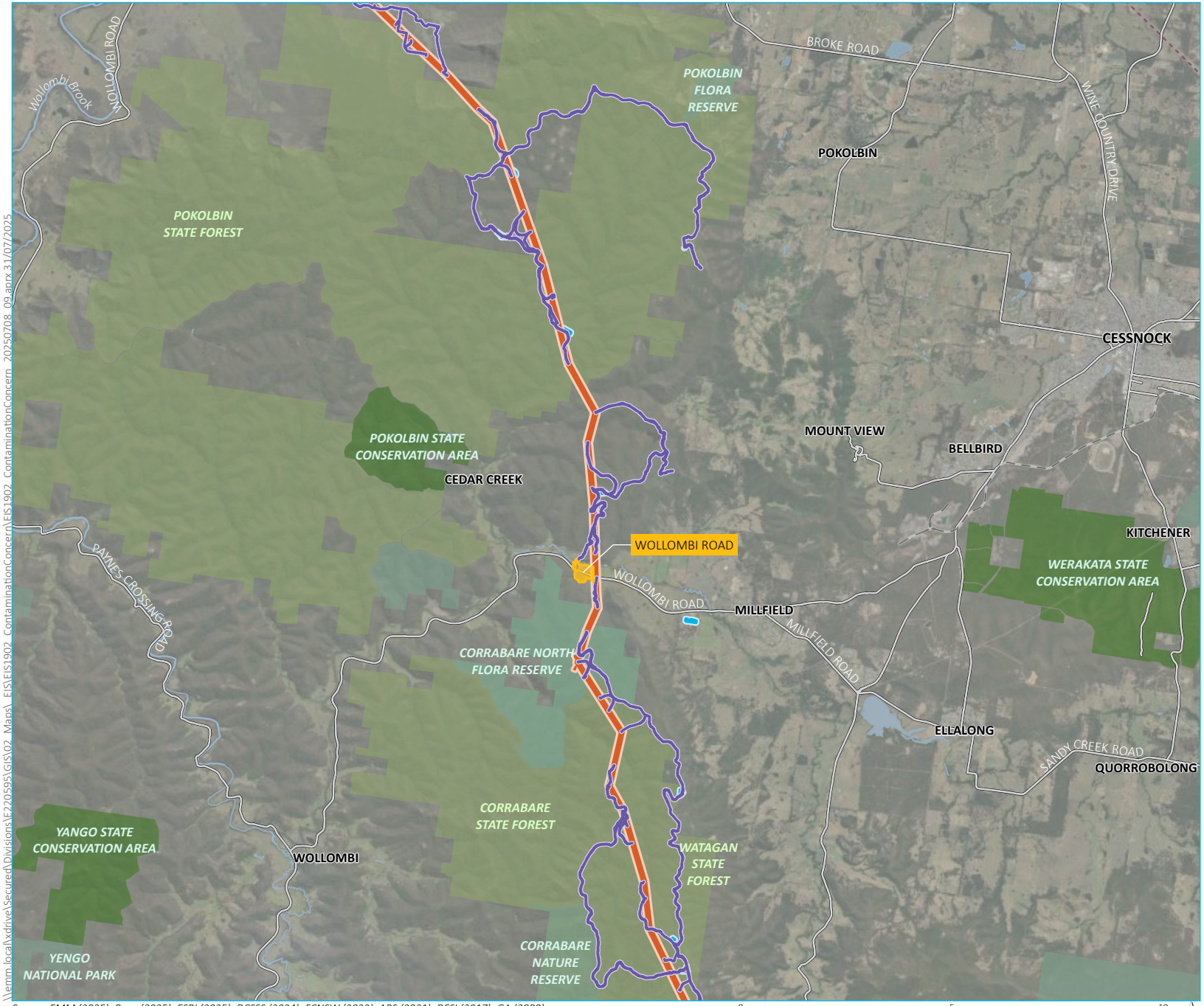

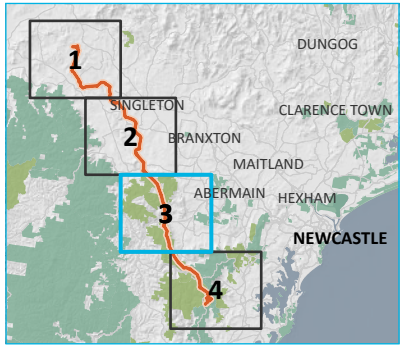

KEY

- Area of contamination concern

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

*Note - Mining leases, farm dams and infrastructure are throughout the study area however are not depicted

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

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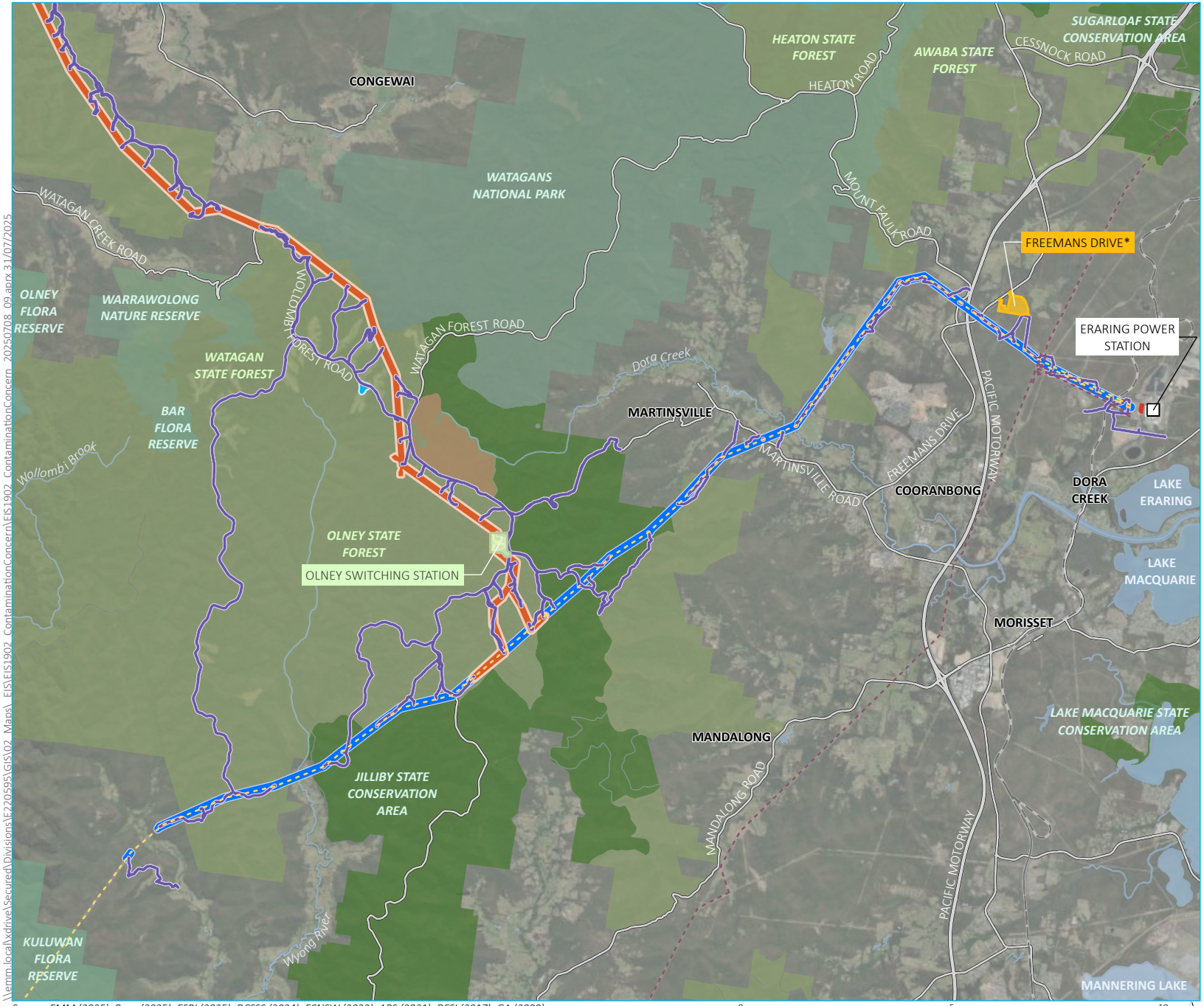
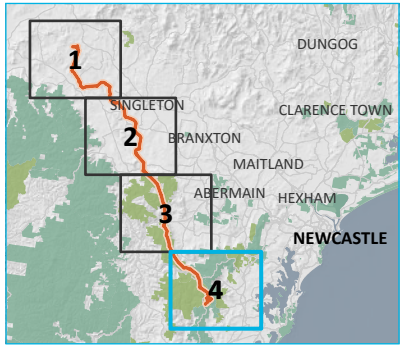
Areas of contamination concern*
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.3

EMM
creating opportunities





KEY

- Area of contamination concern

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

Note - Mining leases, farm dams and infrastructure are throughout the study area however are not depicted

Areas of contamination concern*
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 20.3

EMM
creating opportunities

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

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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.

Acid sulfate soils can corrode infrastructure, including buildings, roads, and pipelines, causing substantial damage. The high acidity of the soil can erode concrete and metals, compromising the structural integrity of buildings and infrastructure.

The majority of project impact area is not located on or near areas identified as containing acid sulfate soils as per *NSW Government eSPADE Online Tool* (DPHI 2024). The only exception is a limited area of around 0.1 hectare in the south of the project impact area located at the intersection upgrade location at Freemans Road and Martinsville Road, Cooranbong, which is shown to have a low risk of acid sulfate soils occurrence at about 2 to 4 metres beneath the ground surface. There is also a potential for localised areas of acid sulfate soils in low lying waterlogged areas (i.e. surrounding creeks or dams).

Naturally occurring asbestos

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.

There are no known occurrences of naturally occurring asbestos within the project impact area based on a review of mapping maintained by the NSW Government's Heads of Asbestos Coordination Authorities (2024).

20.3 Potential impacts – construction

20.3.1 Soils

Erosion and sedimentation

Construction of the project would temporarily expose the natural ground surface and sub-surface through the removal of vegetation, earthworks activities and excavation of surface soils. The exposure of soil to surface water runoff and wind can increase soil erosion potential, particularly where construction activities are undertaken in soil landscapes susceptible to erosion.

Due to the moderately high rainfall characteristics of the Hunter region, the nature of the terrain within the project impact area, and the anticipated impacts from surface disturbance during construction, the erosion and sedimentation risks of the project could result in long term, irreversible impacts to water quality within the project impact area and surrounds if suitable controls are not implemented during construction.

There is a high potential risk for dispersion where soils would be disturbed by construction activities within the project impact area. Increased dispersive behaviour is very likely to occur when soil is

exposed (i.e. left bare), remoulded, compacted or pulverised from high-intensity construction activities such as earthworks. Soil erosion is exacerbated where surfaces are exposed (such as, via construction activity), with high sloped exposed surfaces representing a significant erosion risk.

This risk is especially high for all exposed surfaces, especially on the steeper inclines of SMU 1, or where the sodic, dispersive subsoils are exposed in SMU 2.

Due to the flat nature and more stable physiochemical properties of SMU 3, erosion is generally less of a risk, with the exception of streambank areas and any areas where existing gullying has occurred. Impacts to streambank edges or gullied terrain result in a high water erosion risk during rainfall events.

Given the variable and generally unknown nature of the soil physiochemical properties in SMU 4, as shown in the significant range of modelled soil erosion rates in Table 10 of *Technical Report 9 – Soils and land impact assessment*, erosion risk for this unit should be assumed to be high, especially in the context of sodic/dispersive subsoils known to occur in the locality of this unit.

Mitigation measures to address potential erosion risks during construction is outlined in *section 17.5*.

Salinity

Development of rural land can change the movement of surface water and groundwater, resulting in a change in the way salts and other minerals interact. When the water table rises, dissolved salts that are typically locked in the soil and rock profile can potentially be carried to the surface causing increased soil salinity, and impact soil function and productivity. The current hydrogeological environment of the study area is not anticipated to be altered significantly by the project. As such, construction of the project is not expected to have a significant impact on soil salinity.

In areas where evidence of salting has been previously mapped by DPIE (2014) mitigation measures in accordance with the *Salinity Training Handbook* (NSW Department of Primary Industries (DPI) 2014) would be implemented during construction.

Acid sulfate soils

The majority of the project impact area is not located on or near areas identified as having an acid sulfate soils risk, with the exception of a limited area of 0.1 hectare in the south of the project impact area. This area would involve the development of a new access track/access track upgrade, and adjustment to existing transmission line and is likely to have low impacts on acid sulfate soils. Nonetheless, if soil disturbance is required, targeted soil testing would be undertaken in those areas mapped as containing potential acid sulfate soils prior to construction to confirm any acid sulfate soils risks present.

There is a low potential for localised areas of acid sulfate soils to be present in low lying waterlogged areas across the construction area, such as areas surrounding creeks or dams. Within the remainder of the construction impact area, there is a low to extremely low probability of encountering acid sulfate soils, given the land elevation and distance from the coast, in conjunction with existing acid sulfate soils mapping for NSW. Any accidental disturbance of acid sulfate soils would be managed via an unexpected finds protocol.

Should disturbance of waterlogged areas be required, a preliminary assessment would be undertaken to determine whether acid sulfate soils are present and if the proposed works are likely

to disturb these soils. If acid sulfate soils are present, then mitigation measures would be implemented in accordance with the Acid Sulfate Soil Manual.

Naturally occurring asbestos

Given there are no known occurrences of naturally occurring asbestos within the project impact area, the risk of exposure to naturally occurring asbestos during construction is low. Any accidental disturbance of naturally occurring asbestos would be managed via an unexpected finds protocol.

20.3.2 Disturbance of existing contamination

To determine the risk of disturbing or encountering contaminated material during construction, a risk rating was 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 (see Table 20.7).

Table 20.7 Areas of contamination concern and construction risk

Area of contamination concern [1]	Construction activity	Pathway	Sensitive receiver	Likelihood for contamination to be present	Potential consequence/ pathway	Risk
Bayswater Power Station	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling utilities works	• Direct contact, ingestion, and inhalation • Incidental discharge into receiving environments	• Construction workers • Aquatic and terrestrial ecosystems	High	Moderate	High
	Nearby piling activities	• Direct contact, ingestion, and inhalation • Incidental discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	Medium	Moderate	Medium
Redbank Power Station	Access track upgrade (minor works)	• Direct contact, ingestion, and inhalation • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	High	Minor	Low
Eraring Power Station	Utility connection work (including excavation) and sub-station upgrade activities	• Direct contact, ingestion, and inhalation • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	High	Moderate	High

Area of contamination concern [1]	Construction activity	Pathway	Sensitive receiver	Likelihood for contamination to be present	Potential consequence/ pathway	Risk
Mining lease areas (outside active mining areas)	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling utilities works	• Direct contact, ingestion, and inhalation • Incidental discharge into receiving environment • Potential explosive atmosphere (methane).	• Construction workers • Aquatic and terrestrial ecosystems	Low	Moderate	Low
	Piling activities	• Direct contact, ingestion, and inhalation • Incidental discharge into receiving environment • Potential explosive atmosphere (methane)	• Construction workers • Aquatic and terrestrial ecosystems	Medium	Moderate	Medium
Mining lease areas (inside active mining areas)	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	• Direct contact, ingestion, and inhalation • Off-site transport of contaminants via vehicle/plant movements • Dust exposure • Ignition of HCM • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	High	Significant	High

Area of contamination concern [1]	Construction activity	Pathway	Sensitive receiver	Likelihood for contamination to be present	Potential consequence/ pathway	Risk
	Piling activities	• Direct contact, ingestion, and inhalation • Ignition of HCM • Incidental discharge into receiving environment • Potential explosive atmosphere (methane)	• Construction workers • Aquatic and terrestrial ecosystems	Medium	Moderate	Medium
Dyno Nobel Mount Thorley	Access track upgrade (minor earthworks)	• Direct contact, ingestion, and inhalation • Off-site transport of contaminants via vehicle/plant movements • Dust exposure • Ignition of explosive substances • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	High	Minor	Medium

Area of contamination concern [1]	Construction activity	Pathway	Sensitive receiver	Likelihood for contamination to be present	Potential consequence/ pathway	Risk
Dyno Nobel Warkworth	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	• Direct contact, ingestion, and inhalation • Off-site transport of contaminants via vehicle/plant movements • Dust exposure • Ignition of explosive substances • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	High	Moderate	High
	Piling activities	• Direct contact, ingestion, and inhalation • Ignition of explosive substances • Incidental discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	High	Minor	Medium

Area of contamination concern [1]	Construction activity	Pathway	Sensitive receiver	Likelihood for contamination to be present	Potential consequence/ pathway	Risk
Singleton Military Area	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	• Direct contact, ingestion, and inhalation • Off-site transport of contaminants via vehicle/plant movement • Dust exposure • Ignition of unexploded ordinance • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	Low to medium	Moderate	Medium
	Piling activities	• Direct contact, ingestion, and inhalation • Incidental discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	Low to medium	Minor to moderate	Medium
	Piling activities	• Direct contact, ingestion, and inhalation • Incidental discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	Medium	Minor	Low

Area of contamination concern [1]	Construction activity	Pathway	Sensitive receiver	Likelihood for contamination to be present	Potential consequence/ pathway	Risk
Farm structures	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	• Direct contact, ingestion, and inhalation • Off-site transport of contaminants via vehicle/plant movements • Dust exposure • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	Medium	Minor	Low
	Piling activities	• Direct contact, ingestion, and inhalation • Incidental discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	Low	Minor	Low
Farm dams	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	• Direct contact, ingestion, and inhalation • Off-site transport of contaminants via vehicle/plant movements • Dust exposure • Surface water run-off and discharge into receiving environment	• Construction workers • Aquatic and terrestrial ecosystems	Medium	Moderate	Medium

1: Areas of contamination concern assessed as having a low likelihood for contamination (existing towers and transmission line infrastructure, areas of active cropping/cleared land and existing roadways and rail corridors) in Table 20.6 have been excluded from the risk assessment presented in Table 20.7.

Most of the project impact area is considered to have a low contamination risk. However, there are 8 areas of contamination concern within the project impact area identified as having a medium to high contamination risk.

If inadequately managed, disturbance of existing 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 sub-surface flow (water and/or vapour) or dust, with the potential to impact on receiving environments
- increase the risk of exposure to contaminants (direct contact, ingestion and/or inhalation) by workers, visitors, the local community and biodiversity values in the surrounding environment.

Mining areas

There is a high risk of encountering contamination where construction would occur within past and active mining areas, mine surface water infrastructure or within 500 metres of mine water treatment infrastructure and/or rehabilitated areas. Detailed construction planning at these sites would consider interfaces with existing mine operations plans, the presence of existing environmental management controls, and proposed and existing rehabilitation programs for the mines.

Construction activities have the potential to interact with existing mining operation areas associated with the Mount Arthur Mine, HVO, Mt Thorley Warkworth Mine and Bulga Coal Mine as follows:

- 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 south-east tailing storage facility 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.

At the mine sites, groundwater volumes encountered during construction are expected to be low but there remains a medium risk of encountering contaminated groundwater should dewatering be required during piling activities. Releases of groundwater off-site from mining areas into the surrounding environments would be suitably managed to protect the surrounding surface and groundwater receiving environments.

Further targeted investigations would be completed within the sections of the project impact area that are within mining land (Mount Arthur Mine, Bulga Coal Mine, HVO and Mount Thorley Warkworth) to confirm the potential to encounter contamination (soil and groundwater). This would be completed prior to construction and to inform the detailed design and construction planning in these areas.

Bayswater Power Station

There are several locations within the project impact area where power station infrastructure is present, including a substation switch yard, cooling water reservoir, brine concentrator (contaminated water), effluent ponds and water waste decanting basin.

If not managed appropriately, excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling utilities works 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
- incidental discharge into receiving environments (aquatic and terrestrial ecosystems).

Releases of groundwater off-site from power station areas into the surrounding environments would be avoided.

Eraring Power Station

The project impact area includes the existing switchyard of the power station. Utility connection work, including excavation, and substations upgrade activities would be required.

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).

Dyno Nobel Mount Thorley

The closest works associated with the project would be minor earthworks for access track upgrades located 50 metres from the property boundary.

If not managed appropriately, disturbance of contaminated soil has the potential to 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).

Dyno Nobel Warkworth

The project impact area intersects the property boundary. However, construction works including excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling, utility works and piling activities would be undertaken outside the property boundary.

If not managed appropriately, disturbance of contaminated soil has the potential to 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).

Singleton Military Area

The project impact area includes a portion of transmission line alignment which passes through the Singleton Military Area, which is a Department of Defence controlled area and known UXO site. Based on the Australian Government Defence Singleton Military Area Unexploded Ordnance Report there are no recorded UXO items within the project impact area. In addition, the transmission line alignment was developed in consultation with the Department of Defence to avoid areas known to contain UXOs. However, the UXO register may not be complete and there is a possibility of unrecorded UXO items not captured in the Australian Government Defence Singleton Military Area Unexploded Ordnance Report.

Unexploded Ordnance would be managed in accordance with the Defence Unexploded Ordnance Management Manual and in consultation with the Department of Defence. This would include undertaking a site-specific risk assessment in consultation with Department of Defence prior to any activities that could interact with UXO.

The Singleton Military Area is also listed in the NSW EPA PFAS investigation program (see Table 20.5). A PFAS Management Area Plan for the Singleton Military Area and the surrounding area has been completed by the Department of Defence. The defined PFAS management area is around 3 kilometres to the northeast, and outside 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. Interaction with areas of PFAS is not expected during construction.

Other areas

In addition to the above, the review of aerial imagery identified that there are more than 40 farm dams within the construction impact area that present both potential erosion and contamination hazards due to soil and water contamination often associated with farm dams. Impacts to farm dams would generally be avoided where practicable. Additional investigations would be undertaken to confirm presence of contaminants prior to any works commencing within around 50 metres of a farm dam and the Contamination Management Plan would contain appropriate measures to manage any required farm dam dewatering.

The identified risk to the project from encountering contaminated soil and groundwater would be effectively managed through the implementation of controls as part of a Contamination Management Plan (see *section 20.5*).

20.3.3 Potential risk to the project from existing sources of contamination

Naturally occurring asbestos

Based on the desktop assessment, there is no known or expected naturally occurring asbestos within the contamination study area. Therefore, naturally occurring asbestos is not anticipated to pose a risk to the construction of the project. Notwithstanding, an unexpected finds protocol will be developed and implemented to manage the discovery of previously unidentified contaminated material within the project impact area.

Soil contamination

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

Mine lease areas were evaluated 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 high carbon material (HCM) in discrete locations. The existing power stations and Dyno Nobel Warkworth facility were also evaluated to pose a medium to high risk during construction based on a high likelihood for contamination (from power station infrastructure such as the diesel fuel tank farm, flocculant tanks and associated chemicals, water treatment system and power infrastructure).

Following the implementation of recommended management measures (see *section 20.5*), it is anticipated that the identified risk to the project from encountering contaminated soil would be effectively managed through the implementation of risk controls and an unexpected finds protocol.

Surface water and groundwater contamination

Contaminated groundwater from identified areas of contamination concern poses a low risk to the environment during construction of the project. This is because subsurface excavations below the water table are anticipated to be minor with incidental volumes of groundwater take during dewatering. Within the project impact area there is a potential for construction activities to interact with current mine surface water and groundwater management infrastructure. However, through the implementation of controls as part of the environmental management system and unexpected finds protocol (see *section 20.5*), it is anticipated that the identified risk to the project from encountering contaminated groundwater would be effectively managed.

The potential to encounter surface water and groundwater and potential risks to these are discussed further in *Chapter 17 (Surface water)* and *Chapter 18 (Groundwater)*.

Per- and polyfluoroalkyl substances (PFAS)

The Singleton Military Area is listed in the NSW EPA PFAS investigation program. A PFAS Management Area Plan for the Singleton Military Area and the surrounding area has been completed by the Department of Defence. The defined PFAS Management Area is around 3 kilometres to the northeast 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 project is unlikely to interact with areas of known PFAS.

20.3.4 Potential contamination risk from construction activities

Storage of potential contaminants

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

During construction, there is the potential risk to the soil environment 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 risk controls in place (see s*ection 20.5*), the risks from these activities would be minimal.

Acid sulfate soils and acid rock

Based on the desktop assessment, there is a low risk 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 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 risk of disturbing or mobilising acid sulfate soils. Acid sulfate soils are discussed further in *Technical Report 9 - Soils and land impact assessment*.

Salinity

The current hydrogeological environment is not anticipated to be altered significantly by the project. As such, no significant risk to 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 in accordance with measures outlined in *section 20.5* and in accordance with the *NSW Department of Primary Industries Salinity Training Handbook* (2014).

Soil salinity impacts are discussed further in *Technical Report 9 - Soils and land impact assessment*.

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) which poses a risk of contamination of surface water bodies.

The implementation of management measures, including those in *Chapter 17 (Surface water)* such as the implementation of erosion and sediment control measures, is anticipated to minimise the risk of contamination to the soil environment from displaced sediment.

20.4 Potential impacts – operation

20.4.1 Soils

Operation of the project is unlikely to result in any significant impacts on soils.

The potential for erosion of soils may be present around infrastructure (particularly transmission line tower footings and permanent access tracks) located within the floodplain, where erosion and scour from water flow during flood events or high winds is more likely to occur. However, these impacts are anticipated to be minor as the project would be designed to manage water flows and the effects of wind, including scour protection (where required). Any areas of erosion would be minor and capable of being rectified as part of regular maintenance activities during operation.

Operation of the project is not expected to impact the salinity levels of soils within the operation impact area. Maintenance activities are unlikely to involve ground disturbance activities of sufficient magnitude to increase water infiltration resulting in erosion and off-site transport of saline sediments; particularly, with the implementation of standard erosion and sediment control measures.

There are no known occurrences of naturally occurring asbestos within the project impact area based on a review of mapping maintained by the NSW Government's Heads of Asbestos Coordination Authorities (2024). As a result, risk of exposure to naturally occurring asbestos during operation is negligible.

20.4.2 Contamination

Potential contamination risks associated with the operation of the project include:

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

The operation of the project is not expected to result in the exposure of potentially contaminated soil or groundwater to ecological or human receivers. Maintenance activities during operation would not involve soil disturbance as permanent infrastructure for the project would be above ground. As such, operational activities would not expose the surrounding environment and other sensitive receivers to potentially contaminated soil or groundwater.

As some of the project's transmission infrastructure is within the footprint of coal mine leases, the Bayswater Power Station and the Singleton Military Area, an easement will be required in these areas to facilitate worker access for maintenance activities without the risk of tracking contamination on/off-site. Risks will be effectively managed through standard controls and through interface agreements with the relevant landowners and operators (see *Chapter 12 (Land use and property)*).

The operation of the project poses a contamination risk to the surrounding environment as a result of potential hydrocarbon (fuels, diesel, oils) leaks or spills within the operation impact area, which may result in the accidental contamination of soil, surface water and/or groundwater. Spill volumes from any incidents, should they occur, would be expected to be minor and localised, however there is potential for hydrocarbon fuel to migrate off-site, if not appropriately contained. Spill containment facilities (such as bunded containers, designated fill points and spill kits) will be used during maintenance activities within the operation impact area. Furthermore, incident response procedures will be developed and implemented to manage the risk of contamination from these occurrences.

20.5 Mitigation and management measures

Mitigation and management measures proposed to manage contamination risk during construction and operation of the project are listed in Table 20.8. These measures will be included in a contamination management plan prepared for the HTP.

Further mitigation measures to manage impacts to soil and water are provided in *Chapter 17 (Surface water)* and *Chapter 21 (Hazards and risk).* Waste management is discussed in *Chapter 22 (Other matters)*

It should be noted that some environmental impacts assessed in this EIS are relevant to multiple technical aspects and therefore will share common mitigation measures. Where this occurs, the mitigation measure has not been duplicated but rather one ID number has been provided for the particular measure and a cross reference to that ID number has been included in other related environmental aspects. In line with this approach, reference has been made to the management of erosion and sedimentation in line with mitigation measures SW and SW3 and the management of the storage of chemicals, fuels and other hazardous substances in line with mitigation measures DG1, DG2, DG3 and DG4 in Table 20.8.

Table 20.8 Proposed mitigation and management measures – soils and contamination

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SL1	Erosion and sedimentation	Undertake field assessment and laboratory testing of representative soils subject to disturbance to refine soil management and erosion and sediment control measures. A soil ground truthing program should be prepared to select representative soils and a suitable laboratory testing suite, as determined by a suitably qualified environmental consultant based on a review of the regional data presented in this report and the outcomes of site inspections. The program should cover the entire project impact area, but focus on high risk areas identified within this report (i.e. high erosion risk, mapped acid sulfate soil risk areas, regionally mapped BSAL). The program should consist of a minimum of one site per transmission tower, multiple sites for infrastructure areas where ground disturbance is of higher impact, and one site per 500 m for new tracks, should be included in the program, however this should be informed by landform, risk assessment and site observations and more sites may be required.	Detailed design Construction	All locations
SL2	Disturbance of sodic soils	Implement additional measures if sodic soils are identified in SMU 2 and would be subject to ground disturbance and/or where sodic soils are stockpiled. This is anticipated to be primarily in the localities of Bayswater, Broke and Mount Thorley and may include applying gypsum as an ameliorant to displace the sodium and provide the soil with a stronger aggregate and hold structure when wet.	Detailed design Construction	Areas mapped as SMU 2

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
SL3	Rehabilitation of disturbed areas	A Rehabilitation Management Plan (RMP) will be prepared as part of the project's environmental management system. The RMP will detail all aspects of returning construction areas to a safe, erosionally stable and non-polluting landform consistent with surrounding terrain and land uses. The detailed Rehabilitation Plan will include a Trigger Action Response Plan (TARP) that addresses erosion and soil risks during construction rehabilitation, as per Table 16 of *Technical Report 9 - Soils and land impact assessment*.	Detailed design Construction	All locations
SL4	Rehabilitation of disturbed areas	Areas of disturbed soil would be rehabilitated promptly and progressively during construction to minimise the risk of erosion and sedimentation occurring.	Construction	All locations
SL5	Rehabilitation of disturbed areas	Temporary erosion and sediment control measures will be put in place for high risk areas (i.e. high erosion risk, mapped acid sulfate soil risk areas, regionally mapped BSAL) until a time rehabilitation objectives (as outlined in the RMP) and sufficient groundcover has been achieved.	Detailed design Construction	Areas of high erosion risk, mapped acid sulfate soils risk areas and regionally mapped BSAL
SL6	Erosion and sedimentation during operation	Limit additional soil disturbance during operation by restricting traffic to formed access tracks and roads.	Operation	All locations
SL7	Erosion and sedimentation during operation	Standard erosion and sediment control measures will be implemented to minimise the potential for erosion within areas to be accessed during operation. These measures will be developed on a case-by-case basis and are likely to include measures such as sediment fencing, localised sediment traps, and progressive stabilisation with vegetation.	Operation	All locations

Reference	Impact	Mitigation measure	Timing	Relevant 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 a 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 NSW *Contaminated Land Management Act 1997* and the NSW *Protection of the Environment Operations Act 1997.*	Detailed design Construction	All locations
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

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
C3	Impacts due to spontaneous combustion from disturbance of high carbon material	Avoid disturbance of areas of active (and previously active) surface mining, underground mine access and process routes where possible. Where these areas cannot be avoided, testing of the material(s) will be undertaken to confirm if high carbon material would be disturbed and/or exposed, and appropriate safeguards implemented to make sure the risk of spontaneous combustion is adequately controlled in accordance with the *Industry and Investment MDG Spontaneous Combustion Management Guideline* (NSW 2011).	Detailed design Construction	All locations
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 *Contaminated Land Management Act 1997* and the *Protection of the Environment Operations Act 1997*.	Detailed design 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 Construction	Mount Arthur, HVO, Mount Thorley Warkworth and Bulga Coal Mine sites

Reference	Impact	Mitigation measure	Timing	Relevant 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 m of farm structures or farm dams (if applicable).	Detailed design	Ground disturbance within the construction impact area within 50 m 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

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
C9	Unexploded ordinance	Manage unexploded ordinance risks in accordance with Defence Unexploded Ordnance Management Manual and in consultation with the Department of Defence. Undertake site-specific risk assessment at locations where there is a risk of encountering unexploded ordinance. The risk assessment will be carried out prior to any activities that could interact with unexploded ordinance and include field verification to validate the historical assessment of unexploded ordinance contamination and identify appropriate mitigation practices. Ensure the risk assessment includes input from an appropriate unexploded ordinance specialist and identifies if and when an explosives engineer is required during construction activities. Ensure the management actions identified in the risk assessment are implemented prior to and during all relevant construction activities. Ensure all personnel conducting intrusive works within an identified unexploded ordinance area are provided with appropriate safety and awareness briefing(s) prior to participating in the intrusive works.	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.	Operation	All locations
-	Erosion and sedimentation during construction	Manage erosion and sedimentation through the implementation of Erosion and Sediment Control Plans in accordance with mitigation measures 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 measures DG1, DG2, DG3 and DG4.	Construction and operation	All locations

20.6 Summary and conclusion

Most locations in the contamination study area have a low contamination risk. The highest potential for soil contamination to be encountered is at the Bayswater and Eraring power stations and in the vicinity of the mining complexes (HVO, Mount Thorley, Warkworth and Bulga).

Disturbance of contaminated soil during construction has the potential to expose people and the environment to potentially harmful contaminants in the absence of appropriate controls. There would be a low risk of groundwater contamination during construction due to the minimal and very localised interaction with groundwater.

Construction activities also have the potential to introduce contamination to the environment through accidental spills and leaks of hazardous and dangerous goods, inappropriate management of stockpiled contaminated soils and materials, and from potential vehicle accidents.

The storage and use of chemicals, potential vehicle accidents and accidental leaks and spills have the potential to cause soil and/or groundwater contamination during operation.

The risk to the project of potentially encountering contaminated soil during construction and the risk of contamination being introduced or spread from construction and operation of the project will be minimised through the development of a contamination management plan. Implementation of mitigation measures such in the contamination management plan would avoid and minimise disturbance to areas of medium to high risk of contamination (where possible); ensuring that prior to construction, areas of medium to high risk are tested to confirm the presence/absence of contaminants of concern. Management of contamination and any resulting remediation will be carried out in accordance with the relevant legislation, standards and guidelines.

An unexpected finds protocol will also be implemented to manage the discovery of previously unidentified contaminated material during construction and operation of the project.

Hazards and risk

21

21 Hazards and risks

This chapter presents a detailed summary of the assessment of the potential hazards and risks of the Hunter Transmission Project (HTP, the 'project') during construction and operation and identifies mitigation measures to be implemented to avoid, minimise and manage these impacts, where practicable. This section is informed by the following assessments:

- *Technical Report 14 - Bushfire risk assessment*
- *Technical Report 15 - Contamination preliminary risk screening*
- *Technical Report 16 - Aviation impact assessment*
- *Technical Report 17 - Electric and magnetic fields assessment*.

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to the assessment of hazards and risk and where in this environmental impact statement (EIS) these have been addressed are summarised in *Appendix A (Assessment requirements compliance)*.

21.1 Assessment approach

21.1.1 Legislation, policies, plans and guidelines

The assessment of hazard and risks was undertaken in accordance with the requirements of relevant plans, policies and guidelines including:

- *State Environmental Planning Policy (Resilience and Hazards) 2021*
- specifically for bushfire:
  - *NSW Rural Fires Act 1997*
  - *Planning for Bushfire Protection 2019* (NSW Rural Fire Service, 2019)
  - *Australian Standard ISO31000:2018 - Risk Management*
  - *Hunter Valley Bush Fire Risk Management Plan* (which covers the northern part of the project, including the proposed Bayswater South switching station and the Hebden Road, Pikes Gully Road and Gouldsville Road construction support sites)
  - *Lower Hunter Bush Fire Risk Management Plan* (which covers the central and southern part of the project, including the proposed Wollombi Road construction support site)
  - *Central Coast Bush Fire Risk Management Plan* (which covers the southeastern part of the project, including the proposed Olney switching station and the Freemans Drive construction support site)
- specifically for dangerous goods:
  - *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (NSW Department of Planning (DoP), 2011a) (Applying SEPP 33)

- *Hazardous Industry Planning Advisory Paper No. 6 - Guideline for Hazard Analysis* (NSW DoP, 2011b)
- *NSW Dangerous Goods (Road and Rail Transport) Act 2008* and Dangerous Goods (Road and Rail Transport) Regulation 2014

- specifically for electric and magnetic fields (EMF):
  - *International Commission for Non-Ionizing Radiation Protection (ICNIRP) Guidelines For Limiting Exposure to Electro and magnetic Fields* (ICNIRP, 2010)
- specifically for telecommunications:
  - *Australian Standard 2344:2016 Limits of electromagnetic interference from overhead A.C. powerlines and high voltage equipment installations in the frequency range 0.15 MHz to 3000 MHz*
- specifically for aviation:
  - Commonwealth *Civil Aviation Act 1988* and Civil Aviation Safety Regulation 1998.

21.1.2 Study area

The study area for the hazards and risk assessment varies according to the hazard and risk being considered, meaning these were considered on an issue-by-issue basis. Specifically:

- the bushfire risk assessment considered the project impact area as well as the wider landscape, noting the potential for bushfires to spread and impact assets many kilometres from an ignition location
- the preliminary risk screening considered the storage within, and transport of, dangerous goods to the project impact area
- the electric and magnetic fields (EMF) assessment considered the project impact area and the potential for EMF impacts below transmission lines and surrounding the new switching stations and existing substations
- the telecommunications assessment considered the project impact area and the potential for radio frequency interference with existing telecommunications infrastructure from transmission infrastructure
- the aviation impact assessment considered aviation facilities and operations up to 30 nautical miles (or around 56 kilometres) from the project impact area.

21.1.3 Assessment methodology

Bushfire

The desktop assessment as part of the bushfire risk assessment involved review of a range of databases, reports and websites to determine key inputs for the risk assessment. These included:

- NSW Planning Portal Spatial Viewer to access bushfire prone land mapping
- satellite imagery for analysis of the landscape vegetation cover and features
- NSW Sharing and Enabling Environmental Data (SEED) database for access to NSW State Vegetation Type data, NSW fire history data, and fire extent and severity mapping (FESM) data

- Digital Elevation Model data analysis to carry out a slope assessment
- NSW Rural Fire Service (RFS) website to obtain relevant bushfire management plans, and for determining the fire danger index to be used in assessment of the bushfire attack level (BAL) and asset protection zone (APZ) dimensions under Planning for Bushfire Protection 2019 (RFS, 2019)
- Forestry Corporation of NSW (FCNSW) website for accessing fire management plans covering the Pokolbin, Corrabare, Watagan and Olney State forests
- historical weather observations data from the Bureau of Meteorology (BoM) for the study area for the assessment of historical fire weather.

Bushfire behaviour modelling was also carried out using fire behaviour modelling equations specified in Australian Standard *AS3959:2018 Construction of buildings in bushfire prone areas*. This modelling used fuel input assumptions taken from fuel assessments carried out by GHD for the Pokolbin, Corrabare and Olney State forests.

Field surveys were carried out as part of the bushfire risk assessment, which included:

- site assessment of the proposed Olney switching station location carried out in March 2024
- fuel assessments for the Pokolbin, Corrabare and Olney State forests carried out in July 2024.

Consultation with a range of stakeholders occurred during the preparation of the bushfire risk assessment. Stakeholders included:

- Australian Energy Market Operator (AEMO), Transgrid, RFS, FCNSW and the NSW National Parks and Wildlife Service (NPWS) in relation to route selection for the HTP corridor
- on-site consultation with the FCNSW in relation to the proposed Olney switching station location, APZ requirements, and key fire access and egress routes critical to ongoing fire management operations
- local rural fire service officers to obtain local knowledge insights and inputs into the bushfire risk assessment
- provision of the draft bushfire risk assessment to RFS for review and comment.

The bushfire risk assessment involved assessing the potential impact of the project on the existing bushfire risk to public safety during construction and operation, as well as assessing the bushfire risk to the project, including project infrastructure and personnel during construction and operation.

Bushfire risks from the project to public safety arising from the potential for the project to start a bushfire have been assessed using an approach consistent with the risk assessment process established in Australian Standard *ISO 31000:2018 – Risk Management (ISO 31000)*. Under ISO 31000, risk is a function of consequence and likelihood. In a bushfire risk context, consequences are the potential future impacts of a bushfire, including impacts to human life, property and economic values, and the environment. Bushfire consequences, in particular to public safety, can vary depending on bushfire severity and the degree of exposure and vulnerability of communities to that hazard.

Dangerous goods

The proposed construction methodology for the transport, storage and handling of dangerous goods and hazardous chemicals has been reviewed to inform the management measures that are required during construction. While there is no requirement to undertake a preliminary risk screening for the transport, storage and handling of dangerous goods in construction, this assessment has applied the intent of the screening process in Applying SEPP 33 to construction of the project. The screening process for construction identified:

- typical materials associated with the proposed construction activities
- potential storage locations during construction
- transport routes proposed to be used during construction.

The construction screening reviewed the material and locations in the context of surrounding land uses to identify controls appropriate to manage risks to surrounding land uses during construction.

For operation, a preliminary risk screening was carried out to determine if the project is 'potentially hazardous' and if a preliminary hazard analysis is required in the context of State Environmental Planning Policy (Resilience and Hazards) 2021 based on the screening process detailed in Applying SEPP 33.

The preliminary risk screening involved completing a review of the type and quantity of hazardous materials to be transported and stored on site, the location of storage areas within the project impact area, as well as the expected number of transport movements assessed against the screening threshold quantities defined in Applying SEPP 33 to determine if the project is 'potentially hazardous' and a preliminary hazard analysis is required.

For flammable liquids and combustible liquids stored with flammable liquids, the preliminary risk screening was based on the location of storage relative to surrounding land uses. Applying SEPP 33 sets a threshold for minimum distances to sensitive receivers (including residential receivers, schools and hospitals) and other receivers (meaning all other land uses such as commercial and industrial receivers). Storage of flammable/combustible liquids must be more than 10 metres from sensitive receivers and more than 3 metres from other (commercial and industrial) land uses. For all other dangerous goods, the preliminary risk screening was not based on the distance to receivers.

Electric and magnetic fields assessment

Electric and magnetic fields exist wherever electricity is generated, transmitted or distributed in transmission lines or cables, or used in electrical appliances. Adverse health effects due to the extremely low frequency (ELF) EMF that are generated from electrical infrastructure have not been established, despite being the subject of extensive research.

While no risk to human health has been established, the Energy Corporation of New South Wales (EnergyCo) has adopted an approach of 'prudent avoidance' in accordance with good engineering and risk minimisation guidance from Energy Networks Association (ENA) and reference to World Health Organisation guidance. Prudent avoidance is a precautionary concept developed to address the possibility of health effects from prolonged exposure to field levels much lower than those for which effects have been established. Under this approach, subject to reasonable cost and practicality considerations, the owners of electrical infrastructure should design their facilities to reduce the intensity of EMF where prolonged exposure is possible.

In Australia, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is responsible for protecting the health and safety of people and the environment from EMF. In July 2015, ARPANSA officially adopted the ICNIRP's G*uidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields (1 Hz to 100 kHz)* (ICNIRP, 2010) in full, as they were consistent with ARPANSA's understanding of the scientific basis for the protection of the general public (including the foetus) and workers from exposure to ELF EMF. EnergyCo's position on EMF exposure is to comply with these ICNIRP guidelines.

As a result, the EMF study methodology involved:

- describing EMF risks in relation to human health with reference to relevant research
- modelling the EMF for the proposed 500 kilovolt (kV) transmission line at one metre above ground level (in accordance with international standards) and covering the range of structure types, conductor configurations and other relevant parameters associated with the transmission lines
- modelling locations where the proposed transmission lines would cross existing transmission and distribution lines (including 330 kV, 132 kV and 66 kV lines) or run parallel to these
- assessing the anticipated EMF levels for the transmission lines against the relevant criteria as follows:
  - magnetic fields: 2,000 milligauss being the ICNIRP general public exposure reference limit
  - electric fields: 9.1 kV per metre, ensuring compliance with the ICNIRP general public basic restriction for the central nervous system
- assessing the anticipated public exposure and occupational exposure to EMF at the proposed switching stations and existing substations
- assessing the compliance of the proposed transmission lines, switching stations and substations against 'prudent avoidance' principles
- identifying requirements based on relevant EMF guidelines to be adopted during the detailed design.

Further detail on the methodology for the EMF study including an overview of EMF and human health is provided in *Technical Report 17 - Electric and magnetic fields assessment*.

Telecommunications impact assessment

The potential impact of the transmission line and towers on telecommunication services and mitigation measures to avoid potential disruptions to radio communication services was assessed as part of the assessment of audible noise for the project (see *Technical Report 8 – Noise and vibration impact assessment*). The international Council on Large Electric Systems (CIGRE) empirical calculation method has been employed to determine the radio frequency interference levels for the project. Using this method, the calculated radio frequency interference levels have been assessed at an observation height of one metre and 2 metres above ground for average fair weather and average rain conditions against criteria outlined in AS2344 to determine impacts on existing telecommunications services.

Aviation impact assessment

The aviation impact assessment involved:

- identification and assessment of the obstacle limitation surfaces (OLS) and Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surfaces at certified aerodromes to determine if any infringements would occur
- identification of non-certified aerodromes and helicopter landing sites (HLS) within 10 kilometres of the project impact area to determine the likely impacts of the project to flight operations at these locations
- assessment of the likely impacts of infringements to air route protection surfaces
- assessment of the likely impacts to aeronautical navigation aids and air traffic control surveillance radar systems
- identification of relevant civil aviation safety requirements and standards in relation to existing aerodrome conditions and whether these standards are met, especially in relation to whether obstacle lighting is required
- completion of an aviation impact statement, including:
  - specifying all certified aerodromes within 55.56 kilometres (30 nautical miles) of the project impact area
  - nominating all instrument approach and landing procedures at these aerodromes
  - reviewing the potential effect of the project on the operational airspace of the aerodrome(s)
  - assessment of the potential impacts of the project on air routes
- assessment of the potential impacts of the construction and operation of the project on low-level flight operations, including agricultural spraying and aerial firefighting
- consultation with aerodromes and aircraft operating agencies, including Airservices Australia, the Australian Department of Defence, and other relevant stakeholders.

21.2 Existing environment

21.2.1 Bushfire

Bushfire landscape context

With the exception of locations where the project traverses existing mine sites, most of the project impact area traverses areas mapped as containing bushfire-prone land. The bushfire prone land within the project impact area includes the following forest and grassland vegetation types:

- dry sclerophyll forests, which dominate ridgelines through the Pokolbin, Corrabare and Olney State forests
- moist/wet sclerophyll forests, which are on sheltered south to easterly aspects and in major gully systems throughout the project impact area. These forests are in areas of taller and higher density tree cover, which typically generates higher fuel loads compared to dry

sclerophyll forest areas, including in the Pokolbin, Corrabare, Watagan and Olney State forests

- rainforests, which are typically confined to the lower parts of major gully systems, including in the State forest areas throughout the project impact area. Except when exposed to high intensity fire activity during the most severe drought years, rainforests rarely sustain fire spread
- grasslands, which are mostly in the northern and central portions of the project impact area and surrounding landscape, which vary in fuel load, however, can experience vigorous and fast-moving grass fires following high rainfall periods.

Bushfire-prone land mapping for the project impact area is included in Figure 21.1.

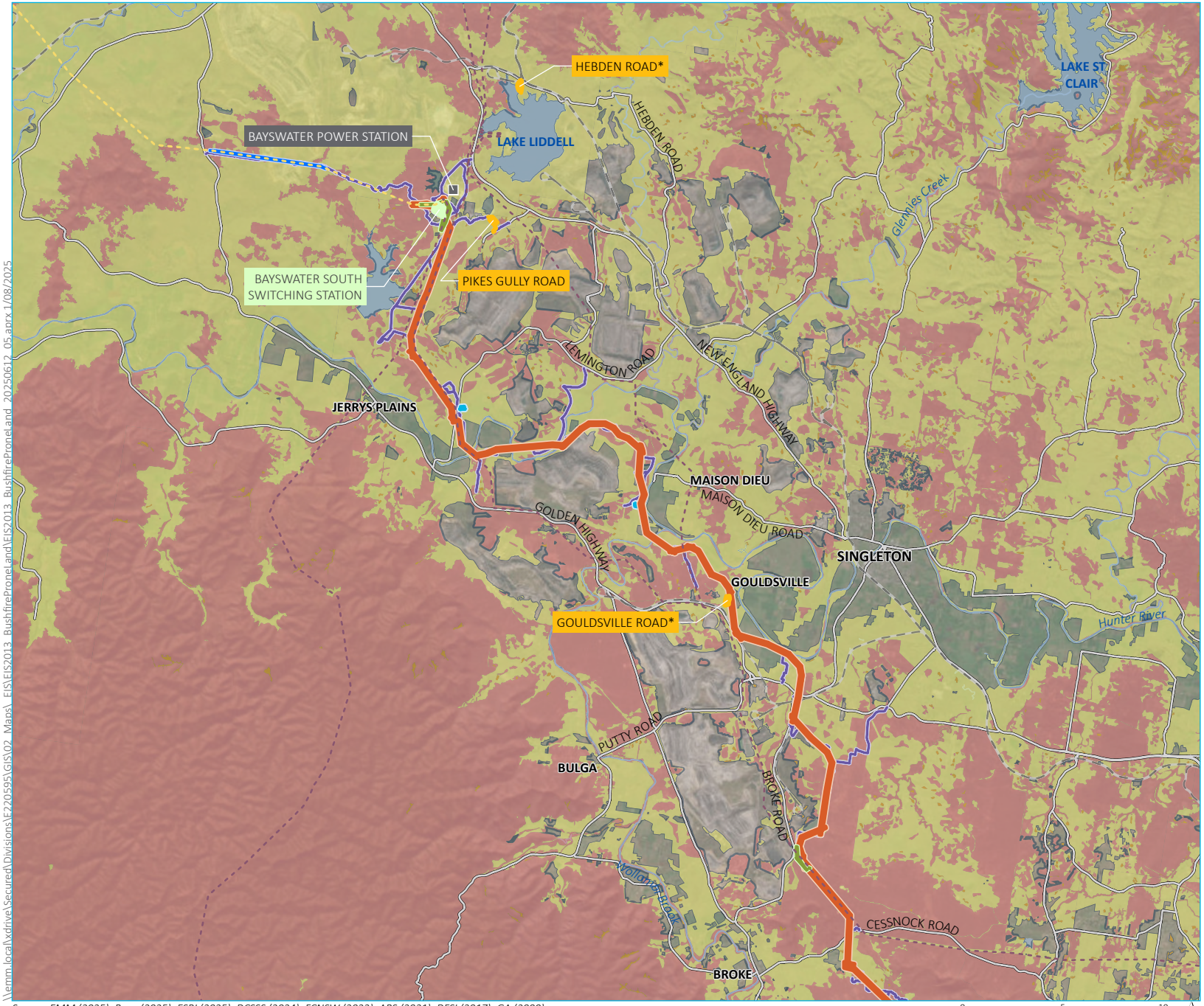
Bushfire history

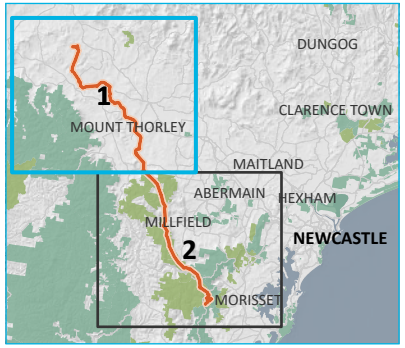
The landscape within and surrounding the project impact area has a varying history of bushfires. In the northern portion of the study area (between Bayswater and Broke), large bushfire events have been infrequent, largely due to the extent of irrigated land along the Hunter River and the disturbed mining land. The land uses have reduced bushfire incidences or has fragmented previous fire spread.

In the central portion of the study area, the Pokolbin and Corrabare State forests have experienced recurring bushfires, particularly along ridgelines and wind-exposed plateaus. Fires are ignited from both natural causes (lightning) and human causes (accidental or deliberate ignition by forest users). In average to above-average rainfall years, fires in this area are typically contained by NSW fire authorities. However, in below average rainfall years when forest fuels dry out and become combustible across the landscape, bushfire ignition can develop into large-scale fires. During these adverse weather conditions, bushfires are problematic to contain and can spread quickly in the rugged forested terrain. The fire history of the plateaus in the central portion of the project impact area demonstrates recurrent large-scale fires in severe drought-affected years. However, fires in the sandstone plateaus areas of State forests have not spread off the steep plateau edges into surrounding low-lying areas.

In the southern portion of the study area around Olney to Eraring, the historical occurrence of bushfires is typified by smaller and less frequent fire extents than in the central portion. This is largely due to the greater prevalence of rainforest gullies and moister forest types on the eastern fall of the Watagan Range, influenced by the higher annual rainfall and more sheltered east to south aspects in the terrain.

The larger 500 kV transmission lines form a crucial component of the energy grid, transporting electricity from its generation sources to transmission substations which serve major population and demand centres. Unlike smaller distribution lines, 500 kV networks have been in operation for over 42 years without causing bushfire ignitions. There can be a public perception that overhead powerlines pose a high bushfire risk and have been the cause of numerous high-consequence bushfires. However, in Australia the history of bushfire ignitions from electrical infrastructure is overwhelmingly associated with distribution network infrastructure (network voltages up to 66 kV). Major fire events, including the 2009 “Black Saturday” bushfires in Victoria and of the 2019/20 “Black Summer” bushfires in NSW and South Australia, were started by distribution lines of 22 kV or less, rather than transmission lines.





KEY

Bushfire prone land
- Vegetation category 1
- Vegetation category 2
- Vegetation category 3
- Vegetation buffer

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

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

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Bushfire prone land within and surrounding the project impact area Map 1 of 2

Hunter Transmission Project
Environmental Impact Statement
Figure 21.1

EMM creating opportunities

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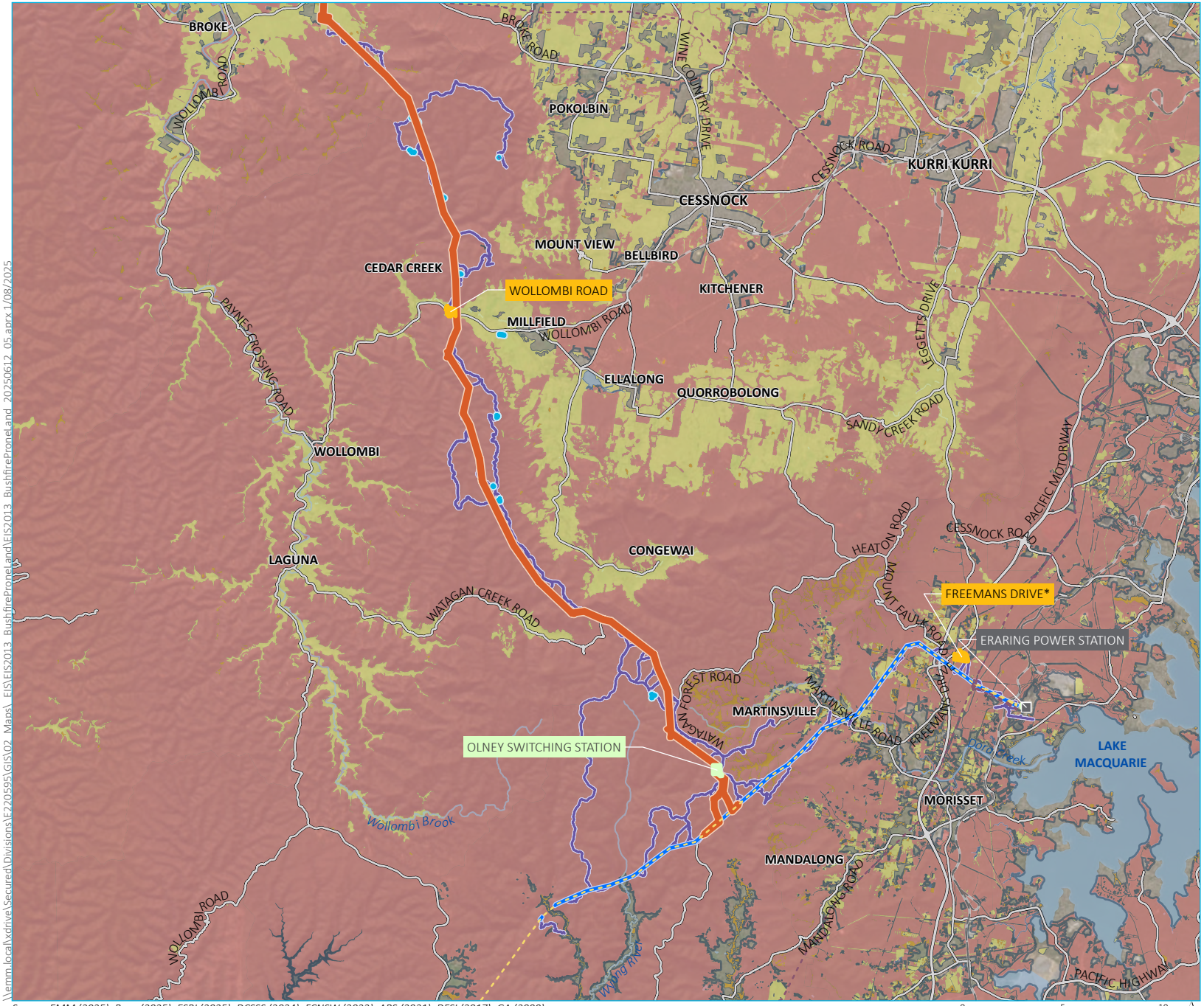

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Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009)

Bushfire prone land within and surrounding the project impact area
Map 2 of 2

Hunter Transmission Project
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Figure 21.1

EMM
creating opportunities

Ignition sources

There are a range of existing ignition sources within the project impact area that are a potential risk to starting fires. These include:

- lightning strike
- fire spreading from legal and illegal burning off
- faulty or inappropriate use of machinery or equipment or faulty low voltage electrical infrastructure
- accidental ignitions from motor vehicle accidents, discarded cigarette butts or fire spreading from campfires
- arson activities
- trees falling and coming in contact with electrical infrastructure
- failure of electrical infrastructure.

Fire behaviour potential

Fire behaviour potential within and surrounding the project impact area is highly variable, depending on the fuels through which the fire is burning, the influence of topography on the fire, and the prevailing weather including the underlying dryness of fuels in the landscape. A particularly important influence on fire behaviour throughout the project impact area is the presence of plateau formations, including the Pokolbin plateau and the Corrabare plateau. The fall from the eastern edges of these plateaus to the valley floors below is typically a 200 to 300 metre elevation change. Similar elevation changes can be found on the northern margins of these plateaus. Historically, these steep slopes associated with abrupt elevation changes have served to contain fires to the plateaus and their footslopes. Despite recurrent fires on these plateaus, including fires burning during highly adverse fire weather conditions (e.g. in the severe 2002/03 and 2019/20 fire seasons) fires have not made extended runs from these plateaus across the cleared adjacent valley areas.

In the southern portion of the project, broad plateau areas forming part of the Olney State Forest merge with the Watagan mountain range. The Watagan mountain range elevations exceeding 400 metres fall away to lowlands along the Dora Creek valley (down to around 40 metres in elevation). Historically, the effects on fire behaviour potential along the eastern fall of the Watagan mountain range has been similar to the effects seen on the Pokolbin and Corrabare plateaus – fire has not run out and across the Dora Creek valley from the range.

21.2.2 Dangerous goods

The existing use of dangerous goods within the project impact area is largely associated with existing agriculture, mining, and energy storage activities.

Agricultural land within the project impact area covers around 862 hectares and represents around 38% of the project impact area. This includes dryland grazing land generally on mid to lower slope landscapes and on rehabilitated mining land, as well as irrigated land generally occurring on highly fertile soils adjacent to the Hunter River. Dangerous goods including pesticides, herbicides, fertilisers and solvents are likely used in these areas. Further details on existing agricultural land uses within the project impact area are outlined in *Chapter 13 (Agriculture)*.

The project impact area intersects 3 mining complexes, including the Hunter Valley Operations mining complex, Mount Thorley Warkworth mining complex and the Bulga Coal Mine. Typical activities at these mining complexes include mining in active surface pits and historical underground mine workings, materials loading and haulage, water management, rehabilitation works and administration. Dangerous goods stored and used in these mining complexes to support mining operations include flammable/combustible liquids, fuels, and explosives.

The Eraring battery energy storage systems (BESS) is located near the proposed upgrades to existing transmission lines (5A1 and 5A2), upgrades at Eraring substation, and the proposed Freemans Drive construction support site as part of the project. Dangerous goods including lithium-ion batteries and the storage of small amounts of oils and chemicals are used at Eraring BESS.

21.2.3 Electric and magnetic fields

Existing sources of EMF within and close to the project impact area include:

- the existing 500 kV transmission lines (including line 5A1 and 5A2 connecting to the Eraring substation and line 5A3 and 5A4 connecting to the Bayswater substation)
- existing 330 kV transmission lines (including line 31 and 32 near Bayswater and line 81 and 82 near the mining complexes and the Singleton Military Area)
- smaller lower voltage (such as existing 132 kV, 66 kV and 33 kV) transmission and/or distribution lines.

See *Chapter 4 (Project description)* for details on the proposed crossings of existing transmission lines. Substations within the project impact area include the Bayswater and Eraring substations.

21.2.4 Telecommunications

Existing telecommunications services that have coverage through the project impact area include AM radio (including Newcastle and Muswellbrook AM radio stations), commercial FM radio, aeronautical very high frequency (VHF), ultra high frequency citizen band (UHF CB) radio and digital television.

Existing telecommunications infrastructure within the project impact area includes Telstra assets in Millfield, Singleton Military Area, Mount Thorley, Cooranbong, Martinsville, Gouldsville, Muswellbrook and Howick. Further information on existing telecommunications and other utilities can be found in *Appendix B (Schedule of utility adjustments and crossings)*.

21.2.5 Aviation

The International Civil Aviation Organisation and Australia's Civil Aviation Safety Authority (CASA) definition of an aerodrome is generic to all types of areas that are suitable for the arrival, departure and surface movement of aircraft. There are 2 types of aerodromes – certified and non-certified.

Certified aerodromes are aerodromes that require certification under the Civil Aviation Safety Regulations 1998. Part 139 of the Civil Aviation Safety Regulations 1998 sets out requirements and standards for certified aerodromes including standards for facilities, obstacle control, operational procedures and safety management.

There are 3 certified aerodromes within 30 nautical miles (55.56 kilometres) of the project impact area, including:

- Cessnock Aerodrome –around 13 kilometres east of the project impact area
- Maitland Aerodrome –around 30 kilometres northeast of the project impact area
- Royal Australian Air Force (RAAF) Williamtown/Newcastle Airport –around 54 kilometres northeast of the project impact area.

Non-certified aerodromes are not regulated by CASA and include private airstrips, aircraft landing areas (ALAs), HLSs and airstrips other than certified aerodromes. CASA recommends an area of interest of 5.4 nautical miles (10 kilometres) be used to assess potential impacts of proposed developments on aircraft conducting taking off and landing operations at a non-certified aerodrome. There are 4 non-certified aerodromes within 5.4 nautical miles of the HTP corridor, which are detailed in Table 21.1.

Table 21.1 Non-certified aerodromes within 5.4 nautical miles of the project impact area

Non-certified aerodrome	Details
Warkworth Aerodrome	Warkworth Aerodrome is operated by the Hunter Valley Gliding Club (HVGC), which operates gliding activities that occur mainly on weekends, Fridays and public holidays. HVGC also makes the aerodrome available for student pilots from flying schools in the Sydney area to practice circuits and take-off/landings which can occur any day of the week. Warkworth Aerodrome is located 2 km (1.1 nautical mile) west of the HTP corridor.
Coolmore Stud Aerodrome	Aircraft larger than single-engine light aircraft regularly operate at Coolmore Stud Aerodrome. This aerodrome is adjacent to the Golden Highway and is 5.35 km (2.9 nautical miles) west of the HTP corridor.
Singleton Aerodrome	Singleton Aerodrome is operated by Singleton Air Services Pty Ltd for their flying operations. Permission is required to fly to/from this aerodrome. The Singleton Aerodrome is located 5.7 km (3 nautical miles) east of the HTP corridor.
Dochra Military Aerodrome	Dochra military aerodrome is operated by the Department of Defence for military training operations within restricted airspace. The Dochra Military Aerodrome is located 9.5 km (5 nautical miles) east of the HTP corridor.

The locations of certified and non-certified aerodromes surrounding the project impact area are included in Figure 21.2.

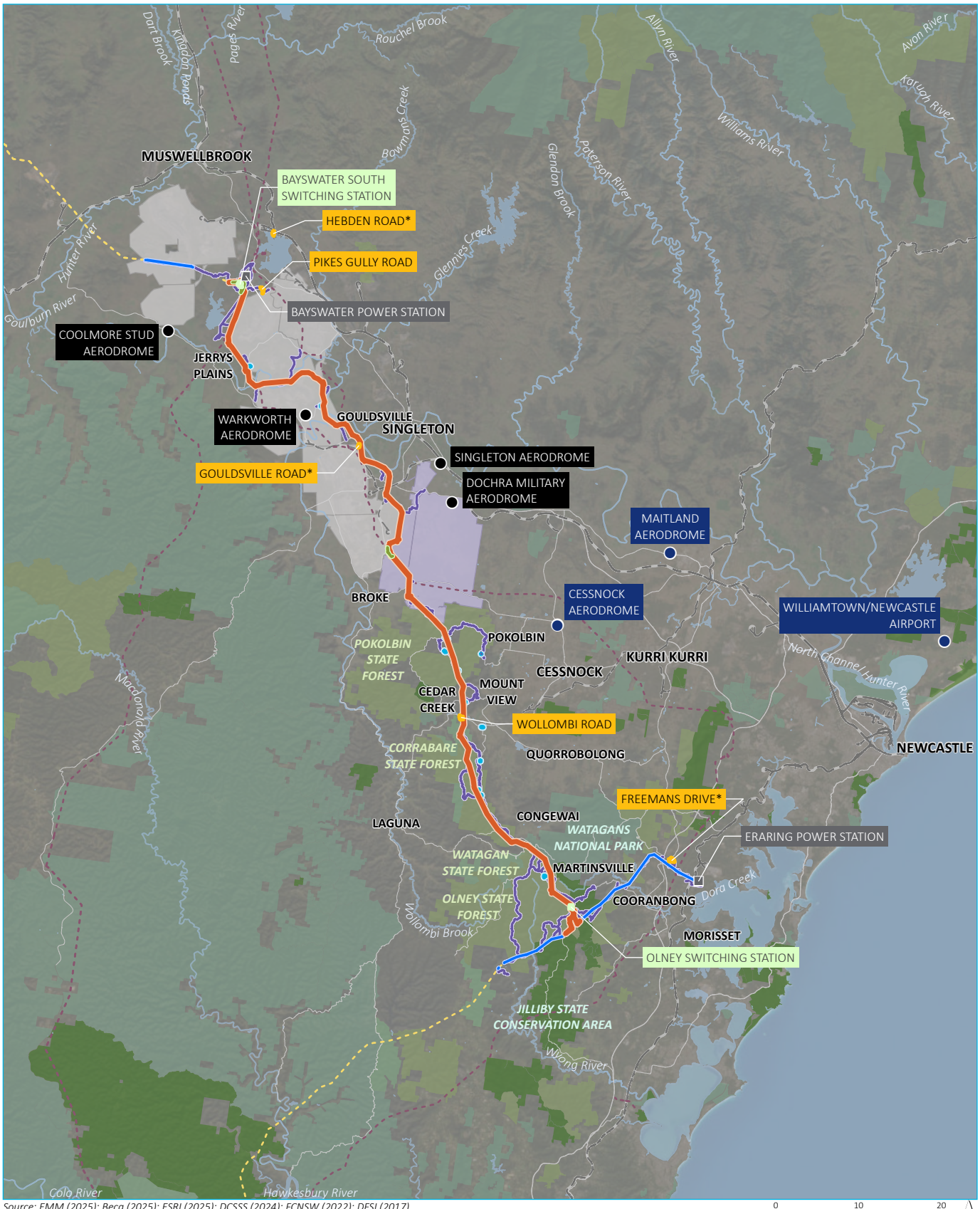
The project impact area is mostly within class G (uncontrolled) airspace, with a small part of restricted airspace associated with the Singleton Military Area. Class G (uncontrolled) airspaces are commonly used for low-level flights for private and recreational flying, such as agriculture, aerial surveys or training flights.

Aerial operations within and surrounding the project impact area include:

- agricultural aerial application operations, including activities such as fertiliser, pest and crop spraying, which are conducted during the day below 500 feet above ground level from various airstrips on farmland surrounding the project impact area

- aerial baiting in national parks and other estate managed by NPWS, typically using helicopters
- emergency services operations, including aerial firefighting and aeromedical services undertaken by the RFS from Cessnock Aerodrome, Warkworth Aerodrome and RAAF Williamtown.

Air routes between airports are provided with a lowest safe altitude (LSALT), which is the lowest altitude that an aircraft can fly on that route without visual reference to the ground or water. The *Civil Aviation Safety Regulation Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedure Design* prescribes a minimum obstacle clearance of 1000 feet (305 metres) below the published LSALT be maintained along each air route. A protection area 13 kilometres (7 nautical miles) laterally either side of an air route is used to assess the lowest safe altitude for the air route. There are 9 air routes overhead and within 7 nautical miles of the project impact area (see Table 5 of *Technical Report 16 - Aviation impact assessment*).



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

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KEY

- Certified aerodrome
- Non-certified aerodrome

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

Certified and non-certified aerodromes surrounding the project impact area

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Figure 21.2

EMM
creating opportunities

21.3 Potential impacts – construction

21.3.1 Bushfire

Risk of bushfire from the project

Risks to public safety

During construction, the potential consequences of a bushfire would be dictated by the landform, vegetation cover and weather factors across the construction impact area, in combination with existing levels of community exposure and vulnerability to bushfire. The construction of the project would have negligible impacts on the existing landform, vegetation cover and weather conditions within the construction impact area. Although vegetation clearance and construction works would be undertaken within parts of the HTP corridor, at switching station sites and at construction support sites, these works are not at a scale which would materially alter risks to public safety from bushfires.

Risk of bushfire ignition

Some construction activities have potential to start fires, meaning diligent control of potential fire ignition risks during construction would be required. Construction activities with potential to ignite fires are outlined in
Table 21.2.

Table 21.2 Potential ignition sources during construction

Potential ignition source	Description
Hot works	Metal grinding, cutting, welding or other works capable of producing hot sparks in the open which can come into contact with dry vegetative fuels starting a fire in weather conditions conducive to fire ignition and spread.
Dangerous goods	Storing or using flammable, explosive or hazardous materials near vegetation poses an ignition risk through potential fire, explosion, or exposure to nearby bushfire.
Earthworks/ vegetation clearing	During earthworks and vegetation clearing, substandard equipment maintenance and equipment defects have the potential to release hot particles/sparks capable of starting a fire in weather conditions conducive to fire ignition and spread.
Rock drilling	Substandard drilling equipment maintenance or equipment defects have the potential to produce sparks capable of starting a fire in weather conditions conducive to fire ignition and spread.
Vehicle movements	Vehicles driven or parked off-road have the potential to ignite nearby vegetation if contact with hot engine parts such as exhaust system components occurs.
Vehicle, helicopter or drone accidents	In the event of a vehicle, helicopter or drone accident, potential ignition could occur if contact is made with vegetation.

Potential ignition source	Description
Smoking	Cigarette butts discarded by smokers into vegetative fuels have the potential to ignite fires.
Unauthorised fire use	Lighting of fires for heating water, food or for warmth have the potential to ignite fires.

During construction, effective, reliable and proven risk controls can be applied to the range of construction activities to prevent accidental fire ignition and spread. As such, with systematic risk controls addressing each of the fire ignition risks in place, the likelihood of fire ignition and spread during construction activities would be very low. These risk controls and management measures are outlined in *section 21.5.*

Risk to the project from bushfire

Bushfire safety risk to the construction workforce

As the construction impact area traverses bushfire prone land, construction workers throughout the construction impact area have potential to be exposed to bushfire threats while travelling to/from and working within the construction impact area. Where possible, construction in State forests would be scheduled outside of the annual bush fire danger period (BFDP) (between October and March each year) when bushfire safety risks are minimal. For timely project delivery it may be necessary for construction activity to continue during the BFDP, subject to the application of a range of risk controls and management measures.

As construction of the project would be carried out within bushfire-prone land, with no shelter-in-place options for many locations, a bushfire safety system and a bushfire emergency management and evacuation plan which aim to prevent direct exposure of workers to bushfire impact would be developed. Key considerations of the bushfire safety system would include making sure workers would not be working in bushfire-prone locations under elevated fire danger conditions, systematic monitoring of fire weather and fire incident occurrence within and surrounding the construction impact area while work crews are in the field, and making sure a systematic bushfire evacuation plan contains readily trafficable evacuation routes (including alternative routes in forested areas) is in place and understood by workers. This would include close coordination with RFS and FCNSW fire teams. With a bushfire safety system in place, the bushfire risk to workers during construction would be as low as reasonably practicable.

Bushfire risk to temporary worker accommodation facilities

During construction, temporary worker accommodation facilities are planned to be built at the Hebden Road, Gouldsville Road and Freemans Drive construction support sites. The temporary worker accommodation facilities would be modular portable building types and require the maintenance of an APZ to BAL 10 specification. This would be largely achieved through construction support site design such that temporary worker accommodation buildings are at a sufficient distance inside the construction support site boundaries that BAL 10 can be achieved. APZs around temporary worker accommodations that achieve BAL 10 compliance are as follows:

- Hebden Road construction support site – near level site close to Lake Liddell with grassland dominant vegetation cover. A 36 metre APZ around the planned temporary worker accommodation location would meet BAL10 requirements
- Gouldsville Road construction support site – level site on the flats of the Hunter River with grassland dominated vegetation cover. A 36 metre APZ around the planned temporary worker accommodation location would meet BAL 10 requirements
- Freemans Drive construction support site – level site next to Jigadee Creek. An APZ of 67 metres from retained forest areas and 36 metres from grass would achieve BAL 10 requirements.

To inform detailed design of temporary worker accommodation facilities, BAL 10 contour maps have been developed for each construction support site, identifying parts of the construction support area where portable buildings can be located with BAL 10 or lower exposure (see *Technical Report 15 - Bushfire risk assessment*).

Evacuation procedures included in the bushfire safety system would apply to the temporary worker accommodation facilities.

Construction support sites bushfire risk

Where construction support sites incorporate temporary site offices, these would require establishment and maintenance of an APZ to BAL 10 specification. In the effectively level, grassland dominated sites selected for construction support sites, a 36 metre APZ/setback from unmanaged grassland vegetation would achieve a BAL 10 requirements. This applies to the Hebden Road, Pikes Bully Road, Gouldsville Road and Wollombi Road construction support sites. At any construction support sites with forest or woodland vegetation adjacent to the site, a 67 metre APZ/setback from areas of forest or woodland vegetation would be required. This applies to the Freemans Drive construction support site. The required temporary portable building setbacks from bushfire prone vegetation would be largely achieved through construction support site design such that portable buildings are located at a sufficient distance inside the construction support site boundaries that BAL 10 can be achieved.

To inform detailed design of temporary buildings within construction support sites, BAL 10 contour maps have been developed for each construction support site, identifying parts of the construction support area where portable buildings can be located with BAL 10 or lower exposure (see *Technical Report 14 – Bushfire risk assessment*).

21.3.2 Dangerous goods

During construction, various hazardous materials and dangerous goods would be used and/or stored within the construction impact area. Typical dangerous goods that would be used during construction include, but are not limited to:

- acetylene
- adhesives, glues and epoxies
- concrete and other mortar products

- cleaning agents
- cold-galvanising spray
- fuels, oils and lubricants (including diesel, unleaded petrol and thinners)
- paints and other paint markers
- pesticides and herbicides
- sulfur hexafluoride.

Dangerous goods would be stored at construction support sites and laydown areas located throughout the construction impact area. The storage of dangerous goods at construction support sites and laydown areas within the construction impact area would be planned so that hazardous materials are stored appropriately and at a suitable distance from sensitive receivers, in accordance with the thresholds established under the Applying SEPP 33 guideline. Establishing suitable buffer distances to sensitive receivers would be able to be achieved, given the distance of the construction impact area from nearby receivers in most locations.

However, in the event that minimum distances cannot be achieved (e.g. due to land constraints or a requirement to store volumes of hazardous materials in excess of storage thresholds), a risk management strategy would be developed as required to confirm that the project would not have a significant off-site risk. Dangerous goods would also be stored across multiple locations to avoid the concentration of risk at any one location.

Storage of dangerous goods and hazardous substances would be secure and in accordance with the supplier's instructions, and would comply with applicable legislation, guidelines and Australian Standards. This includes the NSW *Work Health and Safety Act 2011*, the NSW Work Health and Safety Regulation 2017 and the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005).

Dangerous goods would be transported in accordance with the NSW *Dangerous Goods (Road and Rail Transport) Act 2008* and NSW Dangerous Goods (Road and Rail Transport) Regulation 2014. Extended routes would avoid areas (such as road tunnels) prohibited by NSW Road Rule 300-2 (carriage of dangerous goods in prohibited areas). Small quantities would be transported by construction vehicles to work sites for use during construction. The refuelling of construction plant and equipment would be carried out through tanker trucks, which would travel on State and local roads.

The project may also require the handling and transport of contaminated soil, hazardous waste and asbestos waste. The handling and transport of contaminated soils, hazardous waste and asbestos waste would be adequately managed by the measures identified in *section 21.5*.

Based on the management approach described above and included in *section 21.5*, and adherence to relevant legislation, the risk associated with the storage, handling and transport of dangerous goods and hazardous materials during construction would be able to be managed to an acceptable level.

21.3.3 Electric and magnetic fields

During construction, the transmission line would not be energised (i.e. would not be operational) and would therefore not generate an electric or magnetic field. Existing electrical infrastructure such as existing transmission lines and substations have been designed to meet relevant EMF standards and therefore construction work in proximity to existing infrastructure would not create EMF risks.

21.3.4 Telecommunications

During construction, the transmission line would not be energised (i.e. would not be operational) and would therefore not generate radio frequency interference that would impact existing telecommunications services.

21.3.5 Aviation

The main risks to aviation safety during construction would be associated with construction of transmission towers and the use of cranes. Transmission towers would have a maximum height of 85 metres above ground level and construction cranes would be around 15 metres above the height of the transmission towers. The construction impact area falls outside the OLS for each of the certified aerodromes within 30 nautical miles of the construction impact area, meaning transmission towers and the use of cranes during the construction of the project would not impact any OLS.

Non-certified aerodromes do have an OLS under CASR Part 139 Manual of Standards – Aerodromes. However, the HVGC at Warkworth Aerodrome have established an unofficial OLS in consultation with nearby coal mines to protect gliders from potential impacts from mining operations. Potential impacts to the unofficial OLS of Warkworth Aerodrome associated with construction of the HTP were assessed based on the assumptions ascribed to OLS for certified aerodromes (see *Technical Report 16 - Aviation impact assessment*). The assessment concluded that while the OLS would be impacted by construction of HTP corridor, that potential adverse impacts to glider safety and activities would be minimal with the implementation of mitigation measures developed in consultation with the HVGC (see *section 21.5*).

The construction impact area occurs a significant distance from the remaining non-certified aerodromes. Potential impacts to aerial operations, and from the construction transmission towers and the use of cranes would be negligible.

PANS-OPS assessments carried out showed that no PANS-OPS surfaces would be infringed during the construction of the project by transmission towers or cranes. Cranes are unlikely to present a hazard provided they are a clearly visible colour against the background terrain and/or have an obstacle light fitted near the top of the crane. Cranes that are greater than 60 metres in height will have lighting fitted near the top of the crane.

Helicopters and/or drones would also be used during construction for stringing activities. Helicopters and drones would be operated in accordance with the applicable Civil Aviation Safety Regulations 1998 and obligations in relation to other airspace, aerodrome users and communication requirements in Class G airspace, to reduce their risk from other aviation activity in the area. Their operation would be conducted with prior notification being provided to all airspace users in the area. Prior to the commencement of construction, relevant stakeholders, including Airservices Australia,

the Australian Department of Defence, HVGC, as well as affected private landowners would be notified about the use of cranes, helicopters and drones during the construction of the project.

The use of cranes and erection of transmission line structures during construction may also result in risks to aerial fertiliser and pesticide application and emergency services operations. The cranes and transmission towers would result in additional obstacles, which could result in incidents if not effectively managed and mitigated and aircraft are operating in close proximity to construction infrastructure. Risks to aerial operations would be minimised with the implementation of mitigation measures provided in *section 21.5* including notifying relevant stakeholders of construction of the project.

21.4 Potential impacts – operation

21.4.1 Bushfire

Risk of bushfire from the project

Bushfire risk to public safety

During operation, electricity transmission infrastructure including transmission lines, transmission towers and switching stations would have a negligible impact on the factors which affect bushfire severity, including fuels, landform and weather. Although vegetation maintenance would be carried out within parts of the HTP corridor and at switching stations, such works are not at a scale which could materially alter the consequences of bushfires on public safety.

The maintenance of existing access tracks, and the addition of new access tracks (for accessing transmission towers and easements) associated with the project would improve emergency access and egress for firefighting agencies undertaking fire management operations within and surrounding the project.

Likelihood of bushfire ignition during operation

Potential ignition sources from high voltage transmission infrastructure during operation include:

- hot work during maintenance activities that generate sparks
- asset failure and electrical faults in maintenance equipment
- motor vehicles
- accidental ignitions, including from workers smoking
- storage or use of hazardous materials, which could result in chemical fire or exposure
- encroachment of vegetation within required clearances set for operational and safety requirements, including bushfire risk management (a minimum of 13.5 metres below the conductors at maximum operating temperature)
- potential for trees to fall onto the transmission towers, conductors and associated infrastructure within the easement.

During operation, effective, reliable and proven risk controls can be applied to the range of activities to prevent accidental fire ignition and spread. As such, with systematic risk controls addressing

each of the fire ignition risks in place, the likelihood of fire ignition and spread during operation would be very low. These risk controls and management measures are outlined in *section 21.5.*

Further, as is outlined in *section 21.2.1*, 500 kV transmission lines have been operating in NSW for more than 42 years and have not resulted in bushfire ignitions. For instance, the Eraring to Kemps Creek 500 kV line was commissioned in 1982 and has been in continuous operation since. Despite traversing heavily forested areas, the Eraring to Kemps Creek 500 kV line has been in continuous operation through periods of inclement weather including major storms and catastrophic fire weather without any incident of bushfire ignition.

In Australia, the history of bushfire ignitions from electrical infrastructure is overwhelmingly associated with the lower voltage distribution network infrastructure rather than transmission network infrastructure. As such, the bushfire ignition risk from transmission infrastructure is considered to be minimal. In addition, network operators of high voltage transmission network infrastructure have developed extensive policies and guidelines which require regular management of transmission line assets to manage the potential bushfire risk associated with their operation.

Risk to emergency egress and evacuation

The project design has, as far as practicable, avoided the colocation of the HTP corridor with major strategic access and egress roads, including:

- Broken Back Road in the Pokolbin State Forest
- North Road/Trig Road/Cabans Road in the Corrabare State Forest
- Watagan Forest Road and Wollombi Forest Road in the Olney State Forest.

During consultation with the FCNSW, it was confirmed that these roads provide important north-south access and egress through the eastern parts of the plateaus traversed by the HTP corridor. Importantly, they provide strategic locations from which firefighting agencies (including the FCNSW and RFS) undertake containment operations for the protection of communities to the east. The project would not prevent firefighters from using these strategic trails for fire management operations.

The project would provide additional access tracks (for accessing transmission towers and easements) and some upgrades to existing roads to provide improved access for operation. These works would improve access and egress in the area surrounding the project during operation. In relation to the Olney switching station, a new access road section would provide access around the western side of the switching station to provide strategic access for firefighting in that location.

Risk to the project from bushfire

Bushfire safety risk to workforce

During operation, activities would be largely limited to asset and easement maintenance activities, and potentially fault investigation and response. Where practicable, inspection and maintenance activities would be scheduled to occur outside of the BFDP. Where these activities are to be carried out during the BFDP, activity-specific bushfire safety precautions would be planned and implemented, as occurs routinely for such operational activity across transmission networks traversing bushfire-prone areas in NSW.

Exposure to bushfire impact – 500 kV towers and transmission lines

Risks to project infrastructure from bushfire during operation are anticipated to be low. 500 kV transmission line infrastructure and easements are designed to achieve high network resilience to bushfire impact. Towers would be constructed from non-combustible materials, and their placement in cleared/partially cleared easements (70 metres wide) would provide a high degree of resilience to bushfire impact. Transmission towers would be up to 85 metres tall, enabling conductors to be suspended high above managed vegetation cover in easements. The lowest conductor in each circuit would be suspended more than 13.5 metres above ground level, and tree clearance in easements would be carried out to maintain a minimum 10 metre gap above any easement section with retained tree cover. The transmission line design, including the materials selected for project infrastructure contributes to the provision of passive resilience of the project to bushfire.

Exposure to bushfire impact – switching stations

The Olney and Bayswater switching stations would be in bushfire prone land. Both switching stations would be provided with ang APZ to slow the spread of fire and ensure that radiant heat from an approaching bushfire is at levels unlikely to cause damage to switching station components. APZ widths have been determined to achieve BAL 29 (relevant for non-combustible structures) specified in *Planning for Bushfire Protection 2019* (RFS, 2019). Further detail, including APZ mapping, is provided in *Technical Report 14 – Bushfire risk assessment*.

The APZ for the Bayswater South switching station would be as follows:

- western side of switching station (adjacent to woodland): 32 metres
- northern, eastern and southern sides of switching station (adjacent to grassland): 25 metres.

The APZ for the Olney switching station would be as follows:

- western side of switching station (adjacent to woodland): 75 metres
- northern, eastern and southern sides of switching station (adjacent to grassland: 55 metres.

Additionally, the switching station would be designed to meet the Australian Standard *AS 2067:2016 for Substations and High Voltage Installations Exceeding 1kV*. In combination with the setbacks from vegetation achieved by establishment and maintenance of the APZ, the switching stations would be designed in a way which provides passive protection against bushfire impact.

Installation and ongoing maintenance of a Category 1 fire trail around the western side of the Olney Switching station site, within the APZ, would also be carried out. This fire trail would connect back onto Watagan Forest Road north and south of the switching station site. The fire trail would facilitate expedient, indirect firefighting tactics by fire responders from the western side of the Olney switching station. This will serve to maintain the strategic function of Watagan Forest Road for containing fires to the west, preventing their spread toward communities in the Dora Creek valley (e.g. Martinsville and Cooranbong).

Transmission system outage potential due to bushfire impact

During above average bushfire seasons when forest fuels have significant moisture deficits, bushfires impacting 500 kV transmission lines have the potential to cause power supply interruption (mostly transient) due to flame interaction with conductors. Instances of such interruptions on 500 kV networks are relatively rare, but it is not feasible to fully eliminate the potential for such outages

to occur during bushfires. Outage potential is linked to flame height, which would be minimised where vegetation cover in easements is limited largely to grassy vegetation with any woody vegetation maintained to less than 2 metres high. 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 metres below the conductors at maximum operating temperature). Vegetation with mature growth heights up to 2 metres can remain, while vegetation exceeding 2 metres will be managed to maintain these clearance heights.

During the more than 6-month severe 2019/20 bushfire season, where bushfires impacted existing 500 kV networks, a total of 11 outage events occurred across 3 different 500 kV lines. Similarly, it is possible that HTP would experience outage events episodically during severe bushfire events.

21.4.2 Dangerous goods

Dangerous goods would be stored and transported during operation, maintenance and emergency works. Materials classed as dangerous goods that were carried forward to the preliminary risk screening included:

- liquefied petroleum gas (LPG) (to be used in steel cutting needed for construction, maintenance or emergency works)
- acetylene (to be used in welding and hot works needed for maintenance or emergency works)
- compressed oxygen (to be used in welding and hot works needed for maintenance or emergency works)
- chlorine (to be used in the treatment of cooling water for switching station equipment)
- diesel or petrol (to be used as back-up electricity generation for operations and maintenance)
- lubricating oils and greases (to be used for general maintenance of plant, vehicles and equipment)
- biocides, algaecides and biodispersants (to be used in the treatment of cooling water for switching station equipment)
- pesticides and herbicides (for weed control)
- insulator cleaning solvent (to be used in insulator cleaning)
- corrosion/scale inhibitors (to be used in the treatment of cooling water for switching station equipment).

The results of the preliminary risk screening for hazardous materials and dangerous goods to be stored and transported during operation are outlined in *Technical Report 15 – Preliminary risk screening*.

The preliminary risk screening has demonstrated that:

- the storage and transport of dangerous goods during operation do not exceed the relevant risk screening thresholds in Applying SEPP 33
- there are no other risk factors, and the industry is not captured as an example of a potentially hazardous industry under Applying SEPP 33 during operation.

An assessment in accordance with State Environmental Planning Policy (Resilience and Hazards) 2021 and Applying SEPP 33 has demonstrated that the project is not potentially hazardous during operation. Therefore, a preliminary hazard analysis is not required for the project.

The storage of dangerous goods and hazardous materials during operation and maintenance would be in accordance with the supplier's instructions, and would comply with applicable legislation, guidelines and Australian Standards. Dangerous goods would be transported to and from the operation impact area during operation and maintenance in accordance with the *Dangerous Goods (Road and Rail Transport) Act 2008* and Dangerous Goods (Road and Rail Transport) Regulation 2014.

As is outlined in *section 21.1.3*, the preliminary risk screening for the storage of flammable liquids was based on minimum distances to sensitive and other receivers included in Applying SEPP 33. The preliminary risk screening concluded that the minimum distances are minor in relation to the operation impact area and would be incorporated during detailed design of construction support sites to ensure the project is not potentially hazardous.

Mitigation measures have been included in *section 21.5* in relation to the storage and transport of dangerous goods during construction and operation of the project. The storage of these materials would be sited and arranged so that dangerous goods are stored appropriately and at a suitable distance from any nearby sensitive receivers.

21.4.3 Electric and magnetic fields

The project has been designed to reduce the intensity of the EMF generated and minimise the fields that people would encounter over prolonged periods. An overview of the scientific understanding of EMF and the likely levels of EMF generated by the project is provided in subsequent sections.

Overview of EMF risks relevant to operation

A large number of studies have been conducted over many years to investigate the possibility of adverse health consequences from ELF EMF, including childhood leukaemia, other childhood cancers, cancers in adults, depression, suicide, cardiovascular disorders, reproductive dysfunction, developmental disorders, immunological modifications, neurobehavioural effects and neurodegenerative disease. In general, no links between ELF EMF and these adverse health consequences has been found, however in the case of childhood leukaemia, several studies have reported a statistical association between childhood leukaemia and prolonged exposure to higher-than-normal magnetic fields. This link between prolonged exposure to ELF EMF and childhood leukaemia has led the International Agency for Research on Cancer to classify magnetic fields as a "possible carcinogenic to humans". However, as no mechanism for an effect has been established after 30 years of laboratory research, the UK National Radiological Protection Board's Advisory Group stated in 2001:

> *"In the absence of clear evidence of a carcinogenic effect in adults, or of a plausible explanation from experiments on animals or isolated cells, the evidence is currently not strong enough to justify a firm conclusion that such fields cause leukaemia in children."*

Reviews by the World Health Organization in 2007 and European Commission in 2015 identified that the scientific evidence supporting the other health effects is very weak or does not support it at all.

EMFs also have the potential to interfere with implantable medical devices such as pacemakers and defibrillators. However, standards for the design and manufacture of implantable medical devices require that the devices need to be designed with an immunity up to the general public reference levels as set by ICNIRP. In the case of hearing aids or cochlear implants, it is possible for audible interference ('buzzing') to be experienced within the transmission line easement or directly below the conductors, but this would not damage the devices or the ear (British Cochlear Implant Group, 2020).

EMFs have the potential to affect farmed mammal species similarly to humans. Where EMF levels are within the ICNIRP Guidelines, there is unlikely to be any perceptible adverse health effect on animals. In 1991, Sir Harry Gibbs published the findings of an extensive inquiry into community needs and high voltage transmission line development and concluded:

> *"No reason exists for concern as to the effect of the fields on animals or plants."*

In 2011, the UK Government adopted a National Policy Statement (NPS) for Electricity Networks Infrastructure. The NPS states:

> *"There is little evidence that exposure of crops, farm animals or natural ecosystems to transmission line EMFs has any agriculturally significant consequences."*

In 2005, Fernie and Reynolds (2005) published a review of bird studies and found that:

> *"Most studies indicate that EMF exposure of birds generally changes, but not always consistently in relative effect or direction, their behaviour, reproductive success, growth and development, physiology and endocrinology, and oxidative stress under EMF conditions."*

As such, any EMF generated from the project is unlikely to have notable adverse effects on animals or plants.

EMF levels for transmission lines

The potential EMF from operation of the proposed transmissions lines for the project has been assessed against the ICNIRP Guidelines in accordance with the principle of prudent avoidance (see *section 21.1.3*).

EMF levels directly underneath and at the edge of the transmission line easement would be within the safe limits provided within the ARPANSA recommended ICNIRP public exposure guidelines (i.e. 9.1 kV per metre), when the following absolute minimum ground clearances are achieved by the design of the project:

- 13.5 metres for the majority of the alignment
- 26 metres at 330 kV transmission line crossings
- 14.6 metres at 66 kV and 132 kV line crossings.

The maximum magnetic fields for the transmission line have been evaluated against the applicable limits, including magnetic fields directly under the transmission line and at the edge of the transmission line easement. For all results calculated at or above the minimum ground clearances, the maximum calculated magnetic fields fall within the applicable limits of 2000 milligauss. This includes where the proposed transmission line crosses and runs parallel to other existing and proposed lines.

The maximum electric field strength for the proposed transmission line has also been evaluated against the applicable limits, including electric fields directly under the transmission line and at the edge of the transmission line easement. For all results calculated at or above the minimum ground clearances, the maximum calculated magnetic fields fall within the applicable limits, including where the proposed transmission line cross and runs parallel to other existing and proposed lines. Overall, it unlikely that there would be any prolonged human exposure to EMF from the proposed transmission line given the design has adopted 'prudent avoidance' principles, the project would comply with the ICNIRP guidelines and dwellings would not be permitted within the easement.

EMF levels for switching stations and substations

The anticipated public exposure to EMF at the proposed switching stations and existing substations are summarised in Table 21.3.

Table 21.3 Anticipated public exposure to EMF at proposed switching stations and existing substations

Project element	Anticipated public exposure to EMF
Bayswater South switching station	The proposed Bayswater South switching station would be enclosed by security fencing, with access strictly limited to authorised personnel. The surrounding land is used for power generation and resource extraction, with the nearest identified publicly accessible area being the New England Highway, which is more than 2 km from the proposed switching station. As such, public exposure to EMF from the Bayswater South switching station is anticipated to be negligible. In addition, the Bayswater South switching station is around 200 m from the existing Bayswater substation. At this distance, it is not expected that the EMF levels from each source would significantly influence each other.
Olney switching station	The proposed Olney switching station would be enclosed by security fencing, with access strictly limited to authorised personnel. The surrounding land is used for forestry and recreation. No dwellings, dedicated recreation areas, facilities or other sensitive locations have been identified in the vicinity of the switching station. As such, public exposure to EMF from the Olney switching station is anticipated to be negligible.
Bayswater substation (existing)	No change to the existing EMF levels associated with the Bayswater substation are anticipated as a result of works to connect the HTP, meaning public exposure to EMF would not be increased.
Eraring substation (existing)	No change to the existing EMF levels associated with the Eraring substation are anticipated as a result of works to connect the HTP, meaning public exposure to EMF would not be increased.

The design of the proposed new switching stations and upgrades to existing substations would meet the ICNIRP public exposure guidelines such that:

- the electric field strength one metre above ground at the boundaries of these project elements (where access is unrestricted) would be within the ICNIRP reference level of 5 kV per metre

- the magnetic field one metre above ground at the boundaries of these project elements (where access is unrestricted) would be within the ICNIRP magnetic field reference level of 2000 milligauss.

In line with the approach of 'prudent avoidance', design of the project may include the implementation of further controls to restrict access to areas around the new switching stations and existing substations.

Occupational exposure to EMF at proposed switching stations and existing substations has also been assessed to determine the risk to workers accessing these project elements. Occupational limits set by the ICNIRP are higher than that for public exposure, reflecting the assumption that workers are healthy adults, are trained, and are exposed for shorter periods in controlled environments. The design of the proposed switching stations and modifications to existing substations would be such that EMF in all accessible areas would comply with the ICNIRP Occupational Guideline Levels, including:

- Electric field: 10 kV per metre
- Magnetic field: 10,000 milligauss.

21.4.4 Telecommunications

During operation, the calculated emission levels of radio frequency interference applicable to AM reception exceed the AS 2344 limits at the edge of the transmission line easement during wet conditions only. It has been determined that, under wet conditions, radio frequency interference is likely to negatively impact commercial AM radio reception within 131 metres of the centre of the transmission line easement. Other forms of communication (i.e. commercial FM radio, aeronautical VHF, UHF CB radio and digital television) would not be noticeably affected by radio frequency interference at the edge of the transmission line easement.

Where the transmission line runs parallel to other existing transmission lines, the only potential radio frequency issues during operation would be for AM radio reception during wet conditions. The contributions of radio frequency interference from existing parallel lines to radio frequency interference from the proposed new transmission line would not alter results for FM radio, aeronautical VHF, UHF CB radio or digital television.

21.4.5 Aviation

The transmission line and transmission towers would not infringe on any certified airport OLS or PANS-OPS surfaces during operation. Similarly, operational infrastructure would not impact air routes, and would not impact aviation navigation and communication facilities which are a sufficient distance from the operation impact area (the closest being at Maitland Aerodrome).

Non-certified aerodromes

The operation of the project is not anticipated to impact operations at non-certified aerodromes. Operations at Singleton Aerodrome and Coolmore Stud Aerodrome would not be impacted by the project due to aircraft typically operating well above the operation impact area from these aerodromes.

Warkworth Aerodrome is one nautical mile to the west of the operation impact area and is operated by the HVGC. EnergyCo has consulted with the HVGC since August 2024. Through this consultation the HVGC raised safety concerns about the proposed 500 kV transmission line, citing risks of aircraft collisions during normal operations and emergencies at Warkworth Aerodrome.

Typical operations at the non-certified aerodrome involve a glider and tow plane combination. These are usually airborne within 600 metres of the take-off point and, in a worse case, are airborne within 1000 metres from the take-off point. This indicates that a glider and tow plane combination taking off to the east would take around one minute to reach the operation impact area and would be at a height of more than 500 feet (around 152 metres) or more above ground level. The transmission towers for the project are planned to have a maximum height of 85 metres above ground level and would be on terrain around the same height as the runway at Warkworth Aerodrome. There is no minimum clearance distance that must be achieved between an aircraft and infrastructure such as a powerline within the CASRs during take-off and landing. The CASRs mandate that pilots must operate aircraft safely and maintain obstacle awareness. Therefore, the glider and tow place combination would obtain an acceptable height of more than more than 220 feet (67 metres) above the transmission lines/towers (see *Technical Report 16 – Aviation impact assessment)*.

Competition gliders may descend to a low altitude at high speed towards a finish line around 3 kilometres from the aerodrome, then climb above the operation impact area before landing at Warkworth Aerodrome. The competition director would need to consider the project in task planning and finish placement, including possibly setting a higher finish altitude for safety. The project is unlikely to create a hazard to these types of flights. EnergyCo has consulted HVGC on emergency procedures and training carried out by the HVGC which can be conducted in the area between the aerodrome and the HTP to avoid and mitigate potential adverse impacts to glider safety and activities. Further detail on glider take-off and landing are included in *Technical Report 16 – Aviation impact assessment.*

Aircraft from Sydney flying schools, which also use Warkworth Aerodrome for circuit and landing practice, would achieve adequate altitude above the operation impact area.

Aerial operations

The project would reduce the area available for the aerial application of agricultural products as the use of aircraft would not be able to normally occur under transmission lines however could occur in close proximity to them. Following the finalised design of the project, EnergyCo will provide relevant details of the project to aerodrome owners to enable them to consider the potential impact of the transmission towers and transmission lines on their operations. Project details, including tower locations and height data, as well as aerial operation restrictions will also be provided to nearby landowners once finalised to facilitate flight planning for aerial application operators at nearby properties.

AS3891-Air Navigation - Cables specifies the requirements for the provision of marker balls on overhead infrastructure such that a visual warning is provided for pilots of aircraft. No towers or supporting structures within the HTP corridor require the installation of markers balls under the standard based on distances and slopes between the HTP corridor and existing aerodromes. However, the installation of marker balls will be considered during detailed design as requested by relevant stakeholders, especially where transmission structures occur proximity to Warkworth, HLS,

and the Singleton Military Area. The transmission towers would be large and highly visible structures that would be readily identified by pilots at a sufficient distance to be avoided. The transmission lines are less visible but would be apparent between towers.

Obstacle lighting on transmission towers structures is not required on structures outside a certified aerodrome OLS. The installation of obstacle lighting will be considered during detailed design as requested by relevant stakeholders for non-certified aerodromes and HLS within 5.6 kilometres (3 nautical miles) of the HTP corridor.

The HTP would be located outside the clearance zones of aviation navigation aids, radar systems, and air traffic control systems. The closest air traffic control radar facility– the Mt Sandon Route Surveillance Radar – is located around 139 kilometres (75 nautical miles) north of the HTP corridor.

It is expected that ongoing consultation with landholders would identify areas where regular aerial application operations occur. The operation of the project is not anticipated to impact local aerial operations.

Aerial baiting in the vicinity of the proposed transmission line is likely to be conducted to the same standard as occurs today for existing similar transmission lines. Aerial baiting managed by NPWS may occur within neighbouring public and private properties where agreement from the respective adjoining land manager is obtained and where baiting is part of a cooperative, cross-tenure baiting program. The NPWS guidelines require that aerial baiting must only be carried out during daylight hours and, when flying to and from NPWS estate, operators are required to fly at a minimum of 500 feet AGL and at a safe height to remain clear of obstacles and hazards.

Aerial firefighting and medical emergency evacuations may also occur throughout the area surrounding the project footprint. Similar to aerial baiting, these services are more likely to use helicopters. Aerial firefighting operations are only conducted after extensive planning and review by local emergency services to ensure risks such as existing obstacles and hazards are appropriately considered. When used, emergency medical helicopter flights are able to choose a suitable landing area away from obstacles and hazards or, if required, can conduct winching operation to retrieve patients in areas not suitable for a landing.

The operation of the project is not anticipated to impact aerial firefighting operations or aeromedical services. Most emergency aviation services organisations have formal risk management programs to assess the risks associated with their operations and to implement applicable treatments in order to maintain an acceptable level of safety. EnergyCo have consulted relevant stakeholders including the NSW Ambulance Service and the NSW Ambulance Service undertaking aerial fighting operations and aeromedical services respectively such that relevant project information can be included and considered in their risk management programs.

Furter details on potential impacts to aerial operations from operation of the HTP is provided *Technical Report 16 – Aviation impact assessment.*

21.5 Mitigation and management

The mitigation and management measures that will be implemented to avoid or minimise potential hazards and risks are listed in Table 21.4.

Mitigation measures in other chapters that are relevant to the management of hazards and risks include:

- *Chapter 11 (Traffic and transport)*, specifically measures which address traffic and transport safety
- *Chapter 19 (Flooding)*, specifically measures which address flood risks
- *Chapter 20 (Contamination)*, specifically measures which address management of contaminated land and materials
- *section 22.3 (Waste)*, specifically measures related to handling waste.

Table 21.4 Proposed mitigation and management measures – hazard and risk

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
BF1	Bushfire emergency and evacuation	A bushfire emergency management and evacuation plan (BEMEP) will be prepared and implemented in accordance with the risk management measures detailed in *Chapter 7 (Management)* of *Technical Report 14 - Bushfire risk assessment* and the requirements of NSW RFS. The BEMEP will outline procedures for: • monitoring forecast fire danger ratings, alerts and warnings, and any fire incidents, and communicating this information to the construction and operational workforce • evacuating the project impact area in response to fire warnings or incidents, including protocols for authorising and supervising evacuations and identifying off-site refuge locations and evacuation routes (including alternative emergency evacuation routes in forested areas) • reporting fire and smoke sightings to the NSW RFS, FCNSW, and the Singleton Military Area Range Control • determining when it is safe to returns to the project impact area following an evacuation • training for emergency response and evacuation management.	Detailed design Construction Operation	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
BF2	Bushfire	A bushfire safety system will be prepared and implemented in accordance with the risk management measures detailed in *Chapter 7 (Management)* of *Technical Report 14 - Bushfire risk assessment*. The bushfire safety system will detail restrictions and procedures to prevent accidental fire ignition during construction and operation, and contingency arrangements for workers to extinguish accidental fire ignitions at the source while the fire can still be controlled with portable extinguishers and on-site equipment. In particular, the bushfire safety system will include: • engagement protocols with NSW RFS and FCNSW fire teams • a hot works management system for implementation during construction • a smoking prohibition and a designated smoking area protocol • fire-safe work procedures for earthmoving and drilling works • protocols for driving and parking vehicles off established roads to minimise the potential for accidental fire ignition from vehicle exhausts • measures to minimise worker exposure to bushfire risk, including exclusion of works during elevated fire danger conditions, active fire weather and incident monitoring, and a clearly communicated bushfire evacuation plan with primary and alternative trafficable routes.	Detailed design Construction Operation	All locations
BF3	Bushfire (fire prevention quality assurance)	A works quality auditing process will be applied to construction contractors and will incorporate audit criteria assessing the implementation of the required fire prevention, preparedness and response-readiness measures detailed in *Chapter 7 (Management)* of *Technical Report 14 - Bushfire risk assessment*.	Construction	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
BF4	Bushfire (project design, operation and maintenance)	The project will be designed, operated and maintained to reduce bushfire risk to and from project infrastructure in accordance with the applicable standards detailed in *Chapter 7 (Management)* of *Technical Report 14 - Bushfire Risk Assessment*, including: • transmission lines will be designed to meet or exceed design standards in Australian Standard *AS/NZS 7000:2016 Overhead line design* • easements will meet or exceed design standards in Australian Standard *AS/NZS 7000:2016 Overhead line design – Appendix CC* • switching stations will meet or exceed design standards in Australian Standard *AS 2067:2008 Substation and high voltage installations exceeding 1 kV AC* • maintenance and operation of the transmission infrastructure will be carried out in line with Australian Standard *AS 5577:2013 Electricity Network Safety Management Systems* • Asset management will be carried out in line with *ISO 55001:2014 Asset Management – Management Systems – Requirements*	Detailed design Construction Operation	All locations
BF5	Bushfire (asset protection zones)	APZs will be established for Bayswater South and Olney switching stations, temporary worker accommodation and project office buildings at construction support sites, in accordance with the requirements of *Planning for Bushfire Protection 2019* (NSW RFS 2019) and NSW RFS standards for APZ, and as detailed in *Technical Report 14 -Bushfire Risk Assessment*. Routine inspection and control of vegetation will be carried out for APZ maintenance.	Detailed design Construction Operation	Construction support sites Switching stations
BF6	Bushfire (Olney switching station)	A fire trail will be installed and maintained within the APZ on the western side of Olney switching station, providing connection to Watagan Forest Road.	Construction Operation	Olney switching station

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
BF7	Bushfire (vegetation maintenance)	Cyclic inspections and control of vegetation within transmission line easements and hazard tree zone will be carried out in accordance with Transgrid standard for *Maintenance of Easements and Access Tracks.*	Construction Operation	HTP corridor and hazard tree zone
BF8	Bushfire (firefighting water supply)	Where reticulated (mains) water supply is not available, a static water supply (tank) will be provided at Bayswater South and Olney switching stations in accordance with the requirements of *Planning for Bushfire Protection 2019* (minimum capacity of 20,000 litres). Design details will be confirmed during detailed design. Where reticulated (mains) water supply is available, hydrant spacing, design and sizing is to comply with the relevant clauses of AS 2419.1:2021.	Detailed design Construction Operation	Bayswater South and Olney switching stations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
DG1	Storage and use of dangerous goods	Dangerous goods will be stored in accordance with suppliers' instructions and relevant legislation, Australian Standards, and applicable guidelines. Dangerous goods storage may involve bulk storage tanks, chemical storage cabinets/ containers or impervious bunds. Any storage areas will be designed in accordance with Australian Standard *AS1940: The storage and handling of flammable and combustible liquids* where applicable. The storage and use of dangerous goods will be carried out in line with the following: • all personnel required to work with dangerous goods and other hazardous material will be trained in their safe use and handling • all chemicals or other dangerous goods will be stored in a bunded area and away from any drainage lines or pits. The capacity of the bunded area will be at least 130% of the largest chemical volume contained within the bunded area • no refuelling or bulk herbicide preparation will occur within 40 m of natural drainage lines • in the event that minimum distances cannot be achieved (e.g. due to land constraints or a requirement to store volumes of hazardous materials in excess of storage thresholds), a risk management strategy will be developed as required to confirm that the project would not have a significant off-site risk.	Construction Operation	All locations
DG2	Accidental spills of dangerous goods	Environmental spill kits containing spill response materials suitable for the works being undertaken will be kept on site at all times and be used in the event of a spill. Any spills will be contained, cleaned up promptly and immediately reported to the relevant site representative.	Construction Operation	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
DG3	Transport of dangerous goods	Dangerous goods and hazardous substances will be transported in accordance with relevant legislation and codes, including the *Dangerous Goods (Road and Rail Transport) Act 2008,* Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998 and the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission, 2018).	Construction Operation	All locations
DG4	Storage and transport of dangerous goods during operation	During operation, storage and transport of dangerous goods will be managed to ensure the development remains below the potentially hazardous screening criteria in Applying SEPP 33.	Operation	All locations
EMF1	Public exposure to EMF	Detailed design for the project will be developed to comply with the following criteria for public exposure to EMF: • Magnetic fields: 2000 milligauss being the ICNIRP guideline 'Reference Level' • Electric fields: 9.1 kV per metre directly under the lines and at the edge of easement, ensuring compliance with the ICNIRP guideline 'Basic Restriction', and 5 kV per metre at the boundary of switching stations (where access is unrestricted), ensuring compliance with the ICNIRP reference level.	Detailed design	Transmission line, substation modifications, new switching stations
EMF2	Occupational exposure to EMF	Detailed design for the proposed switching stations and modifications to existing substations will be developed to comply with the following criteria for occupational exposure to EMF: • Magnetic fields: 10,000 milligauss • Electric fields: 10 kV per metre.	Detailed design	Substation modifications and new switching stations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
TC1	Impacts to AM radio	Investigations will be carried out during detailed design to determine the AM radio impacts to receivers within 131 m of the centre of the transmission line. The measured radio frequency interference levels at a sensitive receiver location will be investigated to determine if compliance with the relevant limits can be achieved for at least 80% of the time with a confidence level of at least 80% (80/80 rule).	Detailed design	Sensitive receivers within 131 m of the centre of the transmission line
AS1	Safety of Aircraft Movements	The final design of the HTP with coordinates and elevations will be provided to the following stakeholders prior to construction: • Airservices Australia • Commonwealth Department of Defence • Hunter Valley Gliding Club • NSW Ambulance Service • NSW National Parks and Wildlife Service • Forestry Corporation of NSW • NSW Rural Fire Service • Mine complexes traversed by HTP • Certified aerodrome within 30km of the HTP • Uncertified aerodromes and HLS within 10km of the HTP. Further notification will occur if the finalised design, upon completion of construction, alters the details supplied to the above listed stakeholders. Complete the Vertical Obstacle Notification Form in accordance with the requirements of Airservices Australia.	Detailed design	Operation impact area

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AS2	Safety of Aircraft Movements	To facilitate the flight planning of aerial application operators conducting flight operations on any property near the proposed transmission line, final design details of the project, including location and height information of the transmission line will be provided to landowners. This is so that, when asked for hazard information on their property, the landowner may provide the aerial application pilots and/or emergency services helicopter pilots with all relevant information.	Detailed design	Operation impact area
AS3	Safety of Aircraft Movements	The following stakeholders will be notified of the scheduling of the use of cranes, drones and helicopters for the construction of the project, prior to the commencement of relevant works: • Airservices Australia • Commonwealth Department of Defence • Hunter Valley Gliding Club • NSW Ambulance Service • NSW National Parks and Wildlife Service • Forestry Corporation of NSW • NSW Rural Fire Service • mine complexes traversed by HTP.	Detailed design	Operation impact area
AS4	Safety of Aircraft Movements	Helicopters and/or drones used for stringing will be operated in accordance with the applicable CASRs for their operations.	Construction	Operation impact area

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AS5	Obstacle lighting	Obstacle lighting and marking of the transmission lines is not considered to be required outside of the lateral limits of certified airports' OLS. Whilst not currently a requirement, this would need to be confirmed by CASA. The provision of markers on transmission lines and towers within 3 nautical miles of an uncertified aerodrome and the Singleton Military Area should be discussed with the appropriate stakeholders during detailed design. Obstacle lighting and marking of the transmission lines in the vicinity of HLS is to be considered where requested by nearby landowners.	Detailed design	Operation impact area
AS6	Obstacle lighting	Temporary construction cranes greater than 60m in height will have obstacle lighting fitted near the top of the crane.	Construction	All locations

21.6 Summary and conclusion

Hazards and risks have been considered throughout the design and planning of the project. Detailed consideration has been provided to bushfire, dangerous goods, electric and magnetic fields, telecommunications, and aviation. Strategies to minimise identified risks were incorporated into the design wherever feasible, and a variety of mitigation measures further address these risks and allow the project to meet relevant safety requirements.

With the implementation of the proposed bushfire risk management and mitigation measures, the risk of the project increasing bushfire risk to public safety within or surrounding the project area is anticipated to be low. During construction, bushfire risk would be minimised through measures such as hot works management protocols, fire-safe work procedures, active fire weather monitoring, and bushfire-specific emergency response and evacuation planning. Bushfire risk during operation would be managed through compliance with relevant design and maintenance standards and asset protection zones, as well as bushfire emergency and evacuation plans and safety management systems.

Risks to project infrastructure from bushfire during operation are anticipated to be low, with the implementation of the mitigation measures outlined in *section 21.5*. 500 kV transmission line infrastructure are design to achieve high network resilience to bushfire impact. Towers would be constructed from non-combustible materials, and their placement in cleared/partially cleared easements (70 metres wide) would provide a high degree of resilience to bushfire impact. Transmission towers would be up to 85 metres tall, enabling conductors to be suspended high above managed vegetation cover in easements. The lowest conductor in each circuit would be suspended more than 13.5 metres above ground level, and tree clearance in easements would be carried out to maintain a minimum 10 metre gap above any easement section with retained tree cover.

The Olney and Bayswater switching stations would be in bushfire prone land. Each switching station site would be provided with a surrounding APZ to make sure that trees are not able to fall into the switching stations and so that radiant heat from an approaching bushfire is at levels unlikely to cause damage to switching station components. The setbacks from vegetation achieved by APZ maintenance, in combination with the non-combustible, bushfire-resilient design of the switching stations would serve to provide passive protection against bushfire impact.

Installation and ongoing maintenance of a Category 1 fire trail around the western side of the Olney Switching station site, located within the APZ, would also be carried out. This fire trail would connect back onto Watagan Forest Road north and south of the switching station site. The fire trail would facilitate expedient, indirect firefighting tactics by fire responders from the western side of the Olney switching station. This will serve to maintain the strategic function of Watagan Forest Road for containing fires to the west, preventing their spread toward communities in the Dora Creek valley (e.g. Martinsville and Cooranbong).

The preliminary risk screening of dangerous and hazardous goods has demonstrated that the storage and transport of dangerous goods for the project do not exceed the relevant risk screening thresholds during construction or operation, and the industry is not captured as an example of a potentially hazardous industry under Applying SEPP 33.

During construction, the transmission line would not be energised (i.e. would not be operational) and would therefore not generate an electric or magnetic field. During operation, EMF levels directly underneath and at the edge of the transmission line easement would be within the safe limits in accordance with the ARPANSA recommended ICNIRP public exposure guidelines when appropriate absolute minimum ground clearances are achieved. In addition, switching stations and upgrades to substations would be designed to meet the ICNIRP public exposure and occupational exposure guidelines. In line with the approach of 'prudent avoidance', design methods may include the implementation of further controls to restrict access to affected areas around the new switching stations and existing substations.

During operation, the calculated emission levels of radio frequency interference applicable to AM reception exceed the AS 2344 limits at the edge of the transmission line easement during wet conditions only. Other forms of communication (i.e. commercial FM radio, aeronautical VHF, UHF CB radio and digital television) would not be noticeably affected by radio frequency interference at the edge of the transmission line easement.

The main risks to aviation safety during construction would be associated with construction of transmission towers and the use of cranes. Cranes are unlikely to present a hazard provided they are a clearly visible colour against the background terrain and/or have an obstacle light fitted near the top of the crane. Helicopters and/or drones would also be used during construction for stringing activities. Prior to the commencement of construction, relevant stakeholders, including Airservices Australia, the Australian Department of Defence and the HVGC, would be notified about the use of cranes, helicopters and drones during the construction of the project.

The transmission line and transmission towers would not infringe any certified airport OLS or PANS-OPS surfaces during operation. The operation of the project is not anticipated to impact operations at non-certified aerodromes, including Warkworth Aerodrome which is operated by the HVGC. Impacts to aerial operations, including aerial application of agricultural products, aerial baiting, and aerial emergency services, are also anticipated to be minimal during operation, provided appropriate consultation is carried out with relevant stakeholders. As per Australian standards the location of the HTP corridor is not within sufficient proximity to any certified or non-certified aerodrome to warrant the installation of marker balls and obstacle lighting. While the risk of collision with transmission infrastructure is minimal, the installation of marker balls on transmission infrastructure closest to Warkworth Aerodrome will further minimise any prevailing risk to aerial operations. The installation of markers on transmission infrastructure will also be considered for nearby HLS and the Singleton Military Area as requested by relevant stakeholders during detailed design to further minimise any prevailing risk to aerial operations.

Other matters

22

22 Other matters

22.1 Air quality

This section provides an overview of the existing environment as it relates to air quality, an assessment of potential air quality impacts of the Hunter Transmission Project (HTP, the 'project') and identifies mitigation and management measures to be adopted to minimise and manage these potential impacts.

A detailed air quality and greenhouse gas assessment has been prepared for the project and is provided in *Technical Report 18 – Air quality and greenhouse gas impact assessment*. The Planning Secretary's environmental assessment requirements (SEARs) as they relate to the assessment of air quality and where in this environmental impact statement (EIS) these have been addressed are summarised in *Appendix A (Assessment requirements compliance)*.

22.1.1 Assessment approach

Legislation, policies, plans and guidelines

The air quality impact assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

- *Commonwealth National Environment Protection Council Act 1994*
- *Commonwealth National Environment Protection (Air Toxics) Measure 2021*
- *Commonwealth National Environment Protection (Ambient Air Quality) Measure 2021*
- *NSW Protection of the Environment Operations Act 1997*
- *Approved Methods for Modelling and Assessment of Air Quality in New South Wales* (Environment Protection Authority (EPA) 2016) (the Approved Methods)
- *Guidance on the assessment of dust from demolition and construction* (Institute of Air Quality Management (IAQM), 2014) (IAQM Guidance).

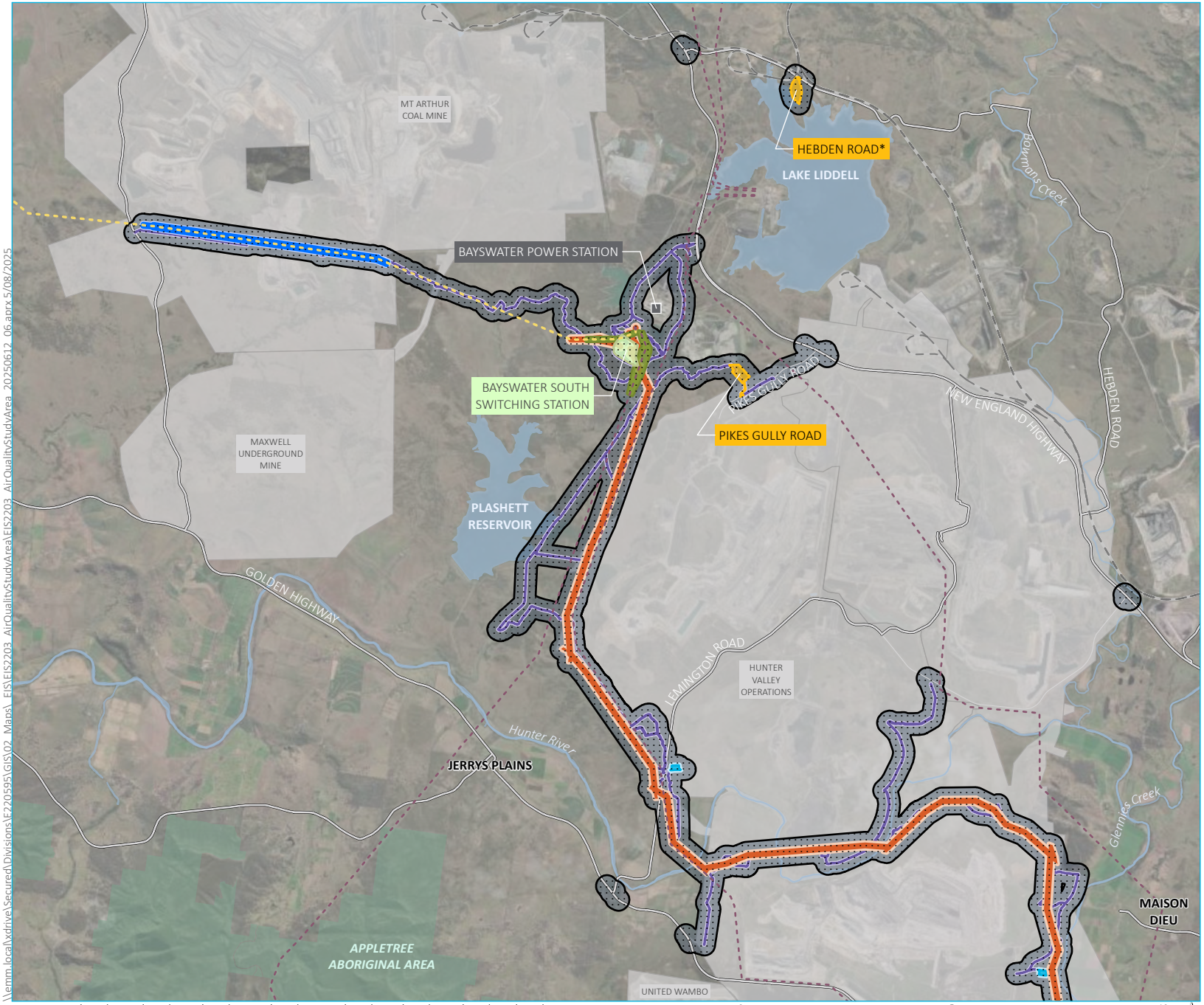
Study area

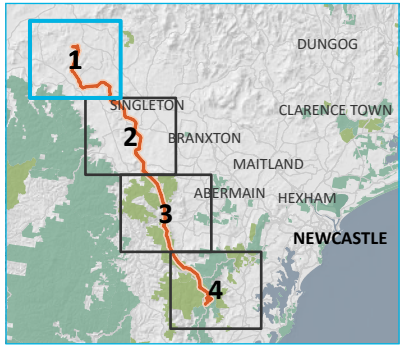
The study area for the air quality impact assessment has been selected in line with the approach detailed within the IAQM Guidance. The air quality study area comprises:

- the project impact area with a 250 metre buffer
- paved public roads within 250 metres of project elements which would be used by construction vehicles to access the project impact area and the adjoining land up to 50 metres from the road.

Potential air quality impacts during operation would be limited to the local area surrounding the switching stations, substation upgrades, transmission towers and access tracks. However, the study area for operational air quality impacts has conservatively been assumed to be the same area used to assess construction impacts.

The air quality study area is included in Figure 22.1.





KEY

Air quality study area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining

Air quality study area
Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.1

EMM
creating opportunities

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

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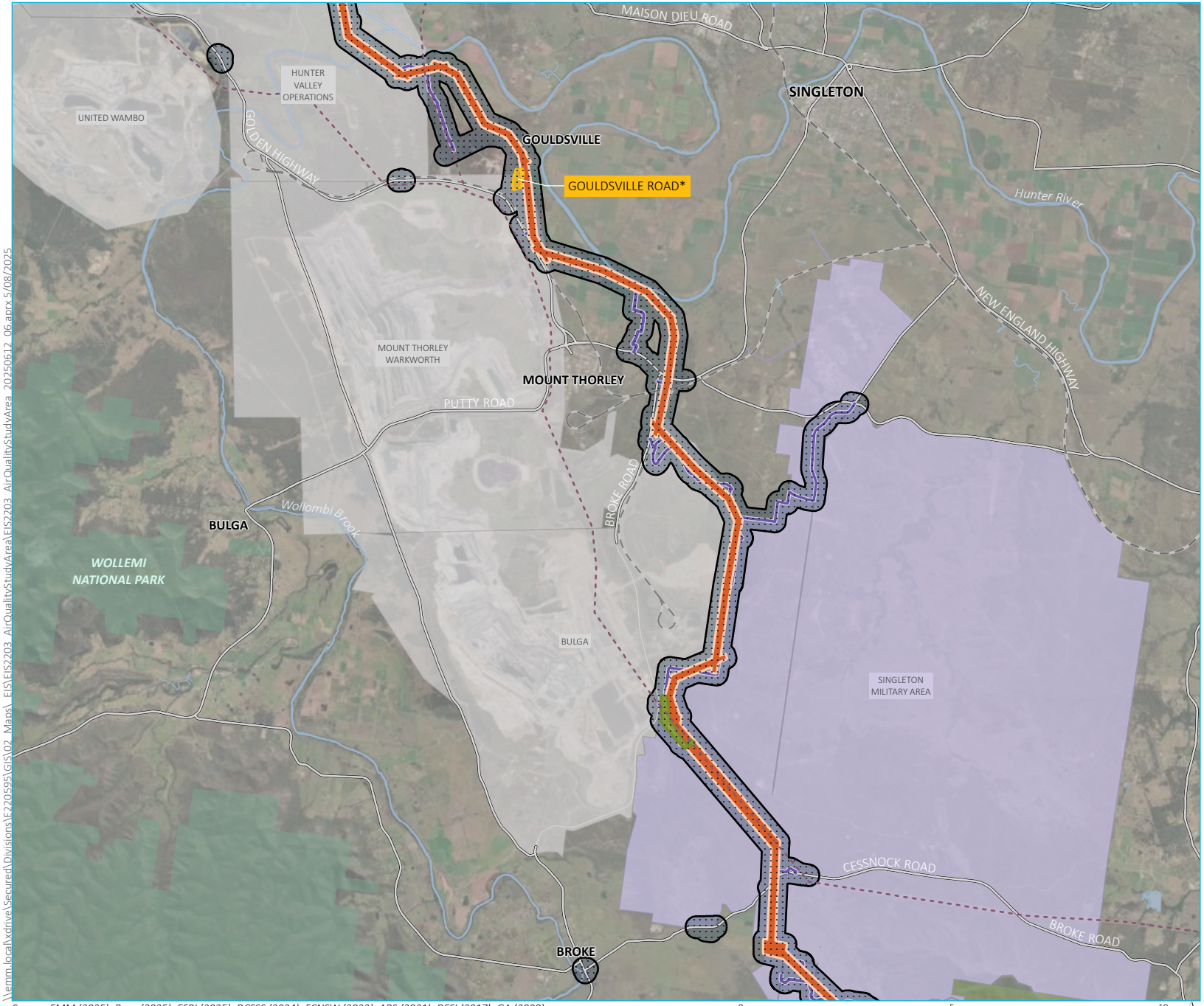

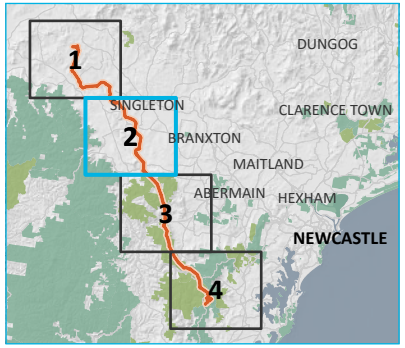

KEY

Air quality study area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

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

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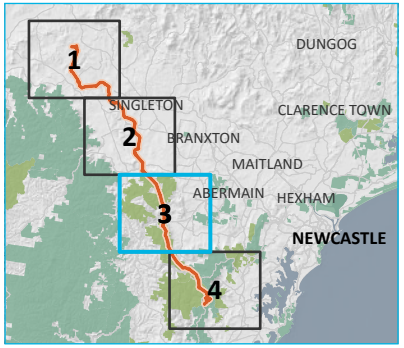
Air quality study area
Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.1

EMM
creating opportunities



KEY

- Air quality study area

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence

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

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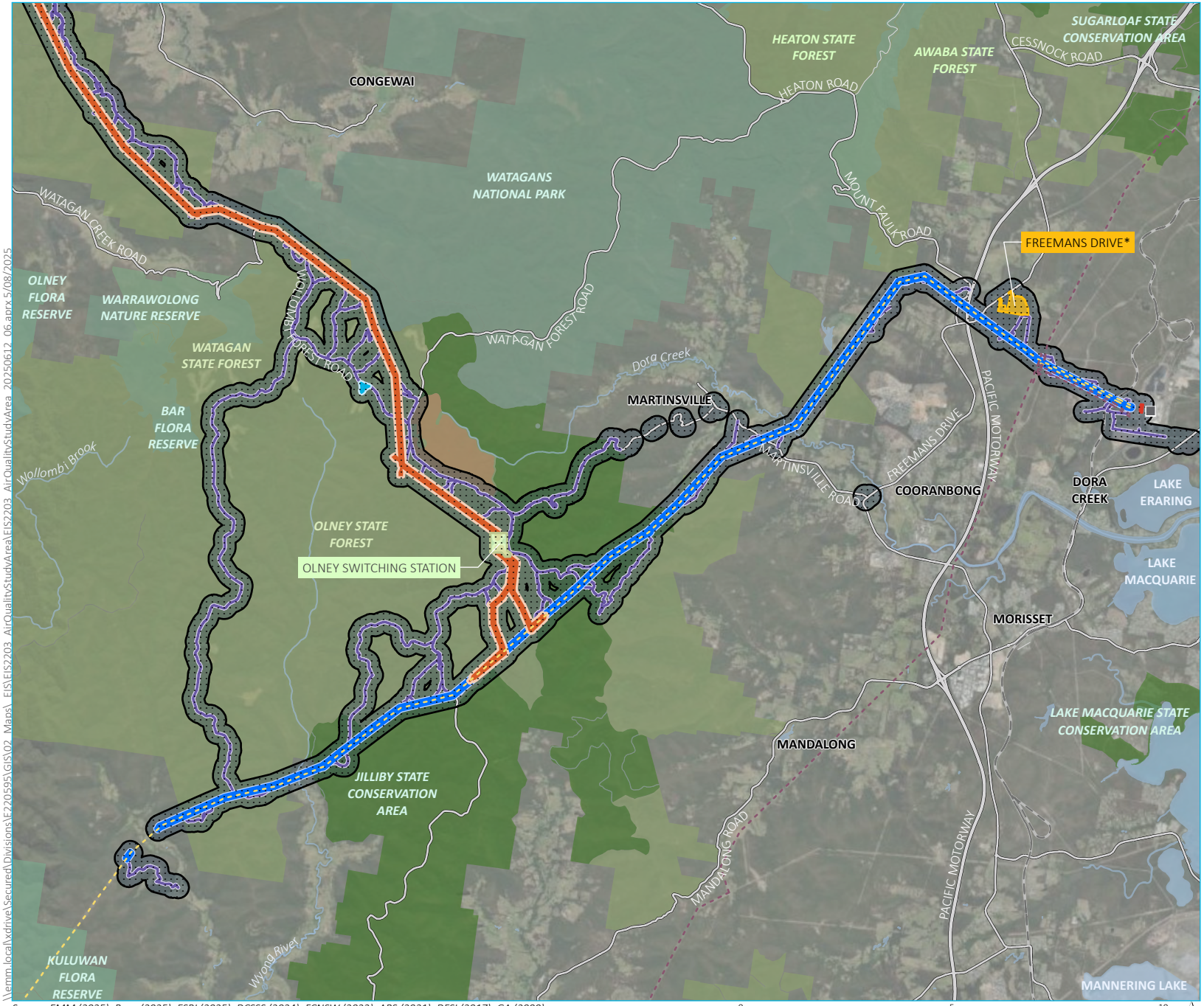
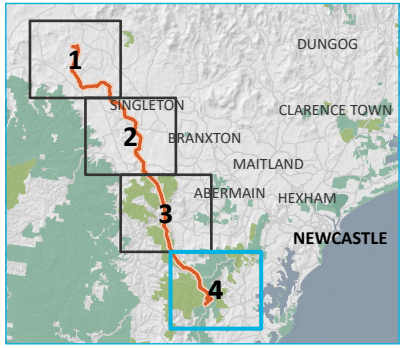
Air quality study area
Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.1

EMM
creating opportunities





KEY

Air quality study area

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
- Minor road
- Named watercourse
- Named waterbody
- Recreation area
- NPWS reserve
- State conservation area
- State forest

Air quality study area
Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.1

EMM
creating opportunities

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

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Assessment methodology

The assessment methodology for the air quality impact assessment involved:

- a desktop review of the existing environment as it relates to air quality, including local topography and land use, nearby sensitive receivers, and existing ambient air quality. This included analysis of ambient air quality data across the study area collected by nearby ambient air quality monitoring stations (AAQMSs). Annual mean PM_{10} and $PM_{2.5}$ concentrations between the years 2018 to 2024 were analysed from the Muswellbrook Northwest, Muswellbrook, Camberwell, Warkworth, Singleton, Singleton Northwest, Singleton South, Bulga, and Morisset AAQMSs
- assigning an ID to sensitive receivers to facilitate the initial screening and assessment for each sensitive receiver
- an initial screening assessment to identify air quality sensitive human and ecological receivers near key project elements within the following buffer requirements as set out in the IAQM:
  - human receivers within 250 metres of the project impact area
  - ecological receivers within 50 metres of the project impact area
  - human or ecological receivers within 50 metres of a route used by construction vehicles and up to 250 metres from an access point to the project impact area
  - any project element where a sensitive receiver was identified within the buffer distance was carried forward to the risk-based assessment
- a qualitative risk-based assessment of potential dust impacts during construction in accordance with the IAQM for amenity-based (i.e. dust soiling), human health and ecological impacts as result of the key construction activities of demolition, earthworks, construction and track-out activities. For each relevant receiver and each project component considered, the risk-based assessment of dust impacts involved combining the potential dust magnitude for each key construction activity and the sensitivity of the air quality study area to dust to identify the potential risk at each receiver to dust
- a qualitative assessment of operational impacts from the operation of the project
- identification of mitigation measures to manage the potential air quality impacts identified in the construction dust risk assessment and qualitative operational assessment.

The air quality assessment has focused on potential dust emissions during the construction and operation of the project as exhaust emissions from plant and equipment and traffic movements during the construction and operation are unlikely to have a significant impact on local air quality (in line with IAQM guidance). During the construction period, the construction support sites, including temporary worker accommodation, would have diesel generators to provide back-up power in the event of a mains outage. It is anticipated that the operation of the generators, and hence emissions, would be rare, of short duration and unpredictable. It is therefore unlikely that these generators would have a significant impact on the local air quality, and they have not been assessed quantitatively.

22.1.2 Existing environment

Topography and land use

The project impact area is across freehold, 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.

Land uses in the northern portion of the project impact area include mining, agriculture and rural residential properties, some of which are located along the alluvial floodplains of the Hunter River. The Singleton local government area hosts around 20 open-cut coal mines, which has significantly altered the landscape from pre-mining conditions.

The central portion of the project impact area includes the Pokolbin and Corrabare State forests and rural residential areas near Cedar Creek, Millfield and Laguna. The southern portion of the project impact area includes the Watagan and Olney State forests, land reserved under the *National Parks and Wildlife Act 1974*, residential areas in Martinsville and Cooranbong, and the Eraring Power Station.

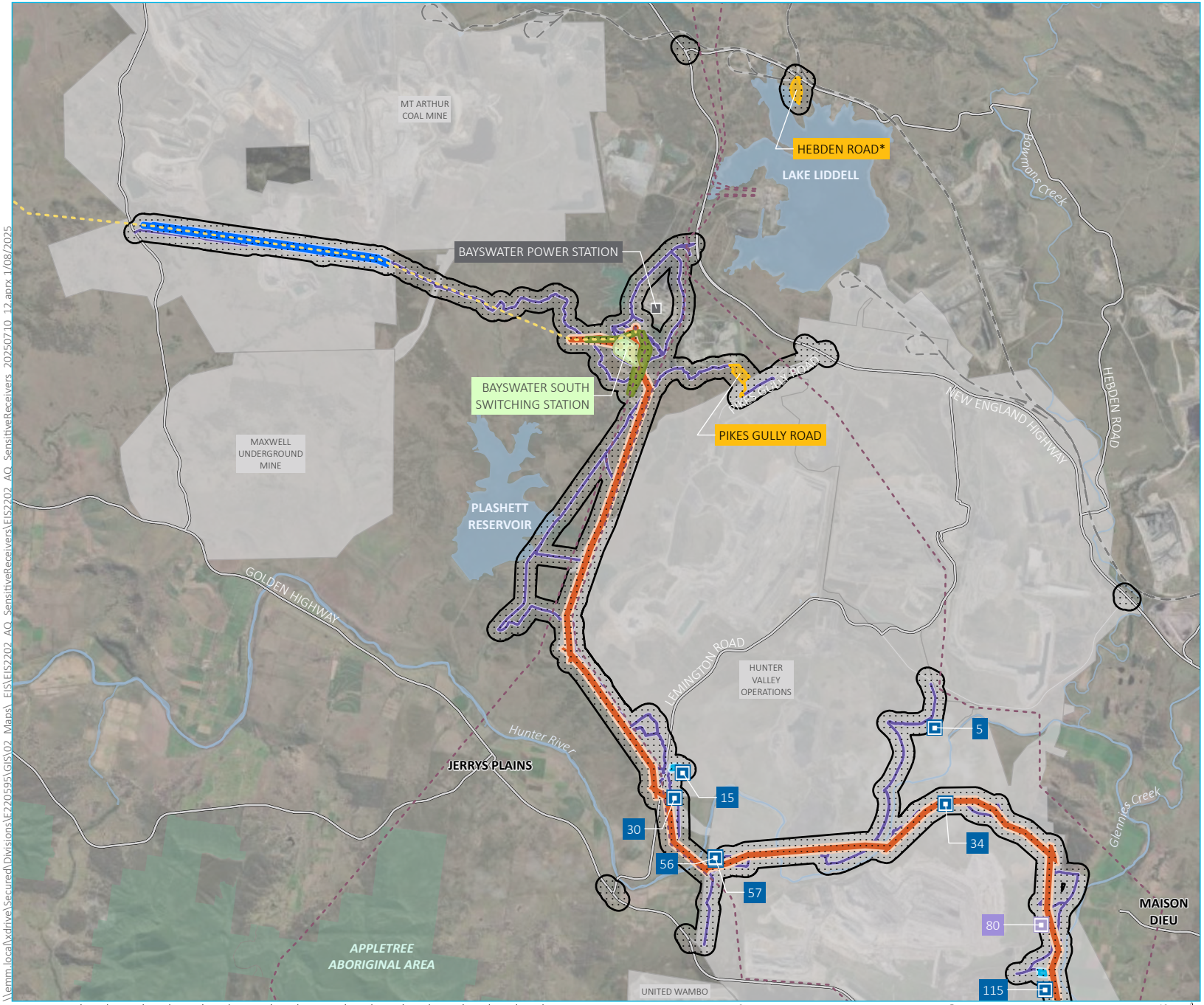
Topography varies throughout the project impact area, with elevation ranging between around 15 metres Australian height datum (AHD) to 520 metres AHD. Topography throughout the northern portion of the project impact area is gently undulating, whereas topography in the central and southern portions of the project impact area is highly variable throughout the major promontories and deep valleys of State forest and National park areas.

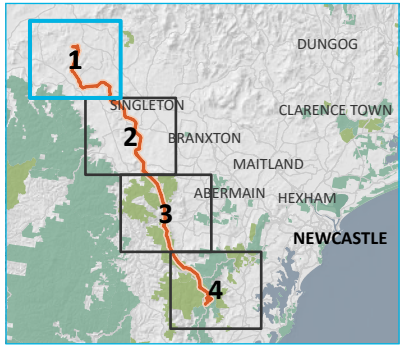
Sensitive receivers

A sensitive human receiver is defined as a location where people are likely to work or reside. This may include residential receivers, schools, hospitals, offices or public recreational areas. The main type of sensitive human receivers within the air quality study area are residential receivers.

There are 31 sensitive human receivers within 250 metres of the project impact area. These receivers include 25 residential receivers, 2 commercial receivers, 2 recreational receivers, one industrial receiver and one utility receiver. Sensitive human receivers are largely within 250 metres of the transmission line or access tracks, with some residential receivers within 250 metres of construction support sites and laydown areas. These are outlined in Figure 22.2.

Sensitive ecological receivers are any sensitive habitat affected by dust soiling. This includes direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats).





KEY

- Air quality study area

Sensitive receiver (receiver ID)

- Industrial
- Residental

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining

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

0 5 10 km

GDA2020 MGA Zone 56

N

Location of sensitive receivers within the air quality study area Map 1 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.2

EMM creating opportunities

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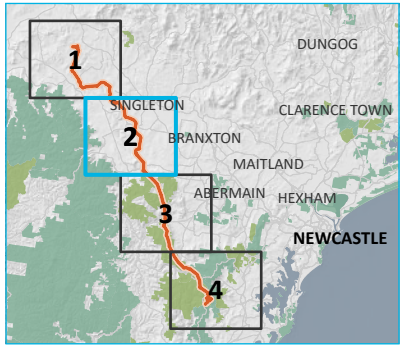

KEY

Air quality study area

Sensitive receiver (receiver ID)

- Industrial
- Residental

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Defence
- Mining

Location of sensitive receivers within the air quality study area Map 2 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.2

EMM creating opportunities

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

0 5 10 km

GDA2020 MGA Zone 56

N

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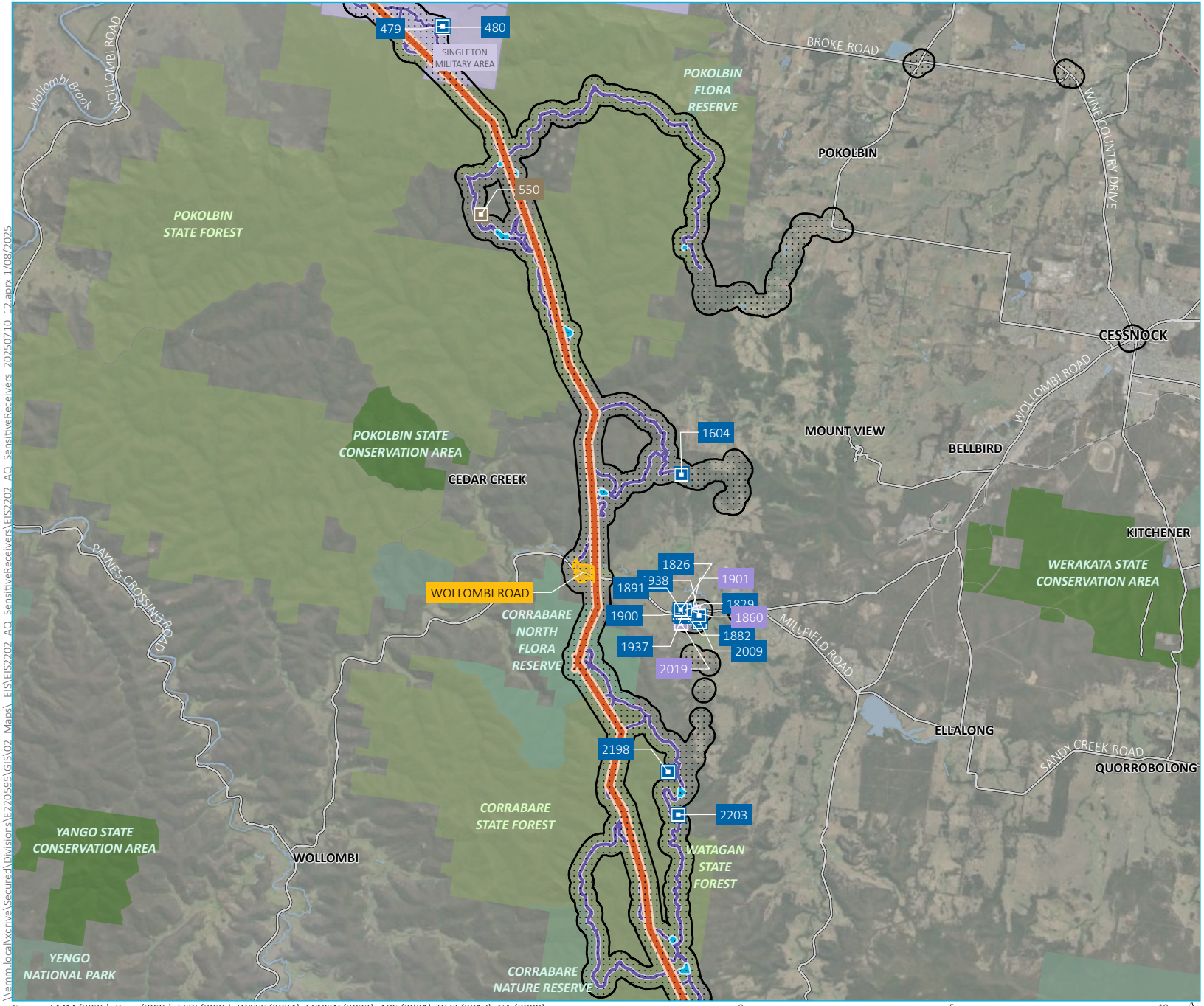

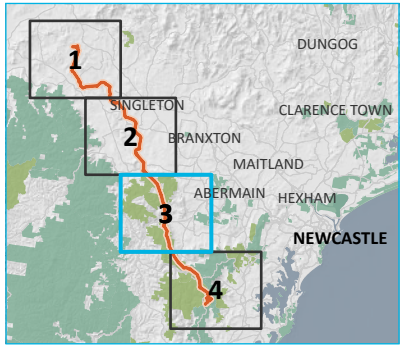

KEY

- Air quality study area

Sensitive receiver (receiver ID)

- Commercial
- Industrial
- Residental

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
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Defence

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

0 5 10 km

GDA2020 MGA Zone 56

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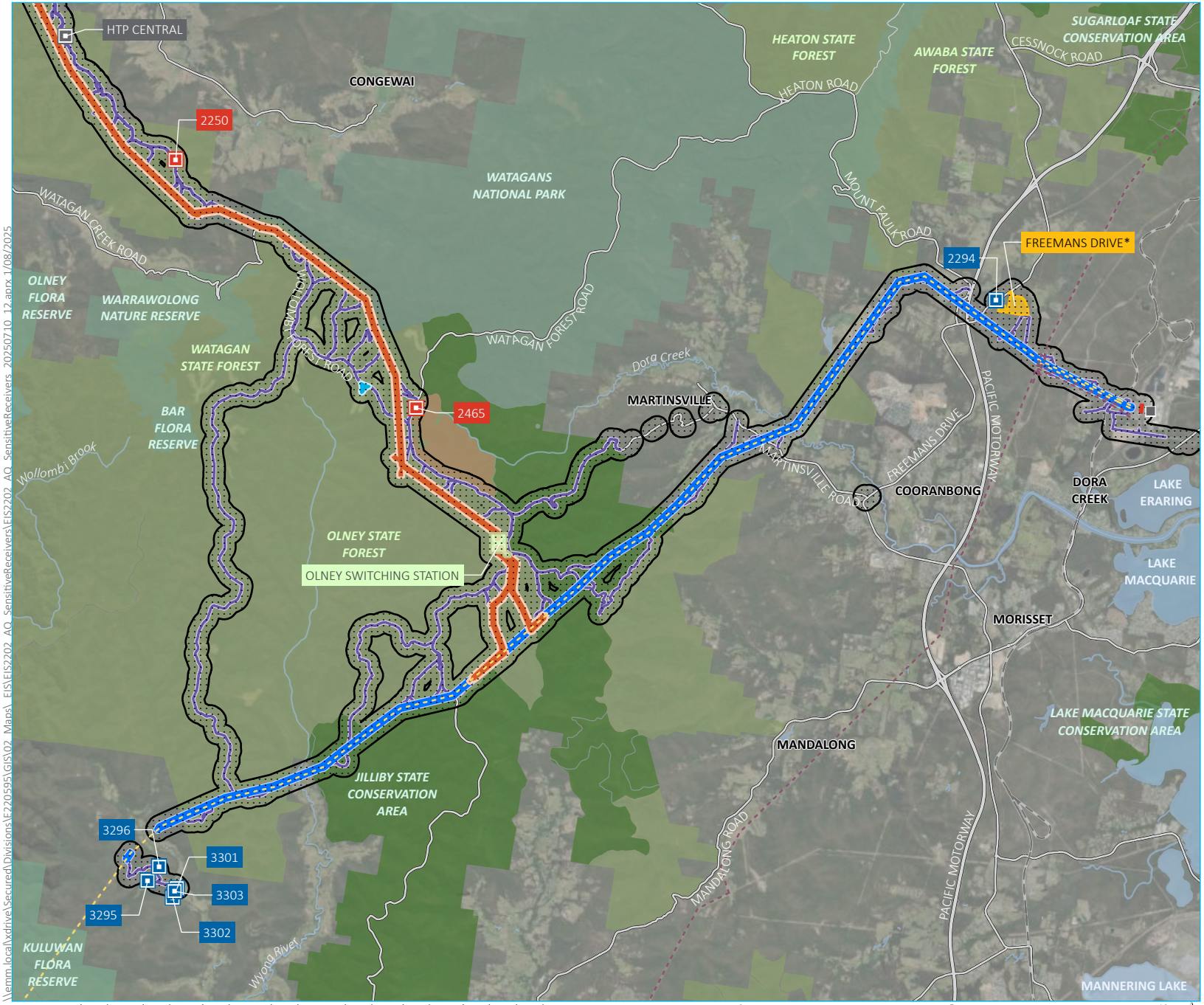
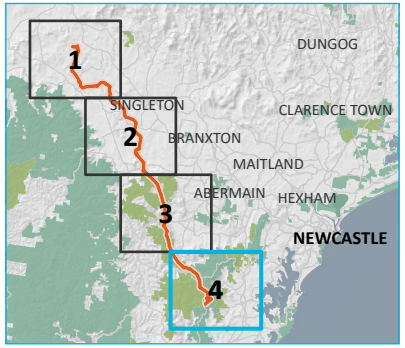
Location of sensitive receivers within the air quality study area Map 3 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.2

EMM
creating opportunities





KEY

- Air quality study area

Sensitive receiver (receiver ID)

- Recreation
- Residental
- Other or unknown

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
- Minor road
- Named watercourse
- Named waterbody
- Recreation area
- NPWS reserve
- State conservation area
- State forest

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

0 5 10 km

GDA2020 MGA Zone 56

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Location of sensitive receivers within the air quality study area Map 4 of 4

Hunter Transmission Project
Environmental Impact Statement
Figure 22.2

EMM creating opportunities

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Ambient air quality

Ambient air quality within and surrounding the project impact area is influenced by the following activities:

- agricultural practices
- extractive industries
- wind generated dust from exposed areas
- dust and exhaust emissions from vehicle movements on public unsealed and sealed roads
- seasonal emissions from household wood heaters
- long range transport of fine particles into the region.

Incidental events such as bushfires and dust storms can also influence local ambient air quality.

These activities give rise to a range of emissions, including deposited dust, particulate matter (PM10 and PM2.5), oxides of nitrogen (NOx), carbon monoxide (CO) and volatile organise compounds (VOCs).

Emissions from all industries and sources within the 5 local government areas through which the project impact area traverses, as reported by the National Pollutant Index (NPI), are summarised in Table 22.1.

Table 22.1 NPI reported total emission sources (2022/23)

Pollutant	Emissions to air (kilograms)				
	Muswellbrook	Singleton	Cessnock	Central Coast[1]	Lake Macquarie
PM_{10}	21,000,000	46,000,000	1,300,000	600,000	1,000,000
$PM_{2.5}$	720,000	870,000	30,000	28,000	120,000
NO_x	51,000,000	16,000,000	1,500,000	20,000,000	21,000,000
CO	11,000,000	15,000,000	8,700,000	23,000,000	28,000,000
Total VOCs	1,200,000	2,200,000	1,800,000	No data	6,300,000

1: Data for the Central Coast local government area was not available, so data for Wyong was used to be representative of emissions generated in the Central Coast local government area near the project impact area.

Ambient air quality data collected from various AAQMS surrounding the project impact area are summarised in Table 22.2. Concentrations highlighted in bold text indicate an exceedance of impact assessment criterion outlined in the Approved Methods.

Table 22.2 Annual mean ambient air quality from AAQMSs surrounding the project impact area

AAQMS	Pollutant	Concentration (µg/m3)						
		2018	2019	2020	2021	2022	2023	2024
Muswellbrook NW	PM_{10}	**25.0**	**33.7**	**21.0**	**15.6**	**14.3**	**19.8**	**16.3**
	$PM_{2.5}$	No data						

AAQMS	Pollutant	Concentration (µg/m3)						
		2018	2019	2020	2021	2022	2023	2024
Muswellbrook	PM_{10}	**27.2**	**34.4**	22.5	18.2	16.6	21.9	18.5
	$PM_{2.5}$	**9.4**	**12.2**	**9.3**	7.3	6.2	7.5	7.1
Camberwell	PM_{10}	**31.1**	**39.9**	24.3	20.6	16.0	20.9	19.4
	$PM_{2.5}$	**8.4**	**10.5**	7.5	5.7	4.8	6.1	5.9
Warkworth	PM_{10}	**26.4**	**33.4**	23.7	20.8	19.3	**32.5**	**28.0**
	$PM_{2.5}$	No data						
Singleton NW	PM_{10}	**26.9**	**34.6**	22.2	18.8	15.2	21.9	20.1
	$PM_{2.5}$	No data						
Singleton	PM_{10}	24.0	**30.1**	20.5	17.5	14.5	19.1	18.7
	$PM_{2.5}$	**8.1**	**10.9**	**8.4**	6.3	5.1	6.7	7.3
Singleton South	PM_{10}	23.0	**30.7**	19.8	16.5	14.0	19.4	18.2
	$PM_{2.5}$	No data						
Bulga	PM_{10}	21.3	**28.6**	18.1	12.9	10.6	17.3	17.0
	$PM_{2.5}$	No data						
Morisset	PM_{10}	-	-	-	9.6	7.9	11.2	11.4
	$PM_{2.5}$	-	-	-	3.9	2.7	5.0	5.0

It should be noted that the PM_{10} concentrations were relatively high in the years between 2018 and 2020 due to extensive bushfires and drought conditions in eastern Australia and are not representative of 'typical' historical levels. The only exceedances of the Approved Methods criterion outside of these years was at the Warkworth AAQMS in 2023 and 2024, indicating that ambient air quality throughout the project impact area is generally compliant with accepted standards.

22.1.3 Potential impacts – construction

In line with IAQM guidance, the assessment of potential dust impacts during construction included the following potential dust-generating activities:

- demolition, which is any activity that involves the removal of existing structures
- earthworks, which covers the processes of soil stripping and vegetation removal, ground levelling, excavation and landscaping
- construction, which is any activity that involves the provision of new transmission infrastructure, including the construction of towers, transmission lines, switching stations, access tracks and construction support sites. This would also involve the use of helicopters during stringing activities

- track-out, which involves the transport of dust and dirt by vehicles from the construction site and unsealed roads onto the public road network (sealed roads), where it may be deposited and then re-suspended by vehicles using the network. Therefore, track-out is only considered for receivers along sealed roads which connect to unsealed roads used for access to the construction impact area.

The generation of dust emissions and their impacts can vary substantially from day-to-day depending on:

- activities undertaken
- duration of the activities
- size of the work site
- meteorological conditions
- proximity of sensitive receivers to the activities and their sensitivity to dust
- adequacy of mitigation measures applied to reduce or eliminate dust.

The project elements assessed in the initial screening and those carried forward to the detailed construction dust assessment based on the initial screening are outlined in Table 22.3.

Table 22.3 Construction dust assessment - initial screening results

Project features	Human receivers		Ecological receivers		Detailed assessment required
	Within 250 m of the construction impact area	Within 50 m of a route used by construction vehicles	Within 50 m of the construction impact area	Within 50 m of a route used by construction vehicles	
Eraring substation	No	No	No	No	No
Bayswater substation	No	No	No	No	No
Bayswater South switching station	No	No	Yes	No	Yes
Olney switching station	No	No	Yes	No	Yes
Construction support site (Hebden Road)	No	No	Yes	No	Yes
Construction support site (Pikes Gully Road)	No	No	Yes	Yes	Yes
Construction support site (Gouldsville Road)	Yes	No	Yes	No	Yes
Construction support site (Wollombi Road)	No	No	Yes	No	Yes
Construction support site (Freemans Drive)	Yes	Yes	No	No	Yes

Project features	Human receivers		Ecological receivers		Detailed assessment required
	Within 250 m of the construction impact area	Within 50 m of a route used by construction vehicles	Within 50 m of the construction impact area	Within 50 m of a route used by construction vehicles	
Laydown area (Hayes Road)	Yes	Yes	Yes	No	Yes
Laydown area (Lemington Road)	Yes	No	No	No	Yes
Transmission line	Yes	Yes	Yes	Yes	Yes

The screening process identified 10 project elements requiring a detailed dust impact assessment given their proximity to human or ecological receivers (within 250 metres and 50 metres respectively). Other elements, including the Eraring substation and Bayswater substation, are not considered further in line with IAQM guidance. Dust emissions from construction work or activities that are screened out by the IAQM methodology are not expected to generate dust emissions of significance, or impact sensitive receivers beyond the construction impact area.

Table 22.4 outlines the anticipated dust generating activities at the 10 project elements carried forward to the detailed construction dust assessment in line with the categories included in IAQM guidance.

Table 22.4 Dust generating activities at assessed project features

Project feature	Dust generating activity	Details
Bayswater South switching station	Demolition	No demolition is proposed as part of the construction of the Bayswater South switching station
	Earthworks	Extent of works: • construction footprint = around 308,745 m^2 • excavation volume = around 282,500 m^3 • filling volume = around 282,400 m^3
	Construction	• Construction of a new switching station • Total construction material volume = around 48,860 m^2
	Track-out	No human receivers within 50 m of a route used by construction vehicles
Olney switching station	Demolition	No demolition is proposed as part of the construction of the Olney switching station

Project feature	Dust generating activity	Details
	Earthworks	Extent of works: • construction footprint = around 203,311 m^2 • excavation volume = around 165,990 m^3 • filling volume = around 167,760 m^3
	Construction	• Construction of a new switching station • Total construction material volume = around 32,690 m^2
	Track-out	No human receivers within 50 m of a route used by construction vehicles
Construction support site (Hebden Road)	Demolition	No demolition is proposed as part of the establishment of the construction support site at Hebden Road
	Earthworks	Extent of works: • construction footprint = around 109,392 m^2
	Construction	• Construction of construction support site • Total construction material volume = around 101,170 m^2
	Track-out	No human receivers within 50 metres of a route used by construction vehicles
Construction support site (Pikes Gully Road)	Demolition	No demolition is proposed as part of the establishment of the construction support site at Pikes Gully Road
	Earthworks	Extent of works: • construction footprint = around 104,267 m^2 • excavation volume = around 1500 m^3 • filling volume = around 1500 m^3
	Construction	• Construction of construction support site • Total construction material volume = around 150,018 m^2 • A helicopter pad would be established at this construction support site for use during stringing activities. During take-off and landing, helicopters have the potential to disturb settled dust in the surrounding area

Project feature	Dust generating activity	Details
	Track-out	No human receivers within 50 m of a route used by construction vehicles
Construction support site (Gouldsville Road)	Demolition	No demolition is proposed as part of the establishment of the construction support site at Gouldsville Road
	Earthworks	Extent of works: • construction footprint = around 90,858 m^2 • excavation volume = around 800 m^3 • filling volume = around 800 m^3
	Construction	• Construction of construction support site • Total construction material volume = around 88,400 m^2 • A helicopter pad would be established at this construction support site for use during stringing activities. During take-off and landing, helicopters have the potential to disturb settled dust in the surrounding area
	Track-out	No human receivers within 50 m of a route used by construction vehicles
Construction support site (Wollombi Road)	Demolition	Removal of residential house and shed structures
	Earthworks	Extent of works: • construction footprint = around 150,018 m^2 • excavation volume = around 1200 m^3 • filling volume = around 1200 m^3
	Construction	• Construction of construction support site • Total construction material volume = around 150,018 m^2
	Track-out	No human receivers within 50 m of a route used by construction vehicles
Construction support site (Freemans Drive)	Demolition	Removal of residential house and shed structures

Project feature	Dust generating activity	Details
	Earthworks	Extent of works: • construction footprint = around 199,264 m^2 • excavation volume = around 2000 m^3 • filling volume = around 2000 m^3
	Construction	• Construction of construction support site • Total construction material volume = around 133,600 m^2 • A helicopter pad would be established at this construction support site for use during stringing activities. During take-off and landing, helicopters have the potential to disturb settled dust in the surrounding area
	Track-out	• Human receivers within 50 m of a route used by construction vehicles • The assessment has accounted for 250 outward movements of heavy vehicles on any one day
Laydown area (Hayes Road)	Demolition	No demolition is proposed as part of the establishment of the laydown at Hayes Road
	Earthworks	Extent of works: • construction footprint = around 15,842 m^2 • excavation volume = around 2762 m^3
	Construction	• Construction of temporary portable site offices • Onsite concrete batching plant
	Track-out	• Human receivers within 50 m of a route used by construction vehicles • The assessment has accounted for 30 daily outward movements of heavy vehicles on any one day
Laydown area (Lemington Road)	Demolition	No demolition is proposed as part of the establishment of the laydown at Lemington Road
	Earthworks	Extent of works: • construction footprint = around 18,500 m^2 • excavation volume = around 9252 m^3
	Construction	• Construction of temporary portable site offices • Onsite concrete batching plant

Project feature	Dust generating activity	Details
	Track-out	• No human receivers within 50 m of a route used by construction vehicles
Transmission line (including access tracks)	Demolition	• Demolition of existing towers and concrete foundations for works in existing easements • Some small structures may be removed (e.g. fences or sheds)
	Earthworks	Extent of works for transmission tower pad (expressed as a total for 3 tower pads including average vegetation clearance): • mean construction footprint = around 41,489 m^2 • mean excavation volume = around 2941 m^3 • mean filling volume = around 2500 m^3 Establishing and upgrading access tracks including the importing and laying of road material (crushed rock): • mean construction footprint = around 6000 m^2 (6 m in width and 1000 m in length)
	Construction	Construction would involve the following: • concrete foundations to be poured from imported concrete • prefabricated steel segments of the transmission tower to be assembled at each transmission tower location • primary construction materials would be steel and premixed concrete
	Track-out	Human receivers within 50 m of a route used by construction vehicles • between 15 to 19 daily outward movements of heavy vehicles for staff and workforce access between tower sections • between 38 to 85 daily outward movements of heavy vehicles for deliveries between tower sections

Combining the sensitivity of nearby human and ecological receivers with the anticipated magnitude of dust emissions from dust-generating activities at each of the assessed project features results in an overall risk of dust impacts during construction for receivers within the relevant buffer distances. A summary of dust risks from the construction dust assessment with and without mitigation is included in Table 22.5.

Table 22.5 Construction dust assessment summary

Activity	Unmitigated risk of dust impacts			Mitigated dust risks	Applicable sensitive receivers
	Dust soiling	Human health	Ecological		
Bayswater South switching station					
Demolition	-	-	-	-	Ecological receivers only
Earthworks	-	-	Medium	Negligible	
Construction	-	-	Medium	Negligible	
Track-out	-	-	-	-	
Olney switching station					
Demolition	-	-	-	-	Ecological receivers only
Earthworks	-	-	Low	Negligible	
Construction	-	-	Low	Negligible	
Track-out	-	-	-	-	
Construction support site (Hebden Road)					
Demolition	-	-	-	-	Ecological receivers only
Earthworks	-	-	Low	Negligible	
Construction	-	-	Low	Negligible	
Track-out	-	-	-	-	
Construction support site (Pikes Gully Road)					
Demolition	-	-	-	-	Ecological receivers only
Earthworks	-	-	Medium	Negligible	
Construction	-	-	Medium	Negligible	
Track-out	-	-	Medium	Negligible	
Construction support site (Gouldsville Road)					
Demolition	-	-	-	-	Ecological receivers only
Earthworks	-	-	Medium	Negligible	

Activity	Unmitigated risk of dust impacts			Mitigated dust risks	Applicable sensitive receivers
	Dust soiling	Human health	Ecological		
Construction	-	-	Medium	Negligible	
Track-out	-	-	-	-	
Construction support site (Wollombi Road)					
Demolition	-	-	Negligible	Negligible	Ecological receivers only
Earthworks	-	-	Low	Negligible	
Construction	-	-	Low	Negligible	
Track-out	-	-	-	-	
Construction support site (Freemans Drive)					
Demolition	Negligible	Negligible	Negligible	Negligible	ID2294
Earthworks	Low	Low	Low	Negligible	
Construction	Low	Low	Low	Negligible	
Track-out	Medium	Low	Low	Negligible	
Laydown area (Hayes Road)					
Demolition	-	-	-	-	ID1826, ID1829, ID1860, ID1882,
Earthworks	Negligible	Negligible	Negligible	Negligible	ID1891, ID1900, ID1901, ID1937,
Construction	Low	Low	Low	Negligible	ID1938, ID2009,
Track-out	Low	Medium	Low	Negligible	ID2019
Laydown area (Lemington Road)					
Demolition	-	-	-	-	ID15
Earthworks	Low	Low	Low	Negligible	
Construction	Low	Low	Low	Negligible	
Track-out	-	-	-	-	
Transmission line (including access tracks)					
Demolition	-	-	-	-	ID5, ID30, ID34, ID56, ID57, ID80, ID115, ID227, ID261,

Activity	Unmitigated risk of dust impacts			Mitigated dust risks	Applicable sensitive receivers
	Dust soiling	Human health	Ecological		
Earthworks	Medium	Medium	Medium	Negligible	ID263, ID266, ID274, ID277, ID309, ID479,
Construction	Low	Low	Low	Negligible	ID480, ID550, ID1604, ID2198, ID2203, ID2226,
Track-out	Low	Medium	Medium	Negligible	ID2250, ID2465, ID2921, ID3295, ID3296, ID3301, ID3302, ID3303

The results of the construction dust assessment indicate the varying levels of risk from negligible to medium for dust soiling, human health, and ecological impacts across the assessed project locations before mitigation measures are applied. Results are summarised below:

- dust soiling impacts – the unmitigated risk across the assessed project elements would be negligible for demolition, would range from low to medium for earthworks and track-out, and would be low for construction
- human health impacts – the unmitigated risk across the assessed project elements was negligible for demolition, and ranged from low to medium for earthworks, construction and track-out
- ecological impacts – the unmitigated risk across the assessed project elements was negligible for demolition, and ranged from low to medium for earthworks, construction and track-out.

The project would follow conventional construction methods and be guided by a construction air quality management plan to effectively manage environmental impacts. Recommended mitigation measures, as summarised in *section 22.1.5*, will ensure that construction dust does not result in significant impacts. With the measures outlined in *section 22.1.5* in place, the residual dust risk to the surrounding area, including identified receivers (human and ecological), is considered negligible for all construction activities.

22.1.4 Potential impacts – operation

Operational activities for the project would include the transmission of electricity, emergency management, maintenance activities, and potential upgrades and replacement of transmission lines and infrastructure to extend the life of the infrastructure.

Potential air quality impacts from the operation of the project would include:

- dust disturbance from vehicles travelling along unsealed access tracks throughout the operation impact area, including to the transmission line easement and to switching stations and substations during maintenance activities and emergency works

- exhaust emissions from vehicles and machinery during travel and maintenance activities throughout the operation impact area.

It is noted that the volume of traffic, fuel use and potential dust emissions during the operation of the project would be substantially lower than during construction. As a result, it is considered that operational air quality impacts from the project are likely to be negligible.

22.1.5 Mitigation and management

Environmental management

The project would be constructed according to conventional methods and would be guided by a construction air quality management plan to effectively manage off-site environmental impacts. The construction air quality management plan may include (but will not be limited to) the recommended mitigation measures identified below. These measures are routinely employed as 'good practice' on construction sites.

Mitigation measures

Mitigation and management measures proposed to avoid or minimise impacts to air quality during construction and operation of the project are listed in Table 22.6.

Table 22.6 Proposed mitigation and management measures - air quality

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AQ1	Air quality – general	A construction air quality management plan would be prepared by a suitably qualified and experienced person and will include appropriate measures to mitigate the risk of air quality impacts from the project during construction.	Detailed design Construction	Project impact area and impacted receivers
AQ2	Dust generation – general	Management measures to prevent or minimise dust generation and impacts on the local community and environment will include but not be limited to: • appropriate communications will be developed before construction and earthwork activities start to notify the potentially impacted residences of the project (including the duration and types of works) and relevant contact details for complaints reporting • a complaints register will be maintained through construction which will include any complaints related to dust • any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation will be recorded in the register • shade cloth barriers with site fences around sensitive receiver locations close to potentially dusty activities, such as excavation and material stockpiles, will be used where practicable • proper maintenance of all equipment engines will be carried out • engines will not be left running at idle where possible • a water cart or sprays will be deployed to keep exposed areas and soil stockpiles moist, where necessary and practical	Construction	• Bayswater South switching station • Olney switching station • Construction support sites and laydown areas • Transmission line (including access tracks)

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
		• working practices will be modified by limiting activity during periods of adverse weather (hot, dry and windy conditions) and when dust is seen leaving the site		
		• the extent of clearing of vegetation and topsoil will be limited to the designated footprint required for construction and appropriate staging of any clearing will be implemented • earthworks and exposed areas will be revegetated (where required) to stabilise surfaces as soon as practicable • imported construction materials such as sands and aggregates will be appropriately managed to maintain adequate moisture levels. This will include, but is not limited to, applying water to stockpiles, covering stockpiles and/or storing materials in bunded areas, where practical • vehicle loads entering and leaving the project impact area with potentially dusty loads will be covered to prevent escapes of materials during transport • water-assisted dust sweepers will be used to remove, as necessary, any material tracked out of the project impact area onto public roads • on-site access roads will be inspected for integrity and necessary repairs to the surface will be instigated where necessary as soon as reasonably practicable • all inspections of construction routes and any subsequent action will be recorded in a site register.		

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
AQ3	Dust generation specific to helicopter and drone usage	Management measures to prevent or minimise dust generation and impacts on the local community and environment from helicopter and drone activities will include but not be limited to: • vegetation will be maintained (or exposed areas will be revegetated) with groundcover (i.e. grass) in the immediate area surrounding helicopter pads • helicopter activities will be monitored by site personnel to implement additional management measures when required • water-assisted dust sweepers will be used to remove, as necessary, any material deposited onto helicopter pads • watering will be deployed to ensure exposed areas are kept moist, where required.	Construction	Construction support sites (Pikes Gully Road, Gouldsville Road and Freemans Drive)
AQ4	Dust generation specific to concrete batching plants	Management measures to prevent or minimise dust generation and impacts on the local community and environment from concrete batching plants will include but not be limited to the following: • trucks transporting aggregates and sand loads will be covered • raw aggregates and sands will be stored appropriately in storage bays or bins and materials will not exceed the height of the bays • raw materials will be kept adequately moist for both storage and transfer (e.g. via front end loader) • cement silos and hoppers will be fitted with dust filters • cement silos will be fitted with emergency pressure alerts and emergency cut-off protection systems • transfer of cement from storage to batching will occur via closed loop system (e.g. steel augers).	Construction	Construction support sites and laydown areas (with concrete batching plants)

22.1.6 Summary and conclusion

The results of the construction air quality assessment indicate the varying levels of risk from negligible to medium for dust soiling, human health and ecological impacts across the assessed project elements before mitigation measures are applied. Results are summarised below:

- dust soiling impacts – the risk across the assessed project elements would be negligible for demolition, would range from low to medium for earthworks and track-out, and would be low for construction
- human health impacts – the risk across the assessed project elements would be negligible for demolition, and ranged from low to medium for earthworks, construction and track-out
- ecological impacts – the risk across the assessed project elements would be negligible for demolition, and ranged from low to medium for earthworks, construction and track-out.

The project would follow conventional construction methods and be guided by a construction air quality management plan to effectively manage environmental impacts. With the measures outlined in *section 22.1.5* in place, the residual risk to the surrounding area, including identified receivers, is considered negligible.

The expected volume of traffic, fuel use and potential dust emissions during the operation of the project would be substantially lower than during construction. As a result, it is considered that operational air quality impacts from the project are likely to be negligible.

22.2 Greenhouse gas

This section provides an overview of the existing environment as it relates to greenhouse gases, an assessment of potential greenhouse gas impacts of the project and identifies mitigation and management measures to be adopted to minimise and manage these potential impacts.

A detailed air quality and greenhouse gas assessment has been prepared for the project and is provided in *Technical Report 18 - Air quality and greenhouse gas impact assessment*. The Planning Secretary's environmental assessment requirements (SEARs) as they relate to the assessment of greenhouse gas and where in this environmental impact statement (EIS) these have been addressed are summarised in *Appendix A (Assessment requirements compliance)*.

22.2.1 Assessment approach

Legislation, policies, plans and guidelines

Greenhouse gas (GHG) impacts associated with the project were assessed with consideration of the following:

- *Commonwealth Climate Change Act 2022*
- *Commonwealth National Greenhouse and Energy Reporting Act 2007* (NGER Act) and the National Greenhouse and Energy Reporting Scheme (NGERS)

- National Greenhouse and Energy Reporting Regulations 2008 and the *National Greenhouse and Energy Reporting (Measurement) Determination* 2008
- NSW EPA Draft Guide for Large Emitters (2024)
- *National Greenhouse Accounts Factor Workbook* (NGAF) (Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024b).

Assessment methodology

The methodology to assess the GHG impacts of the project involved:

- identifying emission sources within the project impact area associated with construction and operation in accordance with the NGAF workbook (DCCEEW 2024b), which considers:
  - Scope 1 emissions – direct GHG emissions which occur within the boundary of an organisation and are a result of the organisation's activities
  - Scope 2 emissions – indirect GHG emissions which occur from the generation of electricity purchased and consumed by an organisation
  - Scope 3 emissions – indirect GHG emissions which occur from all other upstream and downstream activities, such as the downstream extraction and production of raw materials or the upstream use of products and services
- identifying emission calculation methods and emission factors for each source
- identifying the activity data for each emission source based on estimates and projections of likely consumption rates and activity levels during construction and operation
- calculating estimated GHG emissions for the project and comparing these against NSW and National GHG emissions
- identifying mitigation measures to minimise potential impacts from GHG emissions.

As part of the air quality and greenhouse gas impact assessment (AQGHGIA) (see *Technical Report 18 – Air quality and greenhouse gas impact assessment*), GHG emissions have been presented as carbon dioxide equivalents (CO_2e) and include emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). A summary of the identified construction GHG emissions sources that were included as part of the AQGHGIA are provided in Table 22.7.

Table 22.7 GHG emissions sources during construction

Scope	Emission sources
Scope 1	Direct emissions from diesel and petrol combustion in onsite plant and equipment (e.g. land clearing, earthworks, construction)
	Direct emissions from diesel and petrol combustion in transportation around the project impact area
	Direct emissions from vegetation clearing (loss of carbon sink)
Scope 2	Indirect emissions associated with the consumption of purchased electricity
Scope 3	Indirect upstream emissions from the extraction, production and transport of diesel and petrol used for onsite plant and equipment

Scope	Emission sources
	Indirect upstream emissions from the extraction, production and transport of diesel and petrol used for vehicle transport
	Diesel combustion by vehicles transporting material to and from the project impact area
	Indirect upstream emissions from electricity lost in delivery in the transmission and distribution network
	Indirect upstream emissions associated with production and supply of construction materials (embodied emissions)

Operational GHG emissions sources were limited to direct emissions from diesel and petrol combustion in transportation around the project impact area and from the use of SF_6 (Scope 1) and indirect upstream emissions from the extraction, production and transport of diesel and petrol used for vehicle transport (Scope 3).

The following GHG emission sources are considered minor relative to the emission sources listed in Table 22.7 and have therefore been excluded from the AQGHGIA:

- use of oils and greases (Scope 1)
- worker travel to and from the project impact area during construction and operation (Scope 3)
- disposal of solid waste at landfill (Scope 3).

22.2.2 Existing environment

The available annual National and State emissions data reported by the Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW) from 2017 to 2022 (the latest reporting year) is summarised in Table 22.8. Values are presented in million tonnes of carbon dioxide equivalent (Mt CO2-e), which is a metric used to measure and compare emissions from GHGs based on their contributions to global warming.

Table 22.8 Annual GHG emissions data – Australia and NSW[1]

Reporting year	2017	2018	2019	2020	2021	2022
Annual emissions: Australia (Mt CO2-e)						
All sectors	528.9	501.7	490.7	474.5	438.7	432.6
Energy sector	433.7	436.2	434.7	418.8	404.3	396.7
Annual emissions: NSW (Mt CO2-e)						
All sectors	139.0	133.3	120.0	116.7	107.8	111.0
Energy sector	110.7	111.6	108.5	104.1	99.5	94.0

1 *Australian National Greenhouse Accounts* (DCCEEW, 2022).

22.2.3 Potential impacts – construction

The estimated GHG emissions from the Scope 1, Scope 2 and Scope 3 emissions during construction of the project are estimated to be up to 644,384 tonnes of CO_2-e per year. The estimated annual GHG emissions for the construction of the project are outlined in Table 22.9. Although the construction of the project is planned to commence in late 2027, these works would be limited to pre-construction minor works. The emissions from these activities are anticipated to be negligible and therefore have not been quantified. As such, the emissions outlined in Table 22.9 are focused on 2028, 2029 and 2030.

Table 22.9 GHG emissions during the construction period

Year	Annual GHG emissions (tonnes of CO_2-e/year) by scope									
	Scope 1			Scope 2	Scope 3					Total (all scopes)
	Diesel use	Petrol use	Vegetation clearing	Electricity use	Diesel use	Petrol use	Fuel use (material transport)	Electricity use	Embodied emissions	
2028	18,025	902	129,033	601	4442	229	4434	35	486,683	644,384
2029	18,025	902	129,033	371	4442	229	4434	35	486,683	644,154
2030	9013	451	64,516	133	2221	115	2217	9	243,342	322,017

The calculations for the above emissions during construction are included in *Technical Report 18 – Air quality and greenhouse gas impact assessment*. Scope 1 and Scope 2 emissions collectively account for around 23% of the total GHG emissions during construction, with the majority of emissions coming from the loss of carbon sink through vegetation clearing. Scope 3 emissions make up the majority of emissions during construction, representing 77% of the total. Embodied emissions from production of materials make up the majority of Scope 3 emissions during construction.

The GHG emissions estimated for the project were compared against the most recent publicly available State and National GHG emissions to assess their potential contribution to Australia's emissions inventory and therefore their potential impact on Australia's ability to meet GHG reduction targets and policies. The significance of annual GHG emissions relative to State and National GHG emissions has been determined by comparing annual average GHG emissions against the most recent available total GHG emissions inventories (calendar year 2022) for NSW (110,997 kt CO_2-e) and Australia (432,621 kt CO_2-e). Relative to 2022 emission inventory totals, Scope 1 and Scope 2 GHG emissions generated by the construction of project during the peak construction year (2028) would represent around 0.13% of NSW total emissions and 0.03% of National total emissions on an annual average basis. The impact of project construction on the NSW and National GHG emissions inventory and Australia's ability to meet GHG reduction targets and policies is therefore estimated to be negligible.

22.2.4 Potential impacts – operation

The estimated GHG emissions from the Scope 1, Scope 2 and Scope 3 emissions during operation of the project are included in Table 22.10.

Table 22.10 GHG emissions during operational life of the project

Annual GHG emissions (tonnes of CO_2-e/year) by scope					
Scope 1			Scope 3		Total (all scopes)
Diesel use	Petrol use	SF_6 usage[1]	Diesel use	Petrol use	
21	7	914	5	2	949

1: SF_6 gas to be used in gas insulated switchgear and circuit breaker applications. Emissions would be from potential gas leakage.

The calculations for the above emissions during construction are included in *Technical Report 18 – Air quality and greenhouse gas impact assessment*. Operation of the project would emit around 942 tonnes of CO_2-e per year (Scope 1) for the for the life of the project.

Similar to construction emissions, the GHG emissions estimated for the operation of the project were compared against the most recent publicly available State and National GHG emissions to assess their potential contribution to Australia's emissions inventory and therefore their potential impact on Australia's ability to meet GHG reduction targets and policies. The significance of annual GHG emissions relative to State and National GHG emissions has been determined by comparing annual average GHG emissions against the most recent available total GHG emissions inventories (calendar year 2022) for NSW (110,997 kt CO_2-e) and Australia (432,621 kt CO_2-e). Relative to 2022 emission inventory totals, annual average GHG emissions generated by the operation of project would represent around 0.00085% of NSW total emissions and 0.0002% of National total emissions. The impact of the operation of the project on the NSW and National GHG emissions inventory and Australia's ability to meet GHG reduction targets and policies is therefore estimated to be negligible.

Furthermore, operation of the project would contribute to the reduction of GHG emissions through the provision of electricity transmission infrastructure to enable the delivery of renewable energy to the National electricity market. This would contribute to the efforts of the Australian and NSW Governments to meet emissions reduction targets.

22.2.5 Mitigation and management

EnergyCo are committed to the ongoing management and reduction of GHG emissions generated by the project. The following opportunities are proposed as GHG management measures to reduce Scope 1 and 2 emissions:

- consideration will be given to the fuel efficiency of vehicles and equipment
- the purchase of electrical vehicles and equipment will be investigated to reduce or eliminate on-site fuel use

- maintenance of vehicles and equipment according to manufacturers' specifications to optimise fuel consumption
- performing pre-start inspections at each shift on mobile plant and vehicles
- travel distances will be minimised as far as practicable to reduce diesel consumption
- roads will be routinely maintained to reduce truck tyre rolling resistance, where practical
- idling of diesel vehicles and equipment will be minimised wherever feasible
- using low carbon concrete and steel in transmission line towers and other project infrastructure
- sourcing materials from local sources where possible
- consideration will be given to using on-site renewable energy sources where possible to supplement electricity purchased from the grid at construction support sites and temporary worker accommodation
- using refrigerants with a low (or zero) global warming potential at temporary worker accommodation where possible
- implementing education and signage to encourage energy efficiency at construction support sites and temporary worker accommodation
- using motion detectors for lighting at construction support sites and temporary worker accommodation
- tracking electricity and fuel usage on a regular basis.

22.2.6 Summary and conclusion

The impact of project construction on the NSW and National GHG emissions inventory is estimated to be negligible. Operation of the project would contribute to emissions reduction targets made by the Australian and NSW Governments through the provision of electricity transmission infrastructure to enable the delivery of renewable energy to the National electricity market.

The mitigation measures proposed in *section 22.2.5* would further avoid and minimise GHG emissions from the project.

22.3 Waste

This section assesses the potential impacts associated with waste generation during construction and operation of the project and identifies mitigation and management measures to be adopted to promote opportunities for avoiding/reducing waste generation, managing, reusing and recycling and safely disposing of waste associated with the Hunter Transmission Project (HTP, the project).

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to waste management, and where in the environmental impact statement (EIS) these have been addressed, are detailed in *Appendix A (Assessment requirements compliance table)*.

22.3.1 Assessment approach

Legislation, policies, plans and guidelines

The waste assessment was prepared with reference to the following plans/policies/guidelines:

- *Waste Classification Guidelines* (NSW EPA 2014)
- *NSW Circular Economy Policy Statement: Too Good to Waste* (NSW EPA 2019)
- *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027* (NSW EPA 2021).

Study area

The study area for the assessment of potential waste impacts encompasses the project impact area and the local government areas (LGAs) of Muswellbrook, Singleton, Cessnock, Lake Macquarie, Central Coast and Newcastle.

Assessment methodology

A desktop assessment of the potential impacts associated with waste generation during construction and operation was undertaken and involved:

- identifying potential waste generating activities during construction and operation
- identifying potential waste types, indicative quantities, and preliminary waste classifications in accordance with relevant legislation and guidelines
- identifying waste management options for key waste streams
- providing measures to manage waste in accordance with waste hierarchy and circular economy principles.

22.3.2 Existing environment

Existing waste sources in the Muswellbrook, Singleton, Cessnock, Lake Macquarie, Central Coast and Newcastle LGAs includes waste from mining, forestry operations, agricultural and domestic waste.

There are several existing licensed waste management facilities near the project operated by local councils and accept a wide range of wastes, including construction and demolition waste, domestic waste and recycling materials.

Existing waste management facilities within the Muswellbrook, Singleton, Cessnock, Lake Macquarie and Central Coast LGAs, and the waste types able to be received by these facilities are listed in Table 22.11. Preliminary consultation with councils regarding the project's anticipated waste during construction has occurred, with further consultation to be carried out during detailed design to confirm the capacity of the waste management facilities to accept the indicative volumes of waste from the project.

Table 22.11 Waste management facilities within the study area

Facility name	Council	Wastes accepted according to waste classification	Approximate distance from project impact area
Muswellbrook waste and recycling facility (Coal Road, Muswellbrook)	Muswellbrook City Council	Green waste, general domestic waste, mixed waste, electronic waste, steel reinforced concrete, concrete or rubble, scrap metal recycling, soil, waste motor oil, timber, tyres, automotive batteries	23 km north of Bayswater substation
Singleton waste management facility (Dyrring Road, Fern Gully)	Singleton Council	Aluminium and steel, general domestic waste, electronic waste, motor and other oils, plastic, tyres, metals, green waste, timber, glass, electronic waste	14 km northeast of Mount Thorley
Cessnock waste management centre (Old Maitland Road, Cessnock)	Cessnock City Council	Electronic waste, general domestic waste, motor and other oils, metals, timber, tyres, concrete, green waste, corrugated iron, lead, steel, aluminium, electrical cables	20 km northeast of Wollombi Road construction support site
Awaba waste management facility (Wilton Road, Awaba)	Lake Macquarie City Council	Concrete, general domestic waste, bricks, tiles, asphalt, glass, timber, synthetic mineral fibre wastes, general solid waste (putrescible), green waste	10 km southwest of Eraring substation
Summerhill waste management centre (Minmi Road, Wallsend)	City of Newcastle	Bricks, general domestic waste, concrete, asphalt, timber, green waste, scrap metal, glass, electronic waste, batteries, motor oils and other used oils, contaminated soils, tyres	30 km northeast of Eraring substation
EnviroKing Pty Ltd (John Renshaw Drive, Black Hill)	City of Newcastle	Treated wastewater, mineral oil, contaminated water containing oil, liquid waste	47 km northeast of Eraring substation

Facility name	Council	Wastes accepted according to waste classification	Approximate distance from project impact area
Buttonderry Waste Management Facility (Hue Hue Road, Jilliby)	Central Coast Council	General solid waste (non-putrescible), batteries, concrete, asphalt, timber, green waste, scrap metal, motor oils and other used oils, steel, general solid waste (putrescible), asbestos waste, tyres	18 km southwest of Eraring substation
Woy Woy Waste Management Facility	Central Coast Council	General solid waste (non-putrescible), batteries, concrete, asphalt, timber, green waste, scrap metal, steel, motor oils and other used oils, general solid waste (putrescible), asbestos waste, tyres	53 km southwest of Eraring substation

22.3.3 Potential impacts – construction

Waste generation

The key activities with the potential to generate waste during construction (including indicative quantities) are provided in Table 22.12.

The estimated potential construction waste streams and quantities generated by the project is based on the current design and indicative construction methodology and from experience on similar projects. Final quantities and classifications of all waste streams would be confirmed during construction.

To achieve positive waste and resource management outcomes, the project would adopt waste management strategies in accordance with the waste management hierarchy and avoidance and management of impacts. Additional detail about the management of waste is provided below and included in *section 22.3.5*.

Table 22.12 Expected waste generated during construction

Construction activity	Waste type	Indicative quantity (total during construction)	Likely classification of waste stream
Clearing and grubbing	Green waste, including timber, shrubs, grasses, leaves and weeds (excluding easement clearing)	3500 m^3	General solid waste (non-putrescible)
General earthworks and excavation activities	Spoil from excavations that is unsuitable for reuse	48,540 m^3	General solid waste (non-putrescible), subject to classification
Concrete batching plants	Concrete waste	8,000 tonnes	General solid waste (non-putrescible)
Construction of access roads	Asphalt, road base, concrete and gravel	Less than 150 tonnes	General solid waste (non-putrescible)
Maintenance of construction plant, vehicles and equipment	Vehicle/plant maintenance materials, including: • empty oil and other containers/drums • lubricants, waste oils, fuels, coolant, radiator fluid, hydraulic fluid • drained oil filters • electrical waste, including batteries and cables • tyres	18 tonnes	• General solid waste (non-putrescible) – drained oil filters (mechanically crushed), rags and oily rags (only if they contain non-volatile petroleum hydrocarbons and no free liquids) • Hazardous waste – containers holding oil, grease, and lubricants if residues have not been removed by washing • Liquid waste (oils) • Special waste (tyres)

Construction activity	Waste type	Indicative quantity (total during construction)	Likely classification of waste stream
Construction of project infrastructure (transmission line and switching stations)	Steel and other metals Timber used in forming of foundations or piles Conductor, earthing and tower waste materials, pipe and conduit, and electrical cabling	2250 tonnes 400 tonnes 708 tonnes	General solid waste (non-putrescible)
	Hazardous waste and/or contaminated waste	50 tonnes	Hazardous waste and/or special waste (e.g. asbestos)
Transportation of materials required for construction	Transportation and packaging waste, including plastic, paper, cardboard, pallets, fumigated timber cable drums	Less than 300 tonnes	General solid waste (non-putrescible)
Activities at construction support sites, including temporary worker accommodation	General domestic waste, including food waste, paper, cardboard, plastic and glass	80 tonnes	General solid waste (putrescible and non-putrescible)
Dewatering, dust suppression, washdown of plant and equipment and staff amenities	Wastewater, including concrete washouts and sewage	70 ML	Liquid waste

Waste management

Waste generated during construction would be managed using circular economy principles and the waste hierarchy approach of avoid/reduce, reuse and recycle before consideration is given to disposal (see
Figure 22.3). Wastes would be managed in accordance with the waste provisions contained within the NSW *Protection of the Environment and Operations Act 1997* (POEO Act) and other relevant plans, policies, and guidelines listed in *section 22.3.1*.

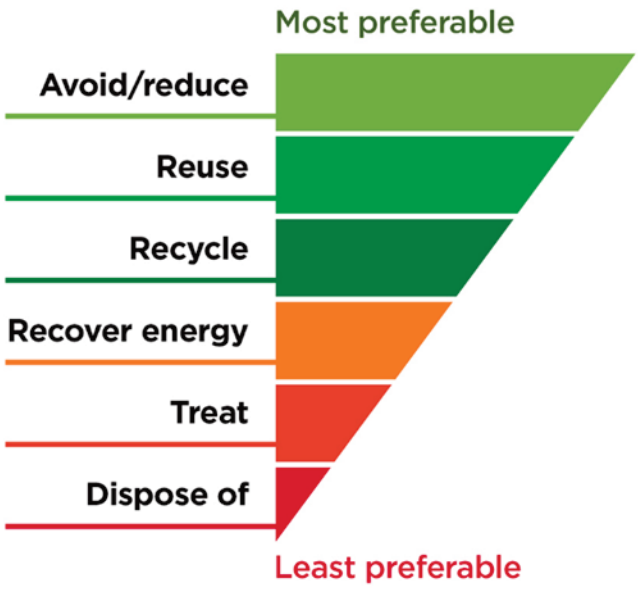

Figure 22-3 Waste hierarchy

Source: NSW Department of Planning

Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the NSW *EPA Waste Classification Guidelines* (2014). These guidelines provide direction on the classification of waste, specifying requirements for management, transportation, and disposal of each waste category.

If improperly managed, waste generated during construction of the project has the potential to contaminate soils, pollute water and generate leachate, odours and dust as well as result in associated environmental, health and safety risks.

The proposed approach to managing construction waste, including measures to facilitate segregation and prevent cross contamination is, provided in Table 22.13. Additional mitigation measures are provided in *section 22.3.5*.

The recycling and disposal facilities for each waste stream would be determined based on availability/capacity, waste licensed to be accepted and confirmed waste classifications. The facilities would be documented in a waste management plan to be prepared prior to construction of the HTP.

Table 22.13 Construction waste management approach

Waste type	Management
Green waste, including timber, shrubs, grasses, leaves and weeds	Usable timber would be reused for fauna habitat or (where practical) offered to directly affected landowners (including the Forestry Corporation of NSW). Following this, clean green waste (i.e. free of weeds and weed seeds) would be chipped, mulched and reused on-site and in line with the relevant NSW EPA Resource Recovery Order. Otherwise, the material would be removed for off-site beneficial reuse in accordance with *The Mulch Order 2016* (NSW EPA 2016) and the *NSW Biosecurity Act 2015.* Weed-contaminated green waste would be disposed of and taken to a licenced waste facility also in line with *Biosecurity Act 2015.*
Spoil from excavations that is unsuitable for reuse	Where contamination is suspected, on-site testing and assessment of soils would be undertaken to determine the correct waste classification. Contaminated spoil would be appropriately contained, sampled, tested and either managed in place (only where there is no unacceptable risk to human health or ecological values) or disposed of at a suitably licensed waste management facility in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Concrete waste	Where feasible, construction waste materials would be reused in line with the relevant NSW EPA Resource Recovery Order. If materials cannot be reused on-site, waste would be segregated/sorted on-site and processed at a materials recycling facility. All wastes would be assessed and disposed of in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Asphalt, road base, concrete and gravel	Where feasible, construction waste materials would be reused in line with the relevant NSW EPA Resource Recovery Order. If materials cannot be reused on-site, waste would be segregated/sorted on-site and processed at a materials recycling facility. All wastes would be assessed and disposed of in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Vehicle/plant maintenance materials	Waste from construction vehicle and plant maintenance would be collected and stored in clearly labelled bins in designated waste storage areas for collection by an authorised contractor for recycling or disposal off-site. Special waste such as tyres would be collected by an authorised contractor for recycling at a facility licensed to receive tyres (including tyre pieces). Liquid wastes would be stored in appropriate containers in bunded areas until transported off-site. The capacity of any bunded area would be at least 130% of the largest volume contained. All waste would be disposed of in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Steel and other materials, timber used in forming of foundations or piles, conductor, earthing and tower waste materials,	Where feasible, construction waste materials would be reused in line with the relevant NSW EPA Resource Recovery Order. If materials cannot be reused on-site, waste would be segregated/sorted on-site and processed at a materials recycling facility. Electrical waste would be stored for collection by an authorised contractor for processing and off-site recycling. All wastes would

Waste type	Management
pipe and conduit and electrical cabling	be assessed and disposed of in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Hazardous waste and/or contaminated waste	Waste classified as hazardous waste (such as asbestos) would be collected and stored in clearly labelled bins in designated waste storage areas for collection by an authorised contractor for off-site disposal in line with the NSW *EPA Waste Classification Guidelines* (2014).
Transportation and packaging waste, including plastic, paper, cardboard, pallets, fumigated timber cable drums	Where feasible, construction waste materials would be reused in line with the relevant NSW EPA Resource Recovery Order. If materials cannot be reused on-site, waste would be segregated/sorted on-site and processed at a materials recycling facility. Electrical waste would be stored for collection by an authorised contractor for processing and off-site recycling. All wastes would be assessed and disposed of in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
General domestic waste, including food waste, paper, cardboard, plastic and glass	General domestic waste would be collected in designated waste collection bins at the construction support sites (including workers accommodation) to ensure source separation of recyclable materials and residual landfill waste. These wastes would be collected on a regular basis by authorised and appropriately licensed waste collection contractors for offsite recycling or disposal.
Wastewater, including concrete washouts and sewage	Wastewater would be temporarily stored in suitably sized tanks at the construction support sites (including workers accommodation) prior to transport by an authorised and appropriately licensed wastewater contractor to an appropriately licensed facility for treatment and disposal at regular intervals during construction.

22.3.4 Potential impacts – operation

Waste generation

Minimal quantities of waste would be generated during operation given the small number of site personnel and minimal ongoing maintenance requirements of the project.

The key activities with the potential to generate waste during operation (including indicative quantities) are provided in Table 22.14.

Table 22.14 Expected waste generated during operation

Activity	Waste type	Indicative quantity	Likely classification of waste stream
Transmission line and switching station maintenance	Maintenance of towers, conductors, vehicles and equipment (e.g. reactors in switching stations)	10 tonnes per year	General solid waste (non-putrescible)

Activity	Waste type	Indicative quantity	Likely classification of waste stream
	Maintenance materials including lubricants, waste oils, fuels, coolant, radiator fluid, hydraulic fluid drained oil filters, electrical waste, including batteries and cables	3 tonnes per year	Hazardous waste or restricted waste (non-putrescible)
	General waste including packaging waste, plastic, paper, cardboard, pallets, fumigated timber cable drums, empty oil and other containers/drums	5 tonnes per year	General solid waste (non-putrescible)
	Green waste from vegetation maintenance	minimal – as only required to maintain vegetation clearances limits along the proposed easement	General solid waste (non-putrescible)
Switching station operations	General waste from workers	5 tonnes per year	General solid waste (putrescible and non-putrescible)
	Wastewater	6 tonnes per year	Liquid waste

Waste management

Waste generated during operation would be managed in a similar way as construction. The proposed approach to managing operation waste, including measures to facilitate segregation and prevent cross contamination, is provided in Table 22.15. Additional mitigation measures are provided in *section 22.3.5*.

The recycling and disposal facilities for each waste stream would be determined based on availability/capacity, waste licensed to be accepted and confirmed waste classifications.

Table 22.15 Operation waste management approach

Waste type	Management
Maintenance of towers, conductors, vehicles and equipment (e.g. transformers in switching stations)	Collected by an authorised contractor for off-site recycling or disposal at appropriately licensed facility in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Maintenance materials including lubricants, waste oils, fuels, coolant, radiator fluid, hydraulic fluid drained oil filters, electrical waste, including batteries and cables	Collected by an authorised contractor for off-site recycling or disposal at appropriately licensed facility in accordance with the NSW *EPA Waste Classification Guidelines* (2014).

Waste type	Management
General waste including packaging waste, plastic, paper, cardboard, pallets, fumigated timber cable drums, empty oil and other containers/drums	Collected by an authorised contractor for off-site recycling or disposal at appropriately licensed facility in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Green waste from vegetation maintenance	Clean green waste (i.e. free of weeds and weed seeds) would be chipped, mulched and reused on-site and in line with the relevant NSW EPA Resource Recovery Order. Otherwise, the material would be removed for off-site beneficial reuse in accordance with *The Mulch Order 2016* (NSW EPA 2016) and the NSW *Biosecurity Act 2015.* Weed-contaminated green waste would be disposed of and taken to a licenced waste facility also in line with *Biosecurity Act 2015.*
General waste from workers	Collected by an authorised contractor for off-site recycling or disposal at appropriately licensed facility in accordance with the NSW *EPA Waste Classification Guidelines* (2014).
Wastewater	Wastewater would be disposed of via a suitable disposal system such as a septic tank with the treated water pumped to a suitable landscaped area. Any wastewater required to be removed from site would be taken to an appropriately licensed facility for disposal in accordance with the NSW *EPA Waste Classification Guidelines* (2014).

22.3.5 Mitigation and management

Environmental management

Waste generated during construction would be managed using circular economy principles and the waste hierarchy approach of avoid/reduce, reuse and recycle before consideration is given to disposal. Waste would be managed in accordance with the waste provisions contained within the NSW *Protection of the Environment and Operations Act 1997* (POEO Act) and other relevant plans, policies, and guidelines listed in *section 22.3.1*. Mitigation measures outlined in this section would be included in a waste management and resource recovery management plan for the HTP.

Mitigation measures

Mitigation and management measures proposed to manage waste during construction and operation of the project are listed in Table 22.16.

Table 22.16 Proposed mitigation and management measures – waste

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
WM1	Waste management	A waste management and resource recovery plan will be prepared and will include appropriate measures to manage waste generation, reuse, recycling and disposal during construction of the project.	Detailed design	All locations
WM2	Waste facilities	The recycling and disposal facilities to be used during construction and operation of the project will be determined based on availability/capacity, waste licensed to be accepted and confirmed waste classifications. Consultation will be carried out with local councils including Muswellbrook, Singleton, Cessnock, Lake Macquarie, Central Coast and Newcastle in relation to the disposal of project waste at licensed facilities.	Detailed design Construction	All locations
WM3	General waste management	The following general waste management actions will be implemented throughout the construction and operation of the project: • the waste hierarchy principles of avoid/reduce, reuse, or recycle with disposal as the last resort will be applied • waste will be assessed, classified, managed and disposed of in line with the NSW *EPA Waste Classification Guidelines* (2014) and the relevant requirements of the Protection of the Environment Operations (Waste) Regulation 2014 • waste streams will be segregated to avoid cross contamination of materials and to maximise reuse and recycling opportunities • waste and surplus spoil will be removed and transported to an appropriately licensed waste disposal or transfer facility or other facilities lawfully able to accept materials • wastewater from construction work will be collected and transported to a licensed premise that can lawfully accept the waste.	Construction Operation	All locations

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
WM4	General waste management	The waste management measures per Table 22.13 and Table 22.15 will be implemented.	Construction Operation	All locations

22.3.6 Summary and conclusion

Waste generated during construction would be managed using circular economy principles and the waste hierarchy approach of avoid/reduce, reuse and recycle before consideration is given to disposal (see
Figure 22.3). Wastes would be managed in accordance with the waste provisions contained within the NSW *Protection of the Environment and Operations Act 1997* (POEO Act) and other relevant plans, policies, and guidelines listed in *section 22.3.1*. Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the NSW *EPA Waste Classification Guidelines* (2014).

Waste generated during operation would be managed in a similar way as construction. The proposed approach to managing operation waste, including measures to facilitate segregation and prevent cross contamination, is provided in Table 22.15. Additional mitigation measures are provided in *section 22.3.5*.

22.4 Economic

This section provides an assessment of potential positive and adverse economic impacts of the project and identifies mitigation and management measures to be adopted to minimise and manage these potential impacts to the extent that they are negative.

An economic impact assessment has been prepared for the project and is provided in *Technical Report 19 – Economic impact assessment*. The Planning Secretary's environmental assessment requirements (SEARs) as they relate to the assessment of economic impacts and where in this environmental impact statement (EIS) these have been addressed are included in *Appendix A (Assessment requirements compliance table).*

22.4.1 Assessment approach

Legislation, policies, plans and guidelines

The following State and regional policies and guidelines were considered as part of the economic assessment:

- *2024 Integrated System Plan* (Australian Energy Market Operator (AEMO) 2024)
- Australian and New Zealand Standard Industry Classification.

Study area

The study area for the economic impact assessment comprises the project impact area and the LGAs of Muswellbrook, Singleton, Cessnock, Lake Macquarie and Central Coast. This area has potential to provide inputs to, and derive economic benefits from, the construction and operation of the project. While the study area is the focus of the analysis, impacts on the wider NSW economy are also assessed.

The study area for the economic impact assessment is shown in Figure 22.4.

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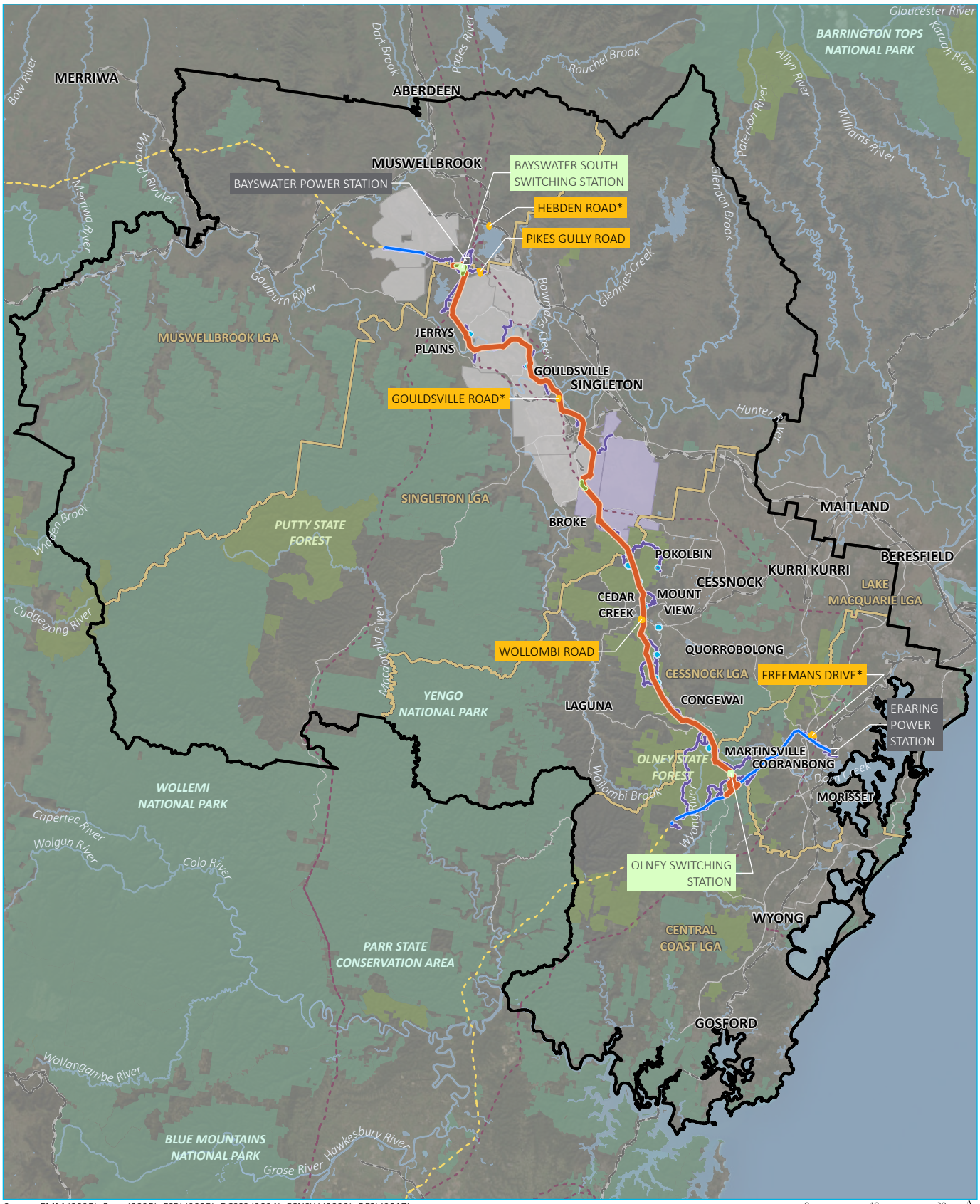

Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); DFSI (2017)

0 10 20 km
GDA2020 MGA Zone 56

N

KEY

- Economic impact assessment study area
- Local government area

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 forest
- Defence
- Mining

Economic impact assessment study area

Hunter Transmission Project
Environmental Impact Statement
Figure 22.4

EMM creating opportunities

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Assessment methodology

The economic impacts of the project were assessed using input-output (IO) analysis. IO analysis is used to assess the direct and indirect impacts of the construction and operation of the project on the regional and NSW economy.

The assessment methodology for the economic assessment involved:

- research on the economic environment at regional and NSW scales considering data from public databases
- development of IO tables for the regional and NSW economy that can be used to identify the economic structures of the region and NSW and the multipliers for each existing sector of the economy. The IO tables were developed using the Generation of Regional Input Output Tables (GRIT) procedure developed by the University of Queensland and recognised internationally (Bayne & West 1988)
- identification of the direct impacts of the project so that the IO multipliers and flow-on effects can then be estimated (West 1993). The multiplier was calculated and applied in the assessment as it summarises the total impact on all industries in an economy from changes in the demand for the output of any industry
- analysis of the impacts of the project on the economy in terms of 4 main indicators:
  - gross regional output – the gross value of business turnover in a region
  - value-added – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services brought in to produce the gross regional output. These costs exclude wage costs
  - income – the wages paid to employees including wages for self-employed and business owners employment – the number of people employed (including self-employed, full-time, and part-time)
- identification of management measures to address potential impacts.

22.4.2 Existing environment

This section characterises the economy of the study area from 2 perspectives – residents of the region and economic activity in the region.

Residents of the region

Based on the Australian Bureau of Statistics (ABS) 2021 Census of Population and Housing, the study area had a population of 665,007 and a labour force of 309,405. The Central Coast LGA and Lake Macquarie LGA together account for 84% of the regional population and 84% of the regional labour force. In 2021, 14,584 people (about 4.7% of the total regional workforce) were unemployed within the study area, with the majority of these in the Central Coast and Lake Macquarie LGAs.

Population changes can be an indication of the health of an economy. This theory of regional economic growth suggests that places that can attract immigration create increased demand for goods and services and therefore more jobs. This growth leads to increasing local multiplier effects, scale economics and an increase in the rate of innovation and capital availability (Sorensen 1990).

Conversely, population losses can contribute to decline, where reductions in population result in the closure of services, which in turn makes it difficult to attract immigration (Sorensen 1990).

The population of the study area has been growing at an average annual rate of 1% since 2006, with the highest growth rate being in the Cessnock LGA, followed by the Central Coast and Lake Macquarie LGAs. The lowest annual population growth rate was in the Muswellbrook LGA followed by the Singleton LGA.

Employment profile

The main occupations of residents were professionals (19.7%), followed by technicians and trade workers (15.9%) and community and personal service workers (13.3%) (ABS 2021). The percentage of residents employed as professionals was greatest in the Central Coast and Lake Macquarie LGAs, while the percentage of residents employed as technicians and trade workers was greatest in the Muswellbrook, Singleton and Cessnock LGAs.

Hospitals (except psychiatric hospitals) was the most significant employment sector for residents in the region and for the Central Coast and Lake Macquarie LGAs. Coal mining was the most significant employment sector for residents of Muswellbrook, Singleton and Cessnock LGAs.

An indication of the nature of the regional economy can be gained by examining places of work employment by industry data using the Australian and New Zealand Standard Industry Classification (ANZSIC) (ABS 2006). The main employment in the region varies across LGAs as shown in Figure 22.5. Health care and social assistance, retail trade, construction, accommodation and food services, and education and training sectors are the most prominent industries in terms of employment in the study area.

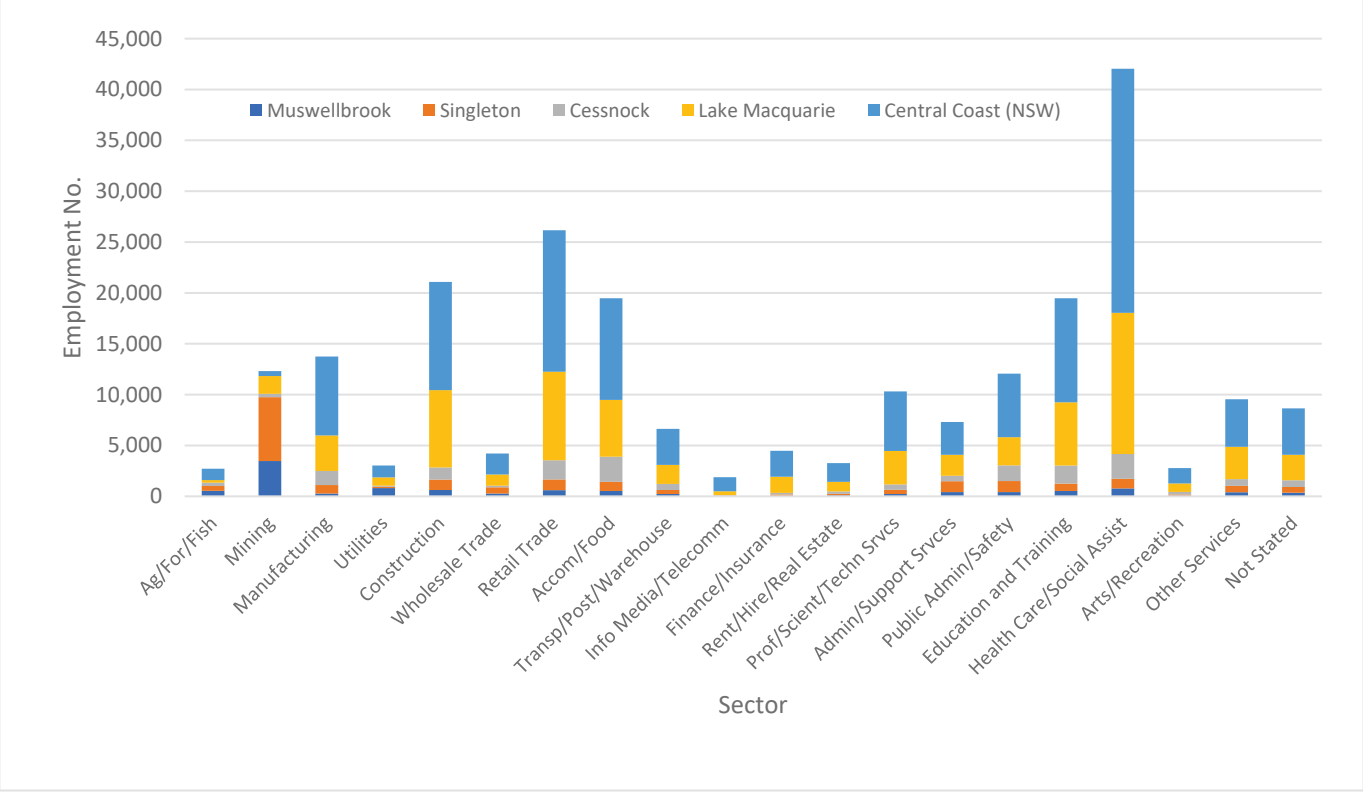


Figure 22-5 Place of work employment by industry (One-digit Industry of Employment ANZSIC Sectors)

Gross regional product and industry analysis

Exporting sectors are key drivers of regional economics and reflect a region's competitive advantages. The regional economy is a net exporter, with exports out of the region totalling around $47 billion and imports into the region totalling around $28 billion. Using the IO industry classifications, the largest exporting industries by value from the regional economy are:

- coal mining ($41.336 billion)
- basic non-ferrous metal manufacturing ($1.221 billion)
- electricity generation ($1.048 billion)
- residential care and social assistance ($981 million)
- insurance and superannuation funds ($688 million).

Coal mining, residential care and social assistance services, retail trade, health care services, and primary and secondary education were the highest value-added industries in the regional economy, as presented in Table 22.17.

Table 22.17 Gross value-added for the 5 largest industries in the regional economy (IO Sectors)

Industry	Gross value-added ($ billion)	Proportion of regional value-added (per cent)	Proportion of regional employment (per cent)
Coal mining	31	50	5
Residential care and social assistance services	2.4	4	9
Retail trade	1.8	3	12
Health care services	1.8	3	10
Primary and secondary education services (including preschool and special schools)	1.5	2	7
Total	38.5	62	43

22.4.3 Potential impacts – construction

Construction of the project would generate economic activity within the regional and NSW economy. Construction would also result in some contraction in agricultural and forestry activity within the construction impact area.

Construction expenditure and workforce

Construction expenditure for the project would be associated with the manufacturing of equipment and expenditure across the following 3 construction sectors of the IO industry classification (ABS 2022):

- the Heavy and Civil Engineering Construction sector, which includes businesses involved in engineering construction and project management services for a diverse range of activities

including the construction of electricity transmission towers and lines, road construction and tunnelling

- the Construction Services sector, which includes businesses involved in earthmoving work such as levelling of construction sites, excavation of foundations, trench digging, concreting services, electrical services and hire of earthmoving plant
- the Non-residential Building Construction sector, which includes businesses engaged in the construction of non-residential buildings.

The construction workforce would vary depending on the stage of construction and associated activities. Average quarterly construction employment would peak at 830 workers at around 9 to 12 months into the
2.5-year construction period. The average annual construction workforce over the peak 2 years of construction is estimated at 486 workers, as shown in Table 22.18.

Table 22.18 Average annual construction workforce and expenditure in the 3 construction sectors

Construction year	Construction workforce (expected)	Annual expenditure ($ million)
2027	450	156
2028	523	181
Average	486	168

In estimating the average annual regional economic impacts of the project, the flow-on effects that are associated with firms buying goods and services from each other (production-induced effects) are separated from the flow-on effects that are associated with employing people who subsequently buy goods and services as households (consumption-induced effects). This is because these effects operate in different ways and have different spatial impacts.

Production-induced effects are generally proportional to the direct inputs into the region, whereas the consumption-induced effects only occur in a proportional way if workers and their families reside in the region. Where workers commute from outside the region, some of the consumption-induced flow-on effects leak from the region. It is estimated that around 20% of the construction workforce is expected to be from the region. The assessment assumed that 20% of the required construction workforce for the project would reside in the workforce accommodation facilities and that none of the wages of these people would be spent in the regional economy. In reality, some construction workforce wages may be spent in the regional economy.

Flow-on effects from the construction of the project are likely to affect several different sectors of the regional and NSW economics, as shown in Table 22.19.

Table 22.19 Industries most likely to have flow-on effects from construction of the project

Construction flow-on effects	Production-induced	Consumption-induced
Most impacted sectors of the regional economy	• Professional, scientific and technical services • Wholesale and retail trade • Cement lime and ready-mixed concrete manufacturing • Structural metal product manufacturing • Employment, travel agency and other administrative services • Road transport	• Retail and wholesale trade • Food and beverage services • Health care services • Primary and secondary education • Residential care and social assistance services • Employment, travel agency and other administrative services
Most impacted sectors of the NSW economy	• Residential building construction • Non-residential property operators and real estate services • Auxiliary finance and insurance services	• Finance, insurance and superannuation • Other services

The average annual construction impacts of the project on the regional economy for the 2 peak years of construction are estimated to be up to:

- $325 million in annual direct and indirect output
- $113 million in annual direct and indirect value-added
- $72 million in annual direct and indirect household income
- 789 direct and indirect jobs.

The average annual economic impacts of the construction workforce on the regional economy are outlined in Table 22.20.

Table 22.20 Average annual economic impacts of the project on the regional economy during construction

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	168	143	15	157	325
Value-added ($ million)	70	36	8	44	113
Income ($ million)	47	21	4	25	72
Employment	486	247	57	303	789

Note: totals may have discrepancies due to rounding.

The average annual construction impacts of the project on the NSW economy for the peak 2 years of construction are estimated at up to:

- $551 million in annual direct and indirect output
- $232 million in annual direct and indirect value-added
- $150 million in annual direct and indirect household income
- 1524 direct and indirect jobs.

The average annual economic impacts of the construction workforce on the NSW economy are outlined in Table 22.21. The impacts are larger for NSW because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy.

Table 22.21 Average annual economic impacts of the construction workforce on the NSW economy

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	168	192	190	382	551
Value-added ($ million)	70	59	103	163	232
Income ($ million)	47	48	55	103	150
Employment	486	378	660	1038	1524

Note: totals may have discrepancies due to rounding.

Agricultural land displacement

Construction of the project would result in a temporary reduction in the land available for agricultural activity within the construction impact area. As identified in *Technical Report 5 – Agriculture impact assessment*, the direct impact of construction on gross agricultural production is estimated to be about $404,738 per year of construction. Using revenue, expenditure and employment ratios in the sheep, grain, beef and dairy cattle sector of the regional and NSW IO tables, the annual direct and indirect impact of this level of gross regional and NSW production is summarised in Table 22.22 and Table 22.23, respectively.

The agricultural impacts of the project during construction are less than 0.1% of agricultural economic activity in the region and a fraction of the economic activity gains from the project. This is slightly higher than the estimated impact in *Technical Report 5 – Agriculture impact assessment*, because this estimate includes direct and indirect impacts across all the economic indicators rather than only agricultural output.

Table 22.22 Annual regional economic impacts of displaced agricultural land during construction

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	0.4	0.15	0.09	0.25	0.65
Value-added ($ million)	0.19	0.07	0.05	0.12	0.31
Income ($ million)	0.05	0.04	0.02	0.06	0.11
Employment	0.84	0.48	0.37	0.85	1.69

Note: totals may have minor discrepancies due to rounding.

Table 22.23 Annual NSW economic impacts of displaced agricultural land during construction

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	0.4	0.3	0.28	0.58	0.99
Value-added ($ million)	0.19	0.14	0.15	0.29	0.48
Income ($ million)	0.06	0.08	0.08	0.16	0.22
Employment	0.84	0.89	0.96	1.85	2.69

Note: totals may have minor discrepancies due to rounding.

State forest land displacement

During construction, the project would impact 661 hectares of production native forests and 49 hectares of plantation forests (assumed to be hardwood). According to the Forestry Corporation of NSW (2024), 1.834 million hectares of hardwood multi use and plantation forests in NSW yields $89 million from timber and extractive resources per year, which equates to $49 per hectare per year. On this basis, the direct impact of construction on gross forestry production is estimated to be around $35,902 per year of construction. The regional impacts associated with this level of reduced economic activity are negligible.

It should be noted that the construction of the project would also reduce access for recreational visitors of State forests because of the temporary closure of sections of the forests where construction activities are planned to occur. Specifically, the Watagan, Corrabare, Olney and Pokolbin State forests are used recreationally for camping, mountain biking and bushwalking, among other activities, and these recreational users typically spend money on goods and services while travelling to and from State forests (e.g. for fuel, tolls, food and water, etc).

This may lead to a temporary reduction in recreational visitors to this part of the State forests and therefore potential to result in localised economic impacts to businesses that would have otherwise benefitted financially from visitors travelling to and from the State forests. However, these impacts

are not anticipated to affect the viability of local businesses and would only occur during periods of inaccessibility to particular locations in State forests (i.e. these impacts would not occur for the entire duration of construction).

Other potential impacts

The construction of the project would create demand for regional labour resources and regional inputs to production. Where there is excess capacity in the regional economy, or the region has access to labour and other resources from outside the region, this demand would increase economic activity in the region.

Increases in labour demand from a project can in the short-term lead to increases in construction wages, associated labour shortages in other areas of the economy (and associated shortages of goods and services), and rising costs as firms pass wage costs onto consumers. The extent of these impacts for regional economies would depend on the balance of labour supply from inside the region and outside the region, as well as adjustment of the overall labour market in response to increased demand. In addition, excess demand for inputs to construction, such as quarry materials and concrete, can result in rising costs for these inputs and potentially shortages for other uses.

It is also noted that the presence of the construction workforce may result in reduced access to community infrastructure, including access to housing and short-term accommodation, recreational infrastructure and health and other community services. Further detail on these impacts is included in *Technical Report 6 – Social impact assessment*.

The extent to which these types of effects would arise from an individual project is uncertain. For instance, a study by Deloitte Access Economics (2011) for the Singleton LGA found no evidence of price rises (house prices, rents, or groceries) in the Singleton economy relative to non-mining regional economies. In any case, this represents the operation of the market system where scarce resources are reallocated to where they are most highly valued and where society will benefit the most from them.

22.4.4 Potential impacts – operation

Operation of the project would result in economic activity in the Electricity Transmission, Distribution, On Selling and Electricity Market Operation sector. Operation would also result in some contraction in agricultural activity in part of the operation impact area.

Operational benefits

The Australian and State Governments are managing significant changes in electricity generation within the National Electricity Market (NEM). As Australia progresses towards a net zero emissions future, coal-fired and other fossil fuel-based generation are being replaced by renewable energy sources, energy storage, and other forms of firming capacity.

Large scale renewable energy projects will be located within renewable energy zones (REZs) across eastern Australia, including 5 within NSW. The implementation of large-scale transmission infrastructure is imperative to ensure the viability of the REZs as they are not located in the immediate vicinity of load centres and, in many cases, existing transmission infrastructure is not equipped to carry the amount of energy expected to be generated. For this reason, the creation of

additional transmission infrastructure is required if the REZs are to meet the aims of the *NSW Electricity Strategy* (DPIE 2019a).

The HTP would provide the necessary transmission infrastructure to connect renewable energy generation projects in the Central-West Orana and New England REZs into the NEM. It will provide up to 5 gigawatts of transfer capacity. It is therefore an integral component of the NSW Electricity Strategy which aims to deliver reliable, affordable and sustainable electricity systems for NSW.

Operational expenditure and workforce

It is estimated that the operational workforce of 10 would all reside in the region. An output and expenditure profile has been estimated based on the coefficients in the Electricity Transmission, Distribution, On Selling and Electricity Market Operation sector of the region and NSW IO models.

Flow-on effects from the project during operation are likely for different sectors of the regional economy associated with the local operational workforce expenditure on goods and services. Consumption-induced flow on effects from the local workforce would principally be associated with retail and wholesale trade, food and beverage services, and health care services industries.

The operation of the project would directly impact the Electricity Transmission, Distribution, On Selling and Electricity Market Operation sector which would have value-added and production-induced flow-on impacts for several industries as summarised in Table 22.24.

Table 22.24 Industries most likely to have production-induced flow-on effects from operation of the project

Construction flow-on effects	Production-induced
Most impacted sectors of the regional economy	• Electricity generation • Electricity transmission, distribution, on selling and electricity market operation • Construction services • Professional, scientific and technical services • Finance • Auxiliary finance and insurance services • Wholesale trade • Employment, travel agency and other administrative services
Most impacted sectors of the NSW economy	• Non-residential property operators and real estate services • Computer systems design and related services

The average annual economic impacts of the project on the regional economy during operation is shown in Table 22.25.

The project is estimated to make up to the following total annual contribution to the regional economy:

- $27 million in annual direct and indirect output
- $10 million in annual direct and indirect value-added
- $4 million in annual direct and indirect household income
- 40 direct and indirect jobs.

Table 22.25 Annual economic impacts of the project on the regional economy during operation

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	13	11	3	15	27
Value-added ($ million)	4	4	2	6	10
Income ($ million)	1.4	1.7	0.8	2.6	3.9
Employment	10	17	13	30	40

Note: totals may have minor discrepancies due to rounding.

The average annual economic impacts of the project on the NSW economy are shown in Table 22.26. The impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy.

The project is estimated to make up to the following total annual contribution to the NSW economy:

- $37 million in annual direct and indirect output
- $15 million in annual direct and indirect value-added
- $7 million in annual direct and indirect household income
- 67 direct and indirect jobs.

Table 22.26 Annual economic impacts of the project on the NSW economy during operation

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	13	15	9	24	37
Value-added ($ million)	4	6	5	11	15
Income ($ million)	1.4	3.2	2.6	5.8	7.2
Employment	10	26	32	57	67

Note: totals may have minor discrepancies due to rounding.

Agricultural land displacement

The project would result in a reduction in the land available for agricultural activity due to establishment of project infrastructure such as transmission towers and switching stations within the operation impact area. A permanent reduction of productive land would primarily be limited to cropping and forestry activities.

Agricultural activities would be able to occur under the transmission line, meaning the operation of the project would only result in a minor reduction in land available for agriculture, including 176 hectares for beef cattle/sheep and 13 hectares for dairy cattle. This reduction in area available for agriculture is associated with the transmission tower footprints, the Bayswater South switching station and operational access roads.

As identified in *Technical Report 5 – Agriculture impact assessment*, the direct impact of operation on gross agricultural production during operation is estimated to be about $88,937 per year.

The agricultural impacts of the project during operation are less than 0.02% of agricultural economic activity in the region and a fraction of the economic activity gains from the project. This is slightly higher than the estimated impact in *Technical Report 5 – Agriculture impact assessment* as this estimate includes direct and in direct impacts across all economic indicators rather than only agricultural output. The annual direct and indirect impact of this level of gross regional and NSW agricultural production is summarised in Table 22.27 and Table 22.28, respectively (total may have minor discrepancies due to rounding).

Table 22.27 Annual regional economic impacts of displaced agricultural land during operation

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	0.09	0.03	0.02	0.05	0.14
Value-added ($ million)	0.04	0.02	0.01	0.03	0.07
Income ($ million)	0.01	0.01	0.01	0.01	0.02
Employment	0.19	0.11	0.08	0.19	0.37

Note: totals may have minor discrepancies due to rounding.

Table 22.28 Annual NSW economic impacts of displaced agricultural land during operation

	Direct	Indirect (flow-on)			Total effect
		Production-induced	Consumption-induced	Total indirect	
Output ($ million)	0.09	0.07	0.06	0.13	0.22
Value-added ($ million)	0.04	0.03	0.03	0.06	0.11
Income ($ million)	0.01	0.02	0.02	0.04	0.05

Employment	0.19	0.19	0.21	0.41	0.59

Note: totals may have minor discrepancies due to rounding.

State forest land displacement

During operation, the project would impact 449 hectares of production native forest and 33 hectares of plantation forest (assumed to be hardwood). According to the Forestry Corporation of NSW (2024), 1.834 million hectares of hardwood multi use and plantation forests in NSW yields $89 million from timber and extractive resources per year, which equates to $49 per hectare per year. On this basis, the direct impact of the operation of the project on gross forestry production is estimated to be around $23,387 per year of operation. The regional impacts associated with this level of reduced economic activity are negligible.

Other potential impacts

The operation of the project would create a small demand for regional labour resources and regional inputs to production relative to the construction of the project. As such, no other effects on other industry sectors are anticipated during operation.

22.4.5 Mitigation and management

Environmental management

Construction and operation of the project would provide positive economic activity to the regional and NSW economies. However, it would also create a large demand for a suitably qualified construction workforce in regional areas. The inclusion of temporary worker accommodation has been proposed to mitigate the risk that the project may increase competition for labour and housing in the region. Notwithstanding, it is the intention of the project to provide positive local employment and business opportunities for the region. These benefits can be maximised via the promotion of local workforce and industry participation via the preparation and implementation of a local workforce participation strategy and industry participation plan.

Mitigation measures

Mitigation and management measures proposed to avoid or minimise economic impacts during construction and operation of the project are listed in Table 22.29.

Table 22.29 Proposed mitigation and management measures – economic

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
E1	Local employment opportunities	Local worker participation will be promoted via the preparation of a local workforce development plan, a local industry participation plan and an Australian industry participation plan.	Detailed design Construction Operation	All locations
E2	Local business opportunities	Consultation will be carried out with local councils, economic development organisations and local chambers of commerce to: • inform local business of the goods and services required for the project, the service provision opportunities and compliance requirements of business to be able to secure contracts • encourage local businesses to meet the requirements of the project for supply contracts • develop relevant networks to assist qualified local and regional businesses to tender for the provision of goods and services to support the project.	Detailed design Construction	All locations

22.4.6 Summary and conclusion

Construction of the project would generate economic activity within the regional and NSW economy. Construction would also result in some contraction in agricultural and forestry activity within the project impact area. The construction workforce would vary depending on the stage of construction and associated activities. Average quarterly construction employment would peak at 830 workers at around 9 to 12 months into the 2.5-year construction period. The average annual construction workforce over 2 years is estimated at 486 workers. Construction expenditure for the project would be associated with the manufacturing of equipment and expenditure across the heavy and civil engineering construction sector, the construction services sector and the non-residential building construction sector. The average annual economic direct and indirect output on the regional economy during construction of the project is anticipated to be $325 million.

Construction of the project would result in a reduction in the land available for agricultural activity within the construction impact area, with the direct impact of construction on gross agricultural production estimated to be about $404,738 per year of construction. In addition, the construction of the project would impact 661 hectares of production native forests and 49 hectares of plantation forests. The direct impact of construction on gross forestry production is estimated to be around $35,902 per year of construction, with regional impacts associated with this level of reduced economic activity anticipated to be negligible.

Operation of the project would result in economic activity in the electricity transmission, distribution, on selling and electricity market operation sector. Operation would also result in some contraction in agricultural and forestry activity in parts of the operation impact area. The project is estimated to make up to $27 million in annual direct and indirect output during operation in the regional economy. The agricultural impacts of the project during operation are less than 0.02% of agricultural economic activity in the region and a fraction of the economic activity gains from the project, while forestry impacts are estimated to be around $23,387 per year of operation, with regional impacts associated with this level of reduced economic activity anticipated to be negligible.

Cumulative impacts

23

23 Cumulative impacts

This chapter provides an assessment of the Hunter Transmission Project's (HTP, 'the project') potential to generate cumulative impacts in the region. The assessment has been completed with reference to the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021a).

The Planning Secretary's environmental assessment requirements (SEARs) as they relate to the assessment of cumulative impacts, and where in the environmental impact statement (EIS) these have been addressed, are included in *Appendix A (Assessment requirements compliance)*.

23.1 Assessment approach

23.1.1 Legislation, policies, plans and guidelines

The *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021a) (the Guidelines) provide guidance for undertaking cumulative impact assessments for State significant projects. In accordance with the Guidelines, the cumulative impact assessment for the HTP and identified future projects has been conducted on specific issues (e.g. traffic and transport, air quality) within an identified study area.

23.1.2 Assessment methodology

The methodology for the cumulative impact assessment included:

- development of the cumulative impact assessment study area to identify potentially relevant future projects for inclusion in the cumulative impact assessment
- screening and identification of relevant future projects to be considered within the cumulative impact assessment study area (see *section 23.1.4*)
- assessing cumulative impacts associated with the interaction between the HTP and relevant future projects. The assessment also considered how interaction of these projects has the potential to affect the construction and operation of the HTP (see *section 23.2* and *section 23.3*)
- the identification of mitigation and management measures to mitigate the cumulative impacts identified in this assessment (see *section 23.4*).

The assessment of cumulative impacts considered both 'issue-specific' cumulative impact assessments and 'combined' cumulative impact assessment as described in the guidelines. The assessment approaches included:

- the assessment of cumulative impacts of issue-specific matters that have been addressed in this EIS and technical reports and how cumulative impacts may affect the baseline values of

key matters (e.g. traffic, biodiversity, air and noise). The outcomes of these issue-specific cumulative impact assessment are presented in *section 23.2*

- the combined cumulative impact assessment considered the cumulative impact of the HTP and identified future projects on key matters, sensitive receivers, or important features in a specific area. The combined cumulative impact assessment is presented in *section 23.3*.

23.1.3 Limitations and uncertainties

The cumulative impact assessment is largely qualitative in nature due to a range of uncertainties including the level of detail available for future projects, the likelihood that those projects would proceed, and uncertainty on timing of future projects. Quantitative assessment of cumulative impacts was undertaken where possible based on the available technical documentation of relevant future projects.

Potential cumulative impacts were identified based on anticipated construction timeframes and available technical documentation for relevant future projects. The scope, timing, and potential interaction with the HTP for relevant future projects detailed in Table 23.2 and Table 23.3 are provisional based on available documentation, and are contingent on the granting of development consent.

The Energy Corporation of New South Wales (EnergyCo) environmental management strategies, management plans, and proposed mitigation measures detailed in *section 23.4* employ an adaptive management approach and will be periodically reviewed as assessment documentation for relevant future projects becomes available. This adaptive management approach will include continuous engagement and coordination with the proponents/key stakeholders of relevant future projects with the aim of confirming construction programs such that potential cumulative impacts can be identified, avoided, and mitigated as appropriate.

23.1.4 Study area and screening of future projects

The cumulative impact assessment study area was defined based on the scale and potential impacts of the project, combined with potential impacts of identified relevant future projects. Conservatively, this included all local government areas (LGAs) that the project traverses, being Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie.

EnergyCo has identified potentially relevant future projects that may be developed concurrently with the HTP which may result in cumulative impacts (see Figure 23.1). Potentially relevant projects identified in the Scoping Report were reviewed as part of this EIS.

Several criteria were used to identify relevant future projects which have the potential to interact with the HTP in a manner to create potential cumulative impacts. Criteria considered relate primarily to location, construction and operational timeframes, and resources. The screening criteria used to identify potentially relevant future projects (approved or yet to be approved) are summarised in Table 23.1.

Table 23.1 Screening criteria

Criteria	Description
Location	• Major projects within the Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie LGAs
Timing	• The timing of the HTP construction overlaps with a relevant future project either in construction or when operational • The timing of the commencement of HTP operation overlaps with the planned construction of a relevant future project
Resources	• Shared resources with the HTP (e.g. construction workforce) • Shared assets and resources (e.g. access roads, electricity connections)

Using the screening criteria, potentially relevant future projects were identified using government and publicly available data resources. These included:

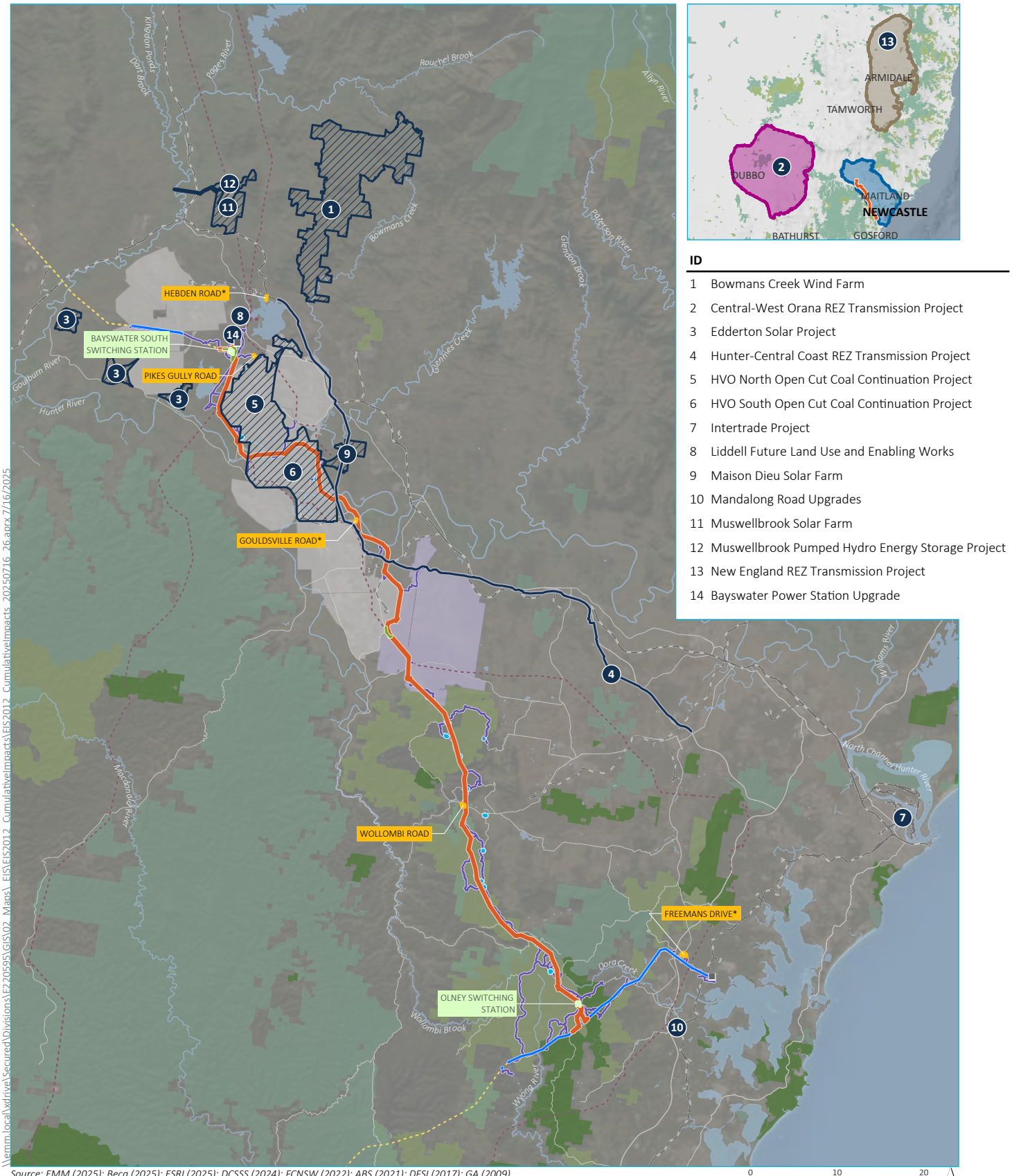
- DPHI's Major Projects website
- Muswellbrook City Council website
- Singleton Council website
- Cessnock City Council website
- Central Coast Council website
- Lake Macquarie City Council website.

Potentially relevant future projects that may create cumulative impacts for the HTP are summarised in
Table 23.2 and shown in Figure 23.1.

Most cumulative impacts would be experienced during construction of the HTP. This includes disruption to people caused by traffic, dust, noise and vibration. Very few cumulative impacts are predicted once the HTP is operational.

Impacts to the environment including impacts on biodiversity, surface and groundwater as well as heritage values would predominately occur during construction of the project. Cumulative impacts to biodiversity and heritage values would be minimal during operation of the HTP.

Table 23.3 shows the relationship between the delivery of relevant future projects and the HTP's construction program.



ID

1	Bowmans Creek Wind Farm
2	Central-West Orana REZ Transmission Project
3	Edderton Solar Project
4	Hunter-Central Coast REZ Transmission Project
5	HVO North Open Cut Coal Continuation Project
6	HVO South Open Cut Coal Continuation Project
7	Intertrade Project
8	Liddell Future Land Use and Enabling Works
9	Maison Dieu Solar Farm
10	Mandalong Road Upgrades
11	Muswellbrook Solar Farm
12	Muswellbrook Pumped Hydro Energy Storage Project
13	New England REZ Transmission Project
14	Bayswater Power Station Upgrade

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

0 10 20 km

GDA2020 MGA Zone 56

N

KEY

- Relevant future project
- Relevant future project

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

Renewable energy zone (see inset)

- Central West Orana
- Hunter-Central Coast
- New England

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

Relevant projects for cumulative impact assessment

Hunter Transmission Project
Environmental Impact Statement
Figure 23.1

EMM
creating opportunities

Table 23.2 Cumulative impact screening of relevant future projects

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
New England REZ Transmission Project	EnergyCo	Construction of new network infrastructure that to connect energy generation and storage projects within the New England REZ to the existing electricity network. The transmission project is proposed to connect to the existing Bayswater substation in the south and 4 energy hubs within the New England REZ located in the Northern Tablelands region of NSW.	New England REZ Transmission Project physically intersects the project impact area at the existing Bayswater substation (Muswellbrook LGA).	Scoping report submitted in July 2024. EIS currently being prepared. The New England REZ Project has a six-year construction program. Stage 1 of this construction would include transmission line construction from Bayswater substation.	Once construction for HTP is complete, construction for the New England REZ would commence prolonging construction related impacts in Muswellbrook LGA and utilising some of the same major transport routes.
Liddell Future Land Use and Enabling Works	AGL	To support the proposed closure strategy of Liddell Power Station, the proponent is seeking to undertake works for the demolition of the Liddell Power Station and associated infrastructure and preparation of the site for ongoing industrial land use.	Liddell Future Land Use and Enabling Works is located around one kilometre north of the project impact area near Lake Liddell in Muswellbrook (Muswellbrook LGA).	The project was determined in January 2025. Works commenced in mid-2025. The developments of the future land use program would extend over a 20-year period, meaning there would be an overlap between HTP construction and some aspect of the future land use program.	The future land use program and the HTP are both developments associated with the energy transition occurring within the same time period within the Muswellbrook LGA drawing on similar resources and infrastructure.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Hunter Valley Operations (HVO) continuation projects (HVO North Open Cut Coal Continuation Project and HVO South Open Cut Coal Continuation Project)	Hunter Valley Operations	The HVO continuation projects involve continuation of mining at the HVO North open cut coal mining complex until 2050, including extension of approved mining areas, mining of deeper coal seams and realignment of Lemington Road, and continuation of mining at the HVO South open cut mining complex until 2045, including a reduction in maximum extraction rate.	The HVO continuation projects would intersect the project impact area at the existing HVO operations (Singleton LGA).	An EIS was submitted to DPHI in December 2022 and following requests for further information, HVO decided to amend their project. Assuming a new EIS will be prepared and submitted, this means construction has been delayed. However, there is a likely overlap with HTP construction.	Based on information available, the timing of the HVO continuation projects would need to be co-ordinated with the HTP construction to avoid duplication of impacts or design revisions.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Maison Dieu Solar Farm	Terrain Solar	The construction, operation and decommissioning of a large-scale solar photovoltaic generation facility, including an integrated battery energy storage system, a high-voltage electricity substation, connection to the national electricity market through the existing Ausgrid substation, and associated infrastructure. This project would generate and supply 60 megawatts (MW) of clean, renewable electricity to the grid with a storage capacity of 40 MW/80 MWh.	Maison Dieu Solar Farm is located around one kilometre east of the project impact area in Maison Dieu (Singleton LGA).	This project is currently in the response to submissions phase.	The construction period of the solar farm may overlap with HTP construction with construction of the solar farm beginning in 2026 and overlapping with the HTP in 2027 Maison Dieu Solar Farm would be operational when HTP is also operational The Maison Dieu Solar Farm and the HTP are both developments associated with the energy transition occurring within the same time period within the Singleton LGA drawing on similar resources and infrastructure.
Mandalong Road Upgrades	Transport for NSW (TfNSW)	The project involves the replacement of roundabouts with new traffic lights and other road and pedestrian safety improvements at 2 intersections on Mandalong Road, Morisset.	Mandalong Road is within the project impact area (Lake Macquarie LGA).	TfNSW has published a project Review of Environmental Factors (May 2025).	The project will influence the construction routes for the HTP. An overlap of construction programs is likely with construction of the project anticipated to start in Q1 2026 and extend in 2027; however, this will be coordinated with TfNSW.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Hunter-Central Coast REZ Transmission Project	EnergyCo	Provision of 2 new 132 kV substations as well as upgrades to existing 132 kV transmission lines.	This project would be located within existing Ausgrid easements between Muswellbrook and Kurri Kurri and would cross the HTP corridor in 3 locations (Muswellbrook, Singleton and Cessnock LGAs).	Ausgrid published a project Review of Environmental Factors in April 2025. Construction is anticipated to take place between early 2026 and mid-2028.	The construction period of the Hunter-Central Coast REZ Transmission Project would overlap with HTP construction and would be operational when HTP is also operational. The Hunter-Central Coast REZ Transmission Project and the HTP are both transmission projects associated with the energy transition occurring within the same time period within 3 overlapping LGAs drawing on similar resources and public infrastructure.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Muswellbrook Solar Farm	OX2	A large-scale solar photovoltaic generation facility and associated infrastructure. The proposed solar farm would have generation capacity of around 135 MW and would produce around 347 GWh of energy annually, which is enough to power around 79,000 homes.	Muswellbrook Solar Farm would be located around 14 kilometres north of the project impact area on the eastern side of Muswellbrook (Muswellbrook LGA).	This project was referred to the Independent Planning Commission in February 2025. The Independent Planning Commission approved the project subject to conditions as of 27 May 2025. Construction is planned to last for 31 months, which means some overlap with HTP construction is likely.	No direct interface between the solar farm and HTP however both projects are associated with the energy transition occurring within the same time period within the Muswellbrook LGA drawing on similar resources and public infrastructure.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Bowmans Creek Wind Farm	Ark Energy	Stage 1 of the Bowmans Creek Wind Farm would involve 54 wind turbines. Stage 2 would involve a further 21 wind turbines.	Bowmans Creek Wind Farm would be located around nine kilometres north of the project impact area on the eastern side of the Muswellbrook LGA.	Stage 1 of Bowmans Creek Wind Farm was determined in February 2024, while an EIS is currently being prepared for Stage 2 after having been issued SEARs. Stage 2 has been determined to be a controlled action by DCCEEW for assessment under the bilateral agreement. Construction of Stage 2 is anticipated to take around 18 months and would be commissioned by mid-2028 (Renew Economy, 2024). As such, overlap with HTP construction is likely.	No direct interface between the wind farm and HTP, however both projects are associated with the energy transition occurring within the same time period within the Muswellbrook LGA drawing on similar resources and public infrastructure.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Central-West Orana REZ Transmission Project	EnergyCo	This project would involve new transmission network infrastructure, including transmission lines and energy hubs, which would transfer power generated by solar and wind farms in the Central-West Orana REZ to electricity consumers.	The Central-West Orana REZ Transmission Project would be located between the proposed substations at Merotherie and Elong Elong and the Wollar substation, around 80 km from the project impact area.	Construction of this project is anticipated to take place between 2024 and 2028. As such, overlap with HTP construction is likely.	Given the distance of this development from the project impact area there is no direct interface with HTP. Operationally, cumulative benefits would result from this project alongside HTP due to increased transmission capacity and greater renewable energy transmission in the National Electricity Market (NEM).
Bayswater Power Station Upgrade	AGL	Improvement of the management of ancillary processes over the remaining operating life of Bayswater Power Station including the augmentation of the existing ash disposal areas and creation of a salt cake disposal landfill.	Bayswater Power Station Upgrade intersects the project impact area where the HTP is proposed to connect to Bayswater Power Station.	The project began construction 2022.	Construction of the Bayswater Power Station Upgrade is anticipated to be mostly completed before construction commences for the HTP. Construction of the HTP would however contribute to impacts to biodiversity values in the Muswellbrook LGA associated with the Bayswater Power Station Upgrade.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Edderton Solar Project	EDF Renewables	This project includes the construction, operation and decommissioning of a solar photovoltaic energy generating facility with an estimated capacity of 350 MW and battery energy storage system (BESS).	Edderton Solar Project is located around 5 km from the project impact area in Denman and Jerrys Plains (Muswellbrook and Singleton LGA).	An EIS is currently being prepared for this project. A scoping report was submitted in April 2024 and SEARs were issued in May 2024. If approved, construction of this project is anticipated to take around 20 months.	No direct interface between the solar project and HTP however both projects would be constructed and operated within the Muswellbrook and Singleton LGA drawing on similar resources and public infrastructure. Construction of the project is anticipated to start as soon as necessary approvals are obtained.
Intertrade Project	EnergyCo	This project would involve construction of a 30-ha hardstand on government land near the Port of Newcastle associated with the transport of materials to REZs.	The Intertrade Project would be located around 30 km northeast of the project impact area in Newcastle (Newcastle LGA).	A scoping report is currently being finalised. Construction is targeted for 2026, with operations to commence by 2027.	Given the distance from the project impact area there is no direct interface between the Intertrade Project and HTP however there are potential cumulative benefits associated with the delivery of large equipment and component parts for HTP construction.

Relevant project	Proponent	Scope	Location (LGA)	Status	Interface with HTP
Muswellbrook Pumped Hydro Energy Storage Project	AGL Energy Pty Limited Idemitsu Renewable Developments Australia Pty Ltd	This project would involve the development of a 500 MW pumped hydro power station, upper and lower reservoirs, grid connection and ancillary infrastructure.	The project would be located 4 km northeast of Muswellbrook (Muswellbrook LGA).	A scoping report has been prepared, and SEARs were issued in November 2024. If approved, construction of this project is anticipated to take around 4 years, overlap with the HTPs construction program is possible.	Given the distance from the project impact area there is no direct interface between the Muswellbrook Pumped Hydro Energy Storage Project. However, both projects would draw similar resources and public infrastructure in the Muswellbrook LGA.

Table 23.3 Relationship between delivery of relevant future projects and the HTP construction program

Project	Approx. distance from HTP	2025				2026				2027				2028				2029			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
HTP	N/A																				
New England REZ Transmission Project	0 km																				
Liddell Future Land Use and Enabling Works	1 km																				
HVO North Open Cut Coal Continuation Project	0 km																				
HVO South Open Cut Coal Continuation Project	0 km																				
Maison Dieu Solar Farm	1 km																				
Hunter-Central Coast REZ Transmission Project	0 km																				

Project	Approx. distance from HTP	2025				2026				2027				2028				2029			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Muswellbrook Solar Farm	14 km																				
Bowmans Creek Wind Farm	9 km																				
Central-West Orana REZ Transmission Project	80 km																				
Edderton Solar Project[1]	5 km																				
Intertrade Project	>50 km																				
Mandalong Road Upgrade	6 km																				
Muswellbrook Pumped Hydro Energy Storage Project	15 km																				
Bayswater Power Station Upgrade[2]	0 km																				

1: Anticipated timing of the Edderton Solar Project is not known based on available documentation. Construction of this project is anticipated to take around 20 months and is anticipated to commence as soon as necessary approvals are obtained. Potential overlap with HTP has been assumed

2: Construction of the Bayswater Power Station upgrade is anticipated to have finished construction prior to construction of the HTP. Ongoing operational activities may occur intermittently.

23.2 Issue-specific cumulative impact assessment

Potential cumulative impacts associated with the HTP have been addressed in the relevant technical reports prepared for this EIS. This section summarises key findings from technical reports associated with cumulative impacts of issue-specific matters.

Based on the findings of the technical reports, some impact types have not been considered as part of the cumulative impact assessment. These impact types and the justification for their exclusion from the cumulative assessment are summarised in Table 23.4.

Table 23.4 Cumulative impact types excluded from issue-specific cumulative impact assessment

Cumulative impact type	Justification for exclusion
Historic heritage	One listed heritage item (The Wishing Well – Historical Heritage Information Management System (HHIMS) Osf 26) would be demolished for construction of the project. Other potential impacts to historic heritage are predominately limited to temporary visual changes to the setting of a heritage item and potential for accidental damage to a heritage structure during construction. The historic heritage management plan (see *section 15.5*) will manage and mitigate any potential cumulative impacts associated with concurrent construction activities between the project and relevant future projects. Operation of the project would have a moderate visual impact on the setting of six historical heritage items (see *section 15.4)*. No relevant future projects are anticipated to have a significant visual impact to the setting of these six heritage items. Accordingly, the potential for cumulative impacts associated as with the operation of the project is anticipated to be negligible.
Soils and surface water	Potential cumulative impacts to soils and surface water are principally associated with the extraction of water for construction of the project. A review of existing water entitlements relevant to the construction of the HTP indicates there are sufficient entitlements to secure allocation for the project (in consideration of relevant future projects) without causing negative cumulative impacts to water resources (see *section 17.3.4*).
Groundwater	The project would have negligible impacts to groundwater levels during construction or operation and would be limited to incidental groundwater take during subsurface construction activities (see *section 18.3.1*). Operation of the project would be unlikely to reduce groundwater quality or affect groundwater recharge (see *section 18.4)*. The potential for cumulative impacts to regional groundwater is anticipated to be negligible.

Cumulative impact type	Justification for exclusion
Contamination	The project would have minimal interaction with relevant future projects that pose a contamination risk. There is potential for encountering contaminated soils and compounding existing contamination issues during construction activities in proximity to relevant future projects including Bayswater Power Station and the HVO continuation projects (see *section 20.3.2*). The implementation of a contamination management plan and relevant mitigation measures would avoid and minimise disturbance to potentially contaminated areas and any cumulative impacts associated with construction of the project.
Bushfire / hazards and risk	The potential for cumulative impacts for bushfire risks is negligible given that the likelihood of ignition during construction and operation is very low with the implementation of proposed risk controls (see *section 21.3*). Furthermore, construction and operation of the project would have no material impact on bushfire public safety risk within the project impact area.

The key matters that may be materially affected by cumulative impacts are summarised in Table 23.5. These key matters are assessed in the following sections.

Table 23.5 Cumulative impacts from identified relevant future/anticipated projects

Relevant future project	Type of cumulative impact with the project								
	Biodiversity	Aboriginal heritage	Landscape and visual	Traffic and transport	Land use and property	Social	Noise and vibration	Air quality / greenhouse gas	Economic
New England REZ Transmission Project	-	-	✓	✓	✓	✓	-	-	✓
Liddell Future Land Use and Enabling Works	-	-	-	✓	✓	✓	-	-	-
Bayswater Power Station Upgrade	✓	-	-	-	-	-	-	-	-
Hunter Valley Operations continuation projects	✓	✓	-	✓	✓	✓	✓	✓	✓
Maison Dieu Solar Farm	✓	-	✓	✓	✓	✓	-	-	✓
Hunter-Central Coast REZ Transmission Project	-	✓	✓	✓	✓	✓	✓	✓	✓
Muswellbrook Solar Farm	-	-	-	-	✓	✓	-	-	✓
Bowmans Creek Wind Farm	-	-	-	-	✓	✓	-	-	✓
Central-West Orana REZ Transmission Project	-	-	-	-	-	✓	-	-	✓
Edderton Solar Project	-	-	-	-	✓	✓	-	-	✓
Intertrade Project	-	-	-	✓	-	-	-	-	✓

Relevant future project	Type of cumulative impact with the project								
	Biodiversity	Aboriginal heritage	Landscape and visual	Traffic and transport	Land use and property	Social	Noise and vibration	Air quality / greenhouse gas	Economic
Muswellbrook Pumped Hydro Energy Storage Project	-	-	-	✓	-	✓	-	-	✓
Mandalong Road Upgrade	-	-	-	✓	-	✓	-	-	-

23.2.1 Biodiversity

Relevant future projects identified as having potential cumulative biodiversity impacts with the HTP include:

- HVO continuation projects
- Maison Dieu Solar Farm
- Bayswater Power Station Upgrade.

Potential cumulative biodiversity impacts to threatened ecological communities (TECs) or threatened species would primarily be a result of vegetation clearing and disturbance compounding existing or future impacts to habitat and biodiversity values. TECs and threatened species subject to potential cumulative impacts are summarised in Table 23.6.

Table 23.6 Cumulative biodiversity impacts to TECs and threatened species

TECs and threatened species impacted by HTP and relevant future projects	HVO Construction Project	Masion Dieu Solar Farm	Bayswater Power Station
Central Hunter Valley eucalypt forest and woodland	-	✓	✓
Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	✓	✓	✓
Warkworth Sands Woodland in the Sydney Basin Bioregion	✓	-	-
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	✓	-	-
Striped Legless Lizard (*Delmar impar*)	✓	-	✓
Hunter Valley Delma (*Delma vescolineata*)	-	✓	-
Pine Donkey Orchid (*Diuris tricolor*)	-	-	✓
Eucalyptus camaldulensis	✓	-	-
Tarengo Leek Orchid (*Prasophyllum petilum*)	-	-	✓
Southern Myotis (*Myotis Macropus*)	✓	✓	✓
Squirrel Glider (*Petaurus norfolcensis*)	-	-	✓
Brush-tailed phascogale (*Phascogale tapoatafa*)	✓	✓	-
Powerful Owl (*Ninox strenua*)	-	✓	-

The interaction of the HTP with these projects has the potential to contribute to cumulative impacts such as further habitat fragmentation. Impacts to habitat connectivity are expected to only occur in the short term where affected flora and fauna would disperse from the project impact area after having adjusted to the new transmission corridor. Habitat connectivity for bird and bat species, given they are migratory in nature, were assessed to largely be unaffected as a result of the project.

A full assessment of cumulative impacts to habitat connectivity resulting from the interaction of the project and relevant future projects is available in *Technical Report 1 - Biodiversity development assessment report.*

23.2.2 Aboriginal heritage

There is potential for cumulative impacts to Aboriginal heritage associated with the HVO continuation projects.

The HVO continuation projects would intersect the project impact area at the existing HVO operations. As identified in the Aboriginal Cultural Heritage Assessment for HVO North and HVO South, all 304 documented extant Aboriginal sites in the project's disturbance area would be either avoided, collected, salvaged or relocated (EMM 2022). The HTP would not create cumulative impacts where the project impact area intersects with HVO North and South operations as all extant Aboriginal sites are documented and managed in accordance with an existing Aboriginal cultural heritage management plan (EMM 2022).

23.2.3 Landscape and visual amenity

There is potential for cumulative landscape and visual impacts associated with the following relevant future projects:

- Maison Dieu Solar Farm
- Hunter-Central Coast REZ Transmission Project
- New England REZ Transmission Project
- Liddell Future Land Use and Enabling Works.

The EIS prepared for the Masion Dieu Solar Farm assessed an overall low to negligible impact on the surrounding landscape character, and a low impact to the visual amenity for surrounding private dwellings situated west of the proposed site location (RPS 2024). Masion Due Solar Farm is located about one kilometre east of the project impact area placing both HTP and Maison Dieu Solar Farm in the same visual catchment for visual sensitive receivers in the area (RPS 2024). However, the private viewpoints affected by the HTP would not have a visual impact caused by the proposed Maison Dieu Solar Farm. Therefore, the potential for cumulative visual amenity impact for private dwellings in proximity to both the HTP and the Maison Dieu Solar Farm was assessed to be negligible.

The Hunter-Central Coast REZ Transmission Project would involve the upgrade of transmission infrastructure in the existing Ausgrid easement located between Muswellbrook and Kurri Kurri which intersects the HTP corridor at 3 locations between Singleton and Mount Thorley. Given the proposed upgrades to transmission infrastructure are for smaller transmission structures compared to the HTP and occur in the existing Ausgrid easement, the overall impact to landscape character and visual amenity was assessed to be of low to moderate significance (Ausgrid 2025). The

interaction of the HTP and the Hunter-Central Coast REZ Transmission Project is addressed in *Technical Report 3 - Landscape character and visual impact assessment*.

The potential for cumulative impacts to landscape and visual amenity because of the New England REZ Transmission Project around Bayswater substation was considered given its proximity to project impact area for HTP in that location. However cumulative impacts to visual amenity for private dwellings and public viewpoints are unlikely given that the closest sensitive receiver to Bayswater substation is 7 kilometres northeast at Lake Lidell Recreation Area.

The Liddell Future Land Use and Enabling Works would involve the demolition of the Liddell Power Station and flute stacks which are visible from Lake Liddell Recreation Area (closest sensitive receiver to the HTP project impact area in that location). With the removal of the flute stacks cumulative impacts to visual amenity from the HTP would be improved for public viewpoints from Lake Lidell Recreation Area (GHD 2023).

Other projects identified in the cumulative impact scoping (see Table 23.2) are not located in proximity to the HTP corridor or would not have concurrent construction programs to cause significant cumulative visual impacts.

23.2.4 Traffic and transport

There is potential for cumulative impacts to traffic and transport associated with the following relevant future projects:

- New England REZ Transmission Project
- Liddell Future Land Use and Enabling Works
- Hunter Valley Operations continuation projects
- Maison Dieu Solar Farm
- Muswellbrook Solar Farm
- Bowmans Creek Wind Farm
- Hunter-Central Coast REZ Transmission Project
- Mandalong Road Upgrades
- Muswellbrook Pumped Hydro Energy Storage Project.

These future projects have the potential to cause cumulative traffic impacts with the HTP as they are likely to use similar construction access routes or have overlapping construction programs with these projects.

Table 23.7 shows which of the relevant future projects would utilise the same key construction access routes as the HTP. Cumulative impacts to traffic generation and distribution would be greatest where construction programs overlap between the HTP and relevant future projects.

TfNSW are proposing upgrades to Mandalong Road which would involve critical safety upgrades of the Freemans Drive and the Gimberts Road intersection in Morisset.

Mandalong Road provides a critical link between the M1 Pacific Motorway in the Lake Macquarie LGA and would be used as a construction route for the HTP.

The proposed upgrades would involve the replacement of the roundabout with new traffic lights, the construction of a new shared path, and minor safety improvements at the Freemans Drive and the Gimberts Road intersection.

Peak construction volumes for the HTP were assessed to perform poorly under current roundabout operation where the intersection upgrades are proposed. The proposed intersection upgrades would improve traffic flow within Morisset and facilitate construction traffic throughput for construction of the HTP, improving the level of service, safety, and road amenity for local road users.

EnergyCo will coordinate with TfNSW to manage any overlapping construction activities should the proposed intersection upgrades overlap and interfere with construction of the HTP. Possible alternative construction routes for the HTP are detailed in *Chapter 11 (Traffic and transport).*

Completion of the proposed intersection upgrades would improve construction traffic throughout for the HTP and contribute to mitigating overall cumulative traffic impacts in the project impact area.

Table 23.7 Cumulative impacts to key construction routes

Relevant future project	New England Highway	Hebden Road	Golden Highway	Liddell and Bayswater Access Road	Lemington Road	Hunter Expressway	Wine Country Drive	Freemans Drive	Mandalong Road
New England REZ Transmission Project	✓	✓	-	-	-	-	-	-	-
Liddell Future Land Use and Enabling Works	✓	-	-	✓	-	-	-	-	-
HVO continuation projects	✓	-	✓	-	✓	-	-	-	-
Maison Dieu Solar Farm	✓	-	-	-	-	-	-	-	-
Muswellbrook Solar Farm	✓	-	-	-	-	-	-	-	-
Bowmans Creek Wind Farm	✓	✓	-	-	-	-	-	-	-
Hunter-Central Coast REZ Transmission Project	✓	✓	✓	-	-	✓	✓	-	-
Mandalong Road Upgrades	-	-	-	-	-	-	-	✓	✓
Muswellbrook Pumped Hydro Energy Storage Project	✓	-	-	-	-	-	-	-	-

23.2.5 Social

The interaction of the HTP with other relevant future projects has the potential to result in both positive and negative localised social impacts. Cumulative benefits arising from the combination of future projects and the HTP are outlined in *section 23.3.2*.

Table 23.8 summarises specific potential cumulative social impacts associated with the localised interaction of the HTP and relevant future projects. In addition to these specific and localised cumulative impacts, some LGAs in the region (notably Muswellbrook, Singleton and Cessnock) will host a larger proportion of future energy generation and energy infrastructure projects. This in combination with the HTP could result in a sense of construction fatigue within these communities specifically related to wellbeing, resilience, rural livelihoods, landscape and visual amenity, as well as prolonged exposure to travel disruptions from construction activities.

Cumulative social impacts would be managed and mitigated as per the measures outlined in *section 23.4.3*.

Table 23.8 Cumulative social impacts

Relevant future project	Cumulative social impact
Hunter Valley Operations continuation projects	• Minor exceedances of noise management levels for rural receivers in the Maison Dieu West and Mount Thorley areas due to concurrent construction activities • Overlapping heavy vehicle movement impacting local road conditions
Hunter-Central Coast REZ Transmission Project	• Potential exceedances of noise management levels at sensitive noise receivers due to concurrent construction of transmission infrastructure where HTP and Hunter-Central Coast REZ transmission corridors overlap • Overlapping heavy vehicle movement impacting local road conditions • Impact to surrounding landscape and amenity due to visual impact where transmission infrastructure from the Hunter-Central Coast REZ and HTP occur near each other
Maison Dieu Solar Farm	• Potential exceedances of noise management levels due to cumulative construction noise impacts for sensitive noise receivers within Maison Dieu West • Disruption to amenity due to construction activities, heavy vehicles movements and visual amenity impacts associated with the construction of transmission infrastructure • Impact to local road conditions due to concurrent use of local roads and overlapping heavy vehicle for construction activities

23.2.6 Land use and property

There is potential for cumulative impacts to land use and property associated with relevant future projects as summarised in Table 23.9.

Table 23.9 Cumulative land use and property impacts

Relevant future project	Cumulative land use and property impact
New England REZ Transmission Project	The New England REZ Transmission Project would involve the construction and operation of high voltage electricity network infrastructure to connect energy generation and storage projects within the New England REZ to the existing electricity network at Bayswater substation. The New England REZ Transmission Project, when considered in combination with the HTP has the potential to impact grazing and cropping land in the Muswellbrook LGA. Disturbances to agricultural land and activities would be mostly temporary with operations being impacted predominately during construction of both projects. The sequencing of construction activities would be undertaken in consultation with affected landowners such that impacts to agricultural operations are minimised to the greatest extent possible.
Maison Dieu Solar Farm	The Maison Dieu Solar Farm would involve the construction, operation and decommissioning of a large-scale solar photovoltaic generation facility, including an integrated battery energy storage system located around one kilometre east of the project impact area in Maison Dieu, in the Singleton LGA. The Maison Dieu Solar Farm would result in the temporary loss of 90 hectares of agricultural land which represents 0.1% of agricultural land in the Singleton LGA (RPS 2024). The Maison Dieu Solar Farm would therefore make a negligible contribution to cumulative impacts on agricultural land use when combined with the HTP.
Hunter-Central Coast REZ Transmission Project	The Hunter-Central Coast REZ Transmission Project would involve the construction and operation of 2 new 132 kV substations as well as upgrades to existing 132 kV transmission lines between Muswellbrook and Kurri Kurri extending across the Muswellbrook, Singleton, and Cessnock LGAs. The Hunter-Central Coast REZ Transmission Project would be mainly constructed within the existing 66 kV and 132 kV transmission corridors and as such no land use changes are anticipated to occur within these areas. The Hunter-Central Coast REZ Transmission Project therefore makes a negligible contribution to cumulative impacts on land use when combined with the HTP.

Relevant future project	Cumulative land use and property impact
Muswellbrook Solar Farm	The Muswellbrook Solar Farm involves the construction and operation of a large-scale solar photovoltaic generation facility and associated infrastructure. The proposed solar farm would have generation capacity of around 135 MW located around 14 kilometres north of the project impact area on the eastern side of Muswellbrook, in the Muswellbrook LGA. The Muswellbrook Solar Farm would remove 482 hectares from agricultural use for the duration of the project. The land is of low to moderate land capability and used primarily for grazing purposes. There is no Biophysical Strategic Agricultural Land affected by the Muswellbrook Solar Farm (EMM 2023a). The Muswellbrook Solar Farm would therefore have a minor contribution to cumulative impacts on agricultural land in the Muswellbrook LGA, when considered together with the HTP.
Edderton Solar Project	The Edderton Solar Project includes the construction, operation, and decommissioning of a solar photovoltaic energy generating facility with an estimated capacity of 350 MW and BESS located around 5 kilometres from the project impact area in Denman and Jerrys Plains in the Muswellbrook and Singleton LGAs. The Edderton Solar Project would be constructed predominately on land with low and moderate land capability and would not impact on any high value Biophysical Strategic Agricultural Land (EDF renewables 2024). The Edderton Solar Project would therefore have a negligible contribution to cumulative impacts to agricultural land in the Muswellbrook and Singleton LGAs, when considered together with the Muswellbrook Solar Farm and the HTP.
Bowmans Creek Wind Farm	Bowmans Creek Wind Farm would involve the construction, operation and decommissioning of 75 wind turbines located around 9 kilometres north of the project impact area on the eastern side of Muswellbrook, in the Muswellbrook LGA. Bowmans Creek Wind Farm would disturb around 157 hectares of agricultural land use for grazing activities during the construction of the project. Following construction, grazing activities would continue on land surrounding the wind turbines which occupy a minor percentage of the site (Epuron 2021). The Bowmans Creek Wind Farm would therefore have a negligible contribution to agricultural land displacement in the Muswellbrook LGA when considered in combination with Edderton Solar Project, Muswellbrook Solar Farm and the HTP.

The potential cumulative land use and property impacts identified above would be minimised through the implementation of mitigation measures detailed in *Chapter 12 (Land use and property).*

23.2.7 Noise and vibration

Cumulative noise and vibration impacts would be limited to relevant future projects with construction programs that overlap with the HTP and where construction works occur in proximity of HTP. Cumulative impacts to noise and vibration are summarised in Table 23.10.

Table 23.10 Cumulative noise and vibration impacts

Relevant future project	Location	Cumulative noise and vibration impact
New England REZ Transmission Project	New England REZ Transmission Project intersects the project impact area at the existing Bayswater substation.	Construction of Stage 1 would include transmission line construction from Bayswater substation, meaning possible overlap with the HTP construction impact area. The closest sensitive noise receiver to both the Bayswater substation and the HTP construction impact area is seven kilometres northeast at Lake Lidell Recreation Area. Therefore, no cumulative noise and vibration impacts are anticipated.
HVO continuation projects	The HVO continuation projects would intersect the project impact area at the existing mining operations.	Concurrent construction activities between the HVO continuation projects and HTP is possible at several discrete locations at Liddel and Bayswater power stations, Jerry Plains West and Howick, Maison Dieu West and Mount Thorley. There are only a small number of sensitive noise receivers common to both the HVO continuation projects and the HTP. Therefore, potential cumulative noise impacts would be limited to a small number of sensitive noise receivers.
Maison Dieu Solar Farm	Maison Dieu Solar Farm is located around one kilometre east of the project impact area in Maison Dieu.	Construction of Maison Dieu Solar Farm and the HTP are likely to occur concurrently. The EIS prepared for Maison Dieu Solar Farm assessed that up to 14 sensitive noise receivers would experience construction noise in exceedance of noise management levels (MAC, 2024). The cumulative noise impacts associated with the construction of the HTP has the potential to contribute to cumulative impacts for sensitive noise receivers in proximity of both the HTP and Maison Dieu Solar Farm. EnergyCo will coordinate with relevant construction contractors to sequence construction activities to avoid any overlapping construction activities. Additional mitigation measures would be developed in consultation with affected landowners should construction activities coincide from both projects.

Relevant future project	Location	Cumulative noise and vibration impact
Hunter-Central Coast REZ Transmission Project	The Hunter-Central Coast REZ Transmission Project works would intersect the HTP corridor at 3 discrete locations in the Mount Thorley area.	Construction of the Hunter-Central Coast REZ Transmission Project is planned to occur throughout 2026 and into 2028. Construction works are located near some residential receivers in the Mount Thorley area. Should construction of the REZ transmission line and the HTP occur concurrently at the locations where both easements overlap, there is potential for creating exceedances of noise management levels for residential receivers. EnergyCo will coordinate with relevant construction contractors to sequence construction activities to avoid any overlapping construction activities. During operation, cumulative noise impacts associated with transmission infrastructure (corona discharge) are expected to produce much lower noise levels that would not contribute to the cumulative impacts at surrounding receivers.

23.2.8 Air quality and greenhouse gas

Cumulative impacts to air quality would primarily be the result of dust generation associated with concurrent construction activities including demolition and earthworks occurring in proximity to each other. It is anticipated that the implementation of mitigation measures as described in *Chapter 22 (Other matters)* would minimise potential cumulative impacts to air quality.

Scope 1 and Scope 2 greenhouse gas (GHG) emissions generated during construction of the HTP would represent around 0.09% of NSW total emissions and 0.02% of national total emissions on an annual average basis. It is anticipated that GHG emissions associated with construction of the project would contribute negligibly to cumulative GHG emissions associated with relevant future projects.

Similarly, annual average GHG emissions generated by the operation of the project would represent around 0.00002% of NSW total emissions and 0.00002% of national total emissions. Operational GHG emissions would, therefore, be negligible when considered in combination with relevant future projects.

Collectively the operation of the project and relevant future projects will contribute to the reduction of GHG emission through the provision of renewable energy generation and storage and transmission infrastructure to enable the delivery of renewable energy to the NEM.

23.2.9 Economic

Cumulative economic impacts may arise from the interaction between the HTP and the identified relevant future projects (see Table 23.5).

Demand for construction workforce and associated goods and services for projects with concurrent construction programs has the potential to lead to labour shortages and short-term inflation of the cost of goods and services in the region. Cumulative job growth and short-term increases to construction workforce demand has the potential to greatly increase demand for both short and long-term accommodation leading to an increase in housing prices. Excess demand for construction materials and equipment with concurrent construction projects have the potential to result in rising costs of these materials and shortages throughout the region. However, the operation of the project in combination with relevant renewable electricity generation, transmission, and storage projects within the region would promote the long-term investment, specialisation and job growth associated with these sectors in the newly developed REZs.

23.3 Combined cumulative impact assessment

23.3.1 Combined impacts

The combined cumulative impact of the HTP and other relevant future projects would contribute to negative social impacts realised through labour shortages associated with the increase competition for labour and skills. Overlapping construction programs for major projects such the Hunter-Central Coast REZ Transmission Project, New England REZ Transmission Project and other energy generation development projects would likely draw from similar labour pools.

The competition for labour and skills has the potential to result in skilled labour shortages and wage competition leading to project delays and promote the need to procure non-local skilled labour.

Concurrent construction programs for major projects in the Muswellbrook and Singleton LGAs also have the potential to cause excess demand for short and long-term accommodation and housing. Peak demand for housing and accommodation is anticipated to occur in 2027 and has the potential to displace community members such as seasonal workers that depend on access to short-term housing and accommodation.

Cumulative impacts associated with accommodation and labour demand will be managed in accordance with the HTP Community and Stakeholder Engagement Plan.

Combined cumulative impacts to road services and infrastructure would be realised through overlapping construction activities and timeframes. Several key routes such Golden Highway, Great North Road, and Wollombi Road, Hebden Road and the New England Highway would experience increased construction impacting upon road amenity and access. Increased traffic and heavy vehicle movements on local and arterial roads would also impact upon community safety and amenity especially in rural and semi-rural areas subject to cumulative traffic growth.

In summary, negative combined cumulative impacts would likely be associated with:

- increased noise and dust impacts during construction associated with the project and relevant future projects where timeframes are likely to overlap

- impacts to landscape and visual amenity during construction and operation to nearby receivers, particularly to Millfield and Congewai Valley communities
- increased demand for accommodation and housing during construction for the project and relevant future projects where timeframes are likely to overlap
- construction fatigue and reduced workforce availability for the project and relevant future projects where timeframes are likely to overlap
- clearing of vegetation and impacts to wildlife during construction and operation for the project and relevant future projects.

23.3.2 Combined benefits

There are many benefits associated with the combination of the HTP and other relevant future projects.

The combined effect of the HTP and other relevant future projects would produce shared social and economic benefits and opportunities. The clustering of renewable energy generation developments in the region would promote flow-on effects for both the production and consumption for goods and services that service the renewable energy sector. For example, the Singleton and Muswellbrook LGAs include over 3400 registered suppliers who can deliver goods and services to support the delivery of the HTP and other relevant future projects. Continued growth and investment in the region associated with the growth of electricity generation, transmission, and storage solutions would contribute to improved livelihoods for local business owners.

Benefits for local and regional communities would also be realised through the promotion of training and employment opportunities in the construction, civil, and environmental services sectors that support a growing renewable energy industry. For instance, the combined cumulative workforce demand of 5000 construction jobs over a 7-year period between 2025 and 2032 associated with the HTP and other relevant future energy and infrastructure projects would promote local employment participation targets. These benefits would be realised in localities such as the Muswellbrook and Singleton LGAs that have historically been dependant on the traditional resources sector. These benefits are increasingly critical as coal-fired power stations, including Liddell Power Station, Eraring Power Station and Bayswater Power Station close.

23.4 Management and mitigation

23.4.1 Environmental Management

Environmental management for the HTP would be undertaken in accordance with the environmental management strategies and management plans detailed in *Chapter 24 (Environmental management)*.

23.4.2 Avoidance and minimisation of impacts

Potential issue-specific cumulative impacts associated with the interaction of the HTP, and other relevant future projects, would be avoided and minimised through the measures detailed in *Chapter 8 (Biodiversity)* to *Chapter 22 (Other matters).* A consideration of cumulative impacts will be considered in construction planning and sequencing with the objective of further minimising potential cumulative impacts as described in this chapter.

23.4.3 Mitigation measures

Mitigation measures aimed at mitigating issue-specific cumulative impacts are described in their respective EIS chapters and technical reports and consolidated in *Appendix E (Proposed mitigation measures).*

The mitigation measures outlined *Appendix E (Proposed mitigation measures)* would mitigate potential cumulative impacts associated with the interaction of the HTP and other relevant future projects.

The mitigation measures outlined in Table 23.11 have been developed to facilitate engagement and coordination with the proponents/key stakeholders of relevant future projects with the aim of identifying and avoiding potential cumulative impacts associated with concurrent construction timeframes and activities.

Table 23.11 Proposed mitigation and management measures - cumulative impacts

Reference	Impact	Mitigation measure	Timing	Relevant location(s)
CI1	Occurrence of cumulative impacts	Consultation with construction contractors, proponents, councils, and affected landowners as required to coordinate construction staging/timing with the aim of minimising and managing potential cumulative impacts. This will include: • identifying the potential for cumulative impacts associated with concurrent construction programs (e.g. shared access routes, work sites, resources) • developing mitigation measures to mitigate cumulative impacts as they arise.	Detailed design Construction	All locations

23.4.4 Managing residual impacts and uncertainties

Provided the implementation of the mitigation measures identified in *section 23.4.3*, residual cumulative impacts arising from the interactions of the HTP and relevant future projects would be appropriately managed. *Chapter 6 (Engagement)* provides details on the ongoing stakeholder engagement and adaptive management strategies undertaken throughout the HTP program with the aim of identifying and addressing cumulative impacts as they arise.

23.5 Summary and conclusion

Potential cumulative impacts associated with the project and other relevant projects have been assessed in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021a).

Relevant projects that may be developed concurrently with HTP, and which may result in cumulative impacts, were identified through the DPHI Major Projects portal and relevant council websites using criteria such as location, timeframes and resources.

Several relevant future projects were identified which have the potential to result in a range of cumulative impacts, including cumulative biodiversity, Aboriginal heritage, landscape and visual, traffic and transport, noise and vibration, air quality, social and economic. In addition, other nearby projects were also identified where cumulative impacts would be limited to the road network as a result of concurrent road use by construction or operational vehicles, and cumulative social and economic impacts as a result of the construction and operation of multiple projects within the same region or LGA.

It is also recognised that the HTP would result in positive cumulative impacts as it forms part of the NEM transition to renewable energy. The project would provide increased transmission capacity and critical energy security as coal-fired power stations close, including the Liddell Power Station, Eraring Power Station and Bayswater Power Station. The combined effect of the HTP and other relevant future projects would produce shared social and economic benefit and opportunities for local and regional communities including local employment opportunities and workforce training. Continued growth and investment in the regions associated with the growth of electricity generation, transmission, and storage solutions would contribute to increased labour and supply chain participation for markets and industries including civil infrastructure, construction, and other technical support services that are increasingly characterising the Muswellbrook and Singleton LGAs.

Mitigation measures have been recommended throughout the EIS to minimise environmental impacts of the project, which would contribute to the minimisation of cumulative impacts alongside other nearby relevant future projects. Further, consultation will be carried out with construction contractors and proponents of other nearby projects, as required, and local councils, to coordinate construction staging/timing with the aim of minimising and managing potential cumulative impacts.

Environmental management

24

24 Environmental management

This chapter describes the environmental management approach for the Hunter Transmission Project (HTP, 'the project') during detailed design, construction and operation, and identifies the process for inspections, monitoring, auditing and reporting of environmental compliance.

24.1 Approach to environmental management

The approach to environmental management for the project will be consistent with:

- the objective of avoiding and minimising impacts throughout all stages of the project
- the relevant conditions of approval for the project (if approved)
- mitigation measures and management plans proposed in this environmental impact statement (EIS) or as otherwise updated in the Submissions Report (or an Amendment Report or Preferred Infrastructure Report, if prepared)
- the environmental management strategy (for construction) and environmental management system (for operation) to be implemented for the HTP.

The environmental management approach for the HTP is illustrated in Figure 24.1.

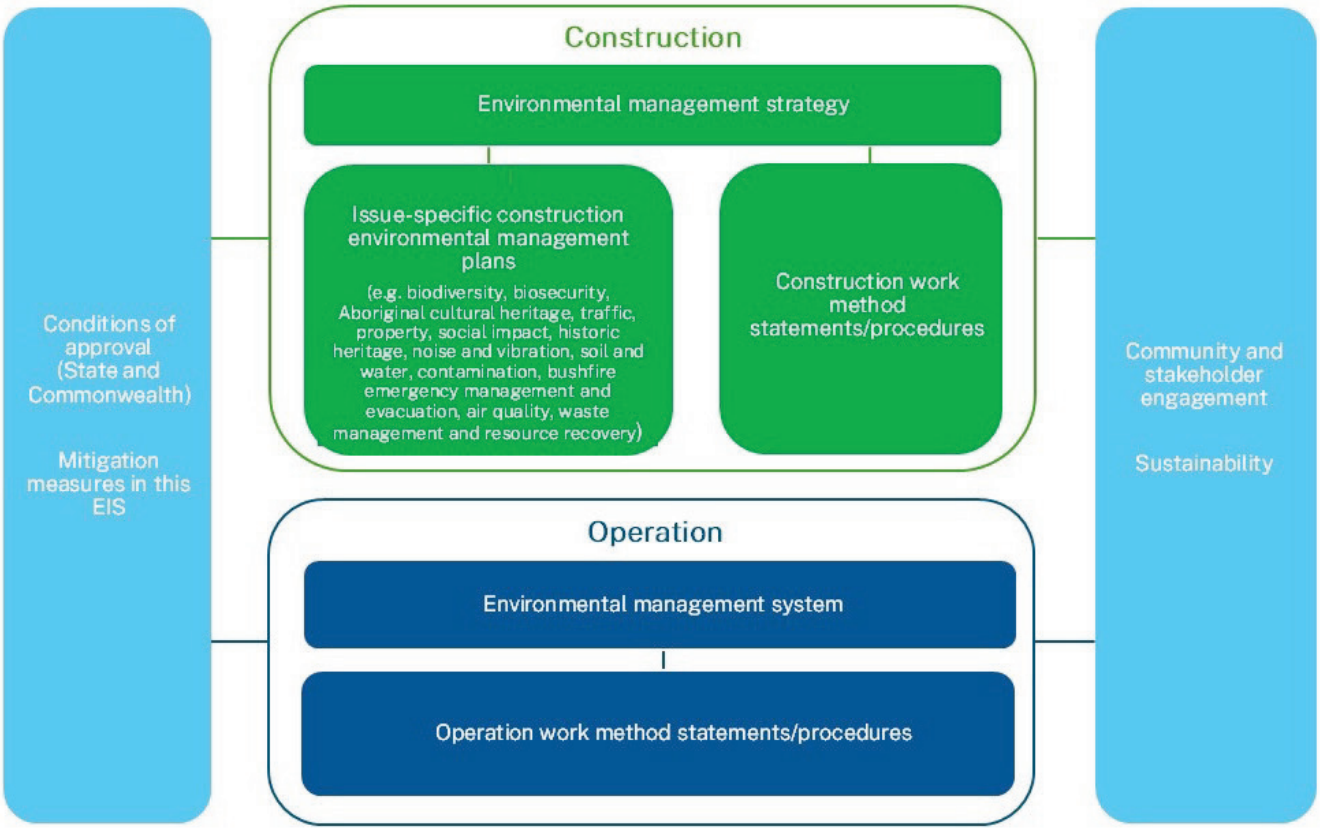


Figure 24-1 Environmental management of the HTP

Community and stakeholder engagement will be undertaken during detailed design, construction and operation of the project in consultation with the community and relevant stakeholders including government.

A community and stakeholder engagement plan will detail the approach to communication between the construction contractors, the community, community groups, government authorities, other identified stakeholders, the network operator and the Energy Corporation of New South Wales (EnergyCo) during detailed design and construction of the HTP.

The community and stakeholder engagement plan will:

- identify people, organisations and government authorities to be consulted
- set out procedures and mechanisms for the regular distribution of accessible information to keep the community and stakeholders informed of the project
- set out the procedures and mechanisms for consulting with relevant councils and government authorities including procedures for no response
- describe the method for advertising the telephone line and email address for enquiries relating to the project
- set out procedures and mechanisms for response to enquiries and feedback

- include a complaints management system that outlines parameters for recording information on complaints received during construction
- set out procedures and mechanisms to resolve any issues and disputes that might arise in relation to environmental and stakeholder management associated with the project.

Community and stakeholder engagement will continue as required through operation of the HTP.

24.2 Pre-construction minor works

Pre-construction minor works are low impact activities carried out before the start of the main construction work. These activities may include finalising the detailed design and construction methodology, site fencing and security, installation of environmental protection measures, and minor work on existing access tracks in advance of physical works.

The conditions of approval for critical State significant infrastructure (CSSI) projects typically require that all construction activities occur in accordance with an approved environmental management strategy and associated construction environmental management plans. Typical conditions of approval, however, often exclude certain pre-construction minor work (including exempt development) and activities with low potential for environmental and community impacts (minor/low impact activities) from the definition of construction. When this occurs, the minor impact activities can occur prior to approval of an environmental management strategy/construction environmental management plans.

The pre-construction minor work will be carried out in accordance with the construction contractors' certified environmental management system and will be subject to the relevant mitigation measures detailed in *Appendix E (Proposed mitigation measures)*. The contractors will prepare construction work method statements/procedures or similar documents for these activities. Any work that is not considered to be of minor/low environmental impact, or otherwise provided for in the conditions of approval will be carried out in accordance with an approved environmental management strategy and environmental management plans as part of the main construction work.

24.3 Construction environmental management

24.3.1 Environmental management strategy

An environmental management strategy will be developed to provide the overall strategic framework for environmental management during construction.

It is possible that 2 construction contractors (one to construct the transmission line and the other to construct the switching stations) would deliver the HTP. Should this occur, each contractor will develop separate environmental management strategies, construction staging plans and issue-specific construction environmental management plans aligned to their respective construction staging plan.

The environmental management strategy/strategies provide a framework for the issue-specific construction environmental management plans and contractor construction work method statements/procedures (see Figure 24.1).

The purpose of the environmental management strategy/strategies will be to ensure that environmental mitigation and management measures are incorporated into a comprehensive framework to facilitate appropriate management throughout construction.

The environmental management strategy/strategies will:

- describe the role, responsibility, authority and accountability of key personnel involved in the environmental management of the project
- describe the interface with the other project contractor(s)
- set out the procedures that will be implemented to:
  - keep the local community, stakeholders and relevant agencies informed about the project status and environmental performance of the project
  - receive, handle, respond to, and record complaints
  - resolve any disputes that may arise
  - respond to any non-conformances and non-compliances
  - respond to environmental incidents and emergencies
  - carry out site inspections and auditing
- include references to strategies, plans and programs approved under the conditions of approval
- include a clear plan showing the monitoring to be carried out in relation to the project, including the monitoring and reporting obligations under the conditions of approval.

The environmental management strategy/strategies will be developed to be consistent with applicable guidelines/policies/standards, mitigation measures and commitments detailed in this EIS and the conditions of consent (both State and Commonwealth) for the HTP.

Construction cannot commence until the environmental management strategy/strategies are approved by the Planning Secretary of the NSW Department of Planning, Housing and Infrastructure.

24.3.2 Issue-specific environmental management plans

Issue-specific environmental management plans that will be developed and implemented during construction will include (but not necessarily be limited to):

- biodiversity management plan
- biosecurity management plan
- Aboriginal cultural heritage management plan
- traffic management plan
- property management plans
- social impact management plan

- historic heritage management plan
- noise and vibration management plan
- soil and water management plan
- contamination management plan
- bushfire emergency management and evacuation plan
- air quality management plan
- waste management and resource recovery management plan.

The issue-specific environmental management plans will be prepared in accordance with the mitigation measures and commitments detailed in this EIS and the conditions of consent (both State and Australian Government) for the HTP.

In addition to the above requirements, the issue-specific environmental management plans will be developed to be consistent with applicable policies/standards/guidelines, such as the *Environmental management guidelines for construction (edition 4)* (DPIE 2020g).

The issue-specific environmental management plans will also refer to the relevant industry standard guidelines for specific issues and activities. For example, erosion and sediment will be managed in accordance with *Managing Urban Stormwater: Soils and construction - Volume 1* (the 'Blue Book').

The content of the issue-specific environmental management plans will follow the same basic structure as that outlined in Table 24.1.

Table 24.1 Example content of issue-specific environmental management plan

Chapter	Content
Introduction	• Purpose, scope, and objectives of the plan • Identification of the conditions of consent to which the plan relates and where in the document these are addressed
Project description	• Project overview • Site location • Scope of works • Timing of activities
Community and stakeholder engagement	• How the community and other stakeholders will be informed about the project status and environmental performance • How complaints and enquiries will be managed

Chapter	Content
Environmental management framework	• Relationship to environmental management strategy • Environmental management structure and responsibilities • Legal and compliance requirements • Training and awareness • Environmental risk assessment • Hold points • Environmental management measures • Environmental monitoring program • Environmental inspections • Environmental control maps or plans • Environmental management documents • Compliance monitoring and reporting • Environmental auditing • Environmental incident and emergency planning, preparedness, and response • Corrective and preventative actions • Review and revision

24.3.3 Staging

For flexibility during construction, the issue-specific environmental management plans may be developed in a staged manner subject to conditions allowing this to occur. A strategy, plan or program may be staged allowing for the development of environmental management plans addressing only the particular requirements of the relevant condition of approval if those requirements are applicable to the particular stage. The construction of the HTP is likely to be undertaken in accordance with construction staging plans, which accounts for the possibility of 2 separate construction contractors, and which is discussed in *Chapter 4 (Project description).*

If issue-specific environmental management plans are staged, a clear description will be provided as to the specific stage and scope of the project to which the plan applies, and the relationship of the stage to any future stage of construction. Individual plans will be made available publicly via the project website.

Staging environmental management plans will also require approval by the Planning Secretary of the NSW Department of Planning, Housing and Infrastructure.

24.3.4 Work method statements/procedures

Work method statements/procedures will be developed by the construction contractor(s) for the construction of the project. These work method statements/procedures will contain instructions for contractors on how to implement the environmental management measures outlined in the issue-specific environmental management plans developed for the construction of the HTP.

24.4 Operation environmental management

24.4.1 Environmental management system

Operation of the project would be managed through the accredited environmental management system maintained by the network operator.

24.4.2 Work method statements/procedures

No issue-specific environmental management plans will be developed for the operation of the project. Rather, work method statements/procedures contained within the environmental management system will be used to assess and manage the potential impacts of maintenance activities associated with the operation of the HTP.

24.5 Summary of mitigation measures

A compilation of mitigation and management measures is provided in *Appendix E (Proposed mitigation measures)*. These mitigation measures will be incorporated into the environmental management strategy, issue-specific construction environmental management plans, and construction work method statements/procedures developed for construction and the environmental management system and operation work method statements/procedures for the operation of the HTP.

24.6 Effectiveness and costs of mitigation

The mitigation and management measures proposed have been developed based on experience on other major transmission line projects similar in nature, and with consideration of mitigation and management measures adopted on other linear infrastructure projects (roads, rail and pipelines). This includes the implementation of risk assessment processes guided by experienced construction environment professionals.

Government and industry policies, procedures and guidelines have been developed to address potential impacts from major infrastructure projects. Mitigation measures carried out in accordance with these policies, procedures and guidelines have proven to be effective on similar projects.

Monitoring programs, inspections and independent auditing will confirm the effectiveness of mitigation and management measures. Further measures will be developed and implemented (if required) including implementation of corrective and preventative actions for any actual or potential non-compliant activities.

The estimated costs of the environmental mitigation and management measures are considered an integral component to the project and as a result have been largely captured in the capital costs of the HTP.

24.7 Change management

The detailed design of the project is likely to refine the concept design and, in many instances, improve the environmental and social outcomes identified in this EIS. These refinements may include:

- finalising the location of the proposed transmission line alignment within the HTP corridor
- micro-siting/adjusting the transmission line towers to avoid areas of high environmental value or cultural significance
- confirming the final layout of the construction support sites, including worker temporary accommodation
- confirming the location of associated ancillary infrastructure (such as laydown areas)
- confirming the final design arrangement of the Bayswater South and Olney switching stations and the upgrades to the existing Bayswater and Eraring substations, including any required drainage and other associated infrastructure
- confirming the requirements for utility and property adjustments
- confirming the required access arrangements for the construction and operation of the temporary and permanent access tracks and any road upgrades required.

In addition, the environmental assessments (*Chapter 8 (Biodiversity)* to *Chapter 22 (Other matters)*) include a discussion on how uncertainties will continue to be resolved and managed during the life of the HTP.

In managing changes between concept design, detailed design and construction, an outline of a proposed change management procedure is provided in Table 24.2.

Table 24.2 Change management procedure

Timing of change	Example scenarios to trigger change	Response
Following commencement of EIS public exhibition	• Contractors feedback during tendering process • Stakeholder and community feedback during public exhibition and in formal submissions • Further environmental and/or ground investigations	• For changes that reduce impacts and are within scope of assessment a clarification would be provided in the Submissions Report • For minor changes, further assessment would be included in the Submissions Report and where relevant addendum or revised technical reports would also be included • For substantial changes, an Amendment Report would be required and submitted with the Submissions Report

Timing of change	Example scenarios to trigger change	Response
During development of detailed design	• Further review of design elements may identify improvements to reliability, safety, performance, interface with existing infrastructure, etc. • Change to the basis of the constructability strategy (part of project concept design) (e.g. access track, construction support site changes and/or staging strategy)	• Detailed design would commence upon receipt of Commonwealth approval • Minor changes would be evaluated through a consistency assessment • Substantial changes may require a Modification to the approval
Post approval during construction	• In developing management plans, alternative environmental management methods may be preferable due to time and/or performance reasons • Changes to construction staging due to weather, property access arrangements/conditions, requirement for preconstruction surveys, etc. • Micro-siting of project infrastructure (e.g. towers)	• Construction would commence following planning approval and completion of detailed design • Minor changes would be addressed in management plans or via a consistency assessment • Substantial changes may require a Modification to the approval

Justification of the project

25

25 Justification of the project

This chapter provides the reasons justifying the carrying out of the Hunter Transmission Project (HTP, 'the project'), considering the environmental, social and economic impacts assessed in this environmental impact statement (EIS) and the requirements of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation). The justification incorporates the strategic need for the project, demonstrates how the project objectives are achieved, and provides an evaluation of the overall findings of the EIS, including how it addresses the relevant statutory requirements.

25.1 Strategic need

The New South Wales (NSW) energy system is undergoing a once-in-a-generation transformation as we move from reliance on coal-fired power to renewable energy to meet our daily needs.

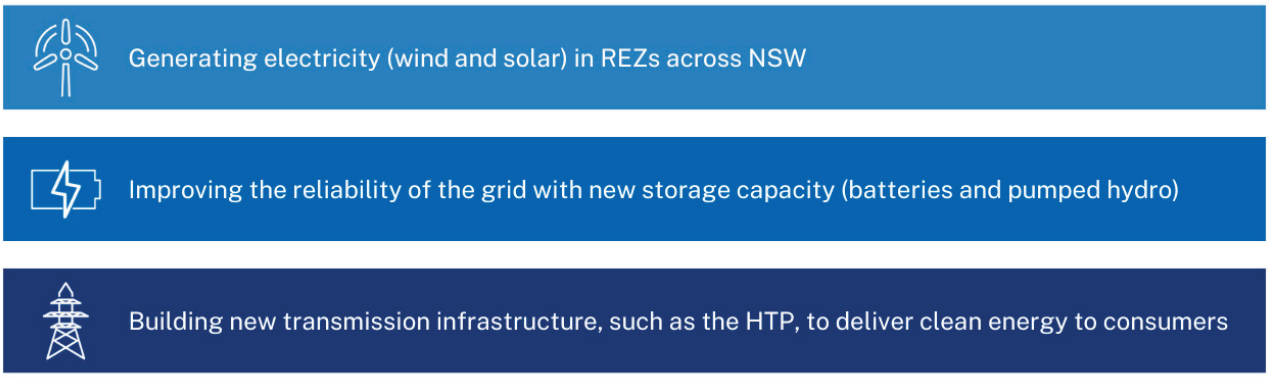
Coal-fired power stations currently provide most of NSW's electricity supply however most of these power stations are reaching the end of their life and are due to shut in the next 10 years. Liddell Power Station closed in April 2023 with Eraring Power Station to potentially close by 2027 and Bayswater Power Station to close by 2033.

At the same time our electricity demand is increasing as our population grows and we electrify our vehicles, homes, businesses and industry.

This means NSW needs new electricity supply and the required associated transmission infrastructure urgently.

The NSW Government has developed the *NSW Transmission Infrastructure Strategy* (DPE 2018), the *NSW Electricity Strategy* (DPIE 2019a) and, most recently, the *NSW Electricity Infrastructure Roadmap* (the Roadmap) to deliver affordable, sustainable, and reliable electricity.

The Roadmap aims to transition NSW to a cleaner future with new supply coming from renewable energy generation, supported by energy storage, largely concentrated within Renewable Energy Zones (REZs) in regional NSW. This involves:



The Energy Corporation of New South Wales (EnergyCo) as infrastructure planner under the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) is responsible for coordinating the delivery of the Roadmap, including building new transmission lines, like the HTP, to connect renewable energy generation in REZs to the electricity grid.

The Roadmap aims for at least 12 gigawatts (GW) of new renewable electricity generation to be developed by 2030. EnergyCo's 2023 *Network Infrastructure Strategy* (2023a) also targets delivery of 14 GW by 2033. A large majority of this generation (10 GW or more by 2030) is expected to be supplied from the Central-West Orana and New England REZs (AEMO ISP 2024). The implementation of large-scale transmission infrastructure is imperative to ensure the viability of the REZs as they are not located in the immediate vicinity of load centres and, in many cases, existing transmission infrastructure is not equipped to carry the amount of energy expected to be generated. For this reason, the creation of additional transmission infrastructure is required if the REZs are to meet the aims of the *NSW Electricity Strategy* (DPIE 2019a).

The HTP is expected to provide (up to) an additional 5 GW of electricity transfer to the main load centres of the Hunter, Sydney and Illawarra. This would provide a substantial quantity of the necessary transfer capacity for new renewable generation from regional NSW.

The HTP is critical to unlocking the generation capacity of the Central-West Orana and New England REZs, and:

- is an urgent NSW Actionable Project under the Australian Energy Market Operator's (AEMO) *2024 Integrated System Plan* for the transition of the National Electricity Market to renewable energy over the next 20 years
- would receive part of the $4.7 billion allocated to the NSW Government to modernise the electricity grid under the Australian Government's Rewiring the Nation program
- is a 'Deliver Now' project under the *Network Infrastructure Strategy* (EnergyCo 2023a) to support the delivery of the NSW Electricity Infrastructure Roadmap (the Roadmap)
- is a Priority Transmission Infrastructure Project (PTIP) under the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) because it is essential for energy security and avoiding breaches of the NSW Energy Security Target.

Further information on the strategic need for the HTP is provided in *Chapter 2 (Strategic context)*.

25.2 Relevant strategic policies and plans

The HTP would be consistent with key strategic government policies and plans which are described in detail in *Chapter 2 (Strategic context)*. These include:

- *2024 Integrated System Plan* (ISP) (AEMO 2024) – the project is included as an Actionable Project in NSW. This means that it is required to be delivered urgently to contribute to the optimal development path towards a cleaner energy market recognised in the 2024 ISP.
- *2023 Infrastructure Investment Objectives Report* (AEMO Services Limited 2023) – the project is recognised as one of the most critical energy projects in NSW. It acknowledges that the project would unlock up to 5 GW of additional transfer capacity, which is essential to meeting energy demands in NSW. It is recognised as contributing to sufficient renewable energy being available in the National Electricity Market (NEM).
- *Australia's Nationally Determined Contribution Communication 2022* (DISER 2022) and Australia's Long-Term Emissions Reduction Plan (DISER 2021) – the project would facilitate the transition to low emission energy sources as it involves the construction of new transmission infrastructure between Bayswater and Eraring, which would enable the connection of new renewable energy projects in the Central-West Orana and New England REZs into the NEM.
- *Network Infrastructure Strategy* (EnergyCo 2023) – the project is a 'Deliver Now' project, meaning it is required to be developed in the near-term to support grid-scale generation and storage in REZs and to maintain the supply of electricity as coal-fired power stations close in NSW.
- *Hunter Regional Plan 2041* (DPE 2022j) –the plan recognises the importance of transmission infrastructure within the Hunter region for the transformation of the electricity sector into one that is cheap, clean and reliable. The plan also recognises the potential for new employment in related manufacturing and energy intensive industries as a result of greater electricity capacity, which would result from the HTP.
- *Staying Ahead: State Infrastructure Strategy 2022 -2042* (Infrastructure NSW 2022) – the project is aligned with the strategic objectives set out in the strategy as it would provide the increased transmission capacity that is required for the orderly clean energy transition in NSW.
- *Net Zero Plan Stage 1: 2020 -2030* (DPIE 2020a) – the project is a critical transmission infrastructure project that would support the transfer of energy generated within the Central-West Orana and New England REZs. This would encourage the continued expansion of renewable energy generation within these REZs, which would help to facilitate the transition of the NEM to energy sources with lower greenhouse gas emissions.
- *NSW Electricity Strategy* (DPIE 2019a) – the project would contribute to the delivery of the aims of the strategy through the provision of regional investment in new transmission infrastructure. It would connect new generation projects to the existing transmission network.
- *NSW Transmission Infrastructure Strategy* (DPE 2018) – the project would enable the connection of renewable energy projects in the Central-West Orana and New England REZs

to the NEM, which would provide certainty to private sector investors and cost savings to energy consumers.

25.3 Efforts to avoid and minimise impacts

The project has been developed following a robust and iterative process including detailed alternatives and options analysis, design, environmental assessment and engagement. Where feasible and reasonable, the project has aimed to avoid and minimise impacts to people and the environment. This has included the iterative refinement of the transmission line corridor, consideration of alternative options suggested by the community and other key stakeholders, as well as assessment of alternative locations for key project components including the switching stations and ancillary infrastructure such as construction support sites and laydown areas.

EnergyCo undertook a detailed assessment of alternatives for the HTP. This included an analysis of strategic project alternatives through which new transmission line infrastructure was selected as the preferred strategic project alternative. Broad strategic corridors (including route options within the corridors) were assessed against strategic objectives and multidiscipline considerations whereby a preferred route was identified for the HTP. This was presented in the Scoping Report and has been further shaped and refined based on feedback from affected landowners, the wider community and other key stakeholders and the results of preliminary environmental surveys undertaken in 2024 and early 2025.

Refinements included:

- moving the southern switching station to Olney State Forest to reduce the impacts on the Martinsville and Cooranbong communities
- relocating the transmission corridor further away from the major recreation areas in the Olney State Forest
- avoiding critical biodiversity and Aboriginal heritage values
- minimising visual and amenity impacts
- minimising impacts on NSW Forestry Corporation's hardwood plantations in the Watagan State Forest
- refining the transmission corridor through multiple private properties to minimise the impacts on landowners
- pushing the transmission corridor further west in the Pokolbin and Corrabare State forests to reduce the extent of vegetation clearing, avoid impacts on threatened plants and animals, avoid major ridgelines and sightlines that have cultural significance for Traditional Owners and the local Aboriginal community and minimise visibility of transmission towers
- narrowing the transmission corridor around the coal mines and confirming the transmission line would run through the Hunter Valley Operations coal mine, minimising impacts on the Maison Dieu community.

The refined corridor best balances technical and cost requirements and addresses the project objectives whilst avoiding and minimising potential impacts on people and the environment and is the corridor assessed in this EIS.

A summary of the alternatives and options assessment, including the opportunities for public involvement, is provided in *Chapter 3 (Alternatives and options)* and *Chapter 6 (Engagement).*

Several aspects of the project design and construction methodology are continuing to be refined. As such, the assessment of impacts has been prepared based on a concept design and using available information at the time to provide a conservative assessment of likely impacts to people and the environment.

A project impact area has been used to define the likely areas to be affected by the construction and operation of the project. It includes the transmission corridor as well as areas outside of the corridor (e.g. switching station sites, substation sites, adjustments/upgrades to existing transmission lines, access roads and tracks, and temporary construction infrastructure such as construction support sites). Assessment of a 140-metre-wide corridor allows flexibility to further reduce impacts during design refinement while at the same time completing a robust and thorough assessment of areas potentially impacted during construction and operation of the HTP. Further explanation of the approach to assessing impacts adopted in this EIS is provided *in Chapter 7 (Approach to assessment).*

The detailed design process would be carried out by construction contractors and informed by the assessment completed for the project as well as government, landowner, community and/or other key stakeholder feedback received on the project. During this stage, the mitigation and management measures documented in this EIS relevant to the detailed design would be implemented to further enable the avoidance and minimisation of potential environmental impacts of the HTP.

25.4 Consideration of community views

Community engagement for the HTP began in 2022. Stakeholders were engaged using a range of tools and techniques including meetings/briefings, information sessions, workshops, phone calls, letters, emails, website updates and newsletters. These were supported by community feedback mechanisms, including a project-specific phone number and email address.

Other targeted activities were also undertaken to support technical studies, including social impact surveys and consultation with Registered Aboriginal Parties (RAPs) for the Aboriginal cultural heritage assessment.

This engagement led to feedback that has significantly influenced the design of the project and minimised impacts on people and the environment in the vicinity of the HTP.

A summary of the key community views and how they have been addressed is presented in Table 25.1 with further detail provided in *Chapter 6 (Engagement)* and *Appendix D (Community engagement outcomes).*

Table 25.1 Community views and how they have been addressed

Key theme and topics raised	How views have been addressed in this EIS
Project design, including issues related to route selection and the design of the project. Included suggestions to underground the line, to use existing easements or upgrade existing lines, as well as feedback on where the project crosses private land	A detailed assessment of alternatives was undertaken for the HTP. This involved an assessment of strategic project alternatives that included optimisation and modification of existing transmission infrastructure as well as new transmission line infrastructure. Network solutions in the form of new transmission line infrastructure was selected as the preferred strategic project alternative. An assessment of undergrounding the new transmission line infrastructure was undertaken and determined not to be feasible. Broad strategic corridors (including route options within the corridors) were assessed against strategic objectives and evaluation criteria whereby a preferred alignment was identified for the HTP. This was presented as a preliminary corridor that was then shaped and refined based on feedback from affected landowners, the wider community and other key stakeholders and the results of preliminary environmental surveys undertaken in 2024 and early 2025. Considerable effort was made to avoid and minimise impacts on private landowners and sensitive land uses as far as possible prioritising the use of disturbed land like mining sites, and public land like State forests over private freehold lands. A summary of the alternatives and options assessment, including the opportunities for public involvement, is provided in C*hapter 3 (Alternatives and options)* and *Chapter 6 (Engagement).*

Key theme and topics raised	How views have been addressed in this EIS
Impacts on private land, including land use impacts as well as issues such as acquisition and compensation	The acquisition of land from private landholders would be required for temporary construction support sites, temporary worker accommodation and laydown areas; permanent acquisition of freehold land for the operation of new switching stations and permanent access roads and tracks; and permanent easements for transmission line infrastructure and associated access. In total, 40 private landholders would be impacted either temporarily during construction or permanently for operation of the HTP (see *Chapter 4 (Project description)*. All acquisitions of private land (including property valuation and compensation) will be conducted in consultation with the relevant landowners and in line with the NSW *Land Acquisition (Just Terms Compensation) Act 1991* (Land Acquisition Act), with a preference for acquisition through negotiated agreement. Land use and property impacts and impacts to agriculture have been assessed and mitigation and management measures identified to avoid and minimise impacts, where required. These impacts are summarised in *Chapter 12 (Land use and property)* and C*hapter 13 (Agriculture)* and are assessed in detail in *Technical Report 5 – Agriculture impact assessment.*
Biodiversity, including issues such as vegetation clearing, impacts on native wildlife, and impacts on threatened and endangered species	Avoiding significant biodiversity values has been a key consideration through the project development. A tiered approach to avoiding areas with significant biodiversity values was adopted, including National parks, nature reserves, protected areas, other project's offset areas, wetlands, and key fish habitat. Additional considerations were incorporated into the location of the transmission line including co-location (placing sections of the transmission line alongside existing infrastructure or in disturbed areas,), relocation (adjusting the transmission line to avoid impacts on listed communities and species following fields surveys), spanning and retention of forested gullies (spanning steep ravines and avoiding clearing vegetation in the valleys), partial clearing (implementing controlled vegetation clearing within and adjacent to the transmission line), and project design alterations. Various other considerations were also implemented to avoid impacts to biodiversity (see *Chapter 3 (Alternatives and options)).* Biodiversity impacts (impacts on plants, animals (including threatened species) and ecological communities) have been assessed and mitigation and management measures identified to avoid and minimise impacts to biodiversity, where required. These impacts are summarised in *Chapter 8 (Biodiversity)* and are assessed in detail in *Technical Report 1 – Biodiversity development assessment report*.

Key theme and topics raised	How views have been addressed in this EIS
Aboriginal cultural heritage, including impacts to places, artefacts and sightlines as well as access to places of value, particularly in the State forests	Avoiding and minimising impacts to Aboriginal cultural heritage has been a key consideration during the development of the project. Considerations were incorporated into the location of the transmission line including co-location and relocation. The transmission line was adjusted to avoid impacts on culturally modified trees, stone arrangements, grinding groove sites and significant rockshelters. It was also located to avoid/minimise impacts on cultural landscapes and views from significant promontories (see *Chapter 3 (Alternatives and options)*). Aboriginal cultural heritage impacts have been assessed and mitigation and management measures identified to avoid and minimise impacts to heritage, where required. These impacts are summarised in *Chapter 9 (Aboriginal heritage)* and are assessed in detail in *Technical Report 2 – Aboriginal cultural heritage assessment*.
Traffic and transport, including need for upgrades to local roads, including Pokolbin Mountains Road and Mount Baker Road. Also impacts of increased traffic and large vehicles on roads in surrounding communities	There is the potential for traffic and transport impacts associated with the movement of construction vehicles plant and equipment, materials delivery and workers moving between work sites and construction support sites. A traffic and transport assessment determined that the road network would continue to perform at acceptable levels of service and intersection performance would not be impacted at most locations. Improvement and upgrades are proposed in several locations to better accommodate the construction requirements of the project (see *Chapter 4 (Project description), Chapter 11 (Traffic and transport)* and *Technical Report 4 – Traffic and transport impact assessment*).
Visual impacts, including changes to the scenic landscape as a result of the project. Focus of feedback with communities in Millfield and the Congewai Valley and for landowners adjacent to Singleton Military Area in Broke	Avoiding and minimising landscape character and visual impacts has also been a key consideration through the project development. Considerations were incorporated into the location of the transmission line including co-location and relocation. The transmission line was adjusted to avoid/minimise visual impacts from neighbouring communities as far as possible. It was also located to avoid/minimise impacts on cultural landscapes and views from prominent landscapes. Partial vegetation clearing has also been implemented such that overall impact to landscape character and culturally significant views is minimised (see *Chapter 3 (Alternatives and options)*). Landscape and visual impacts have been assessed, and mitigation and management measures identified to avoid and minimise impacts, where required. These impacts are summarised *in Chapter 10 (Landscape and visual)* and are assessed in detail in *Technical Report 3 – Landscape character and visual impact assessment.*

25.5 Biophysical, economic and social considerations

A comprehensive analysis of the key environmental, social and economic impacts associated with the HTP is provided in *Chapter 8 (Biodiversity)* through *Chapter 22 (Other matters).* Cumulative impacts are assessed in *Chapter 23 (Cumulative impacts)* of this EIS.

A summary of the HTP's key impacts is provided in *section 25.5.1* through *section 25.5.4*

25.5.1 Biophysical

Biodiversity

The most significant impact to the biophysical environment arising from the project would be on biodiversity due to the extent of vegetation clearing required to facilitate construction. The transmission corridor has been refined to avoid and minimise impacts to biodiversity where possible, however, based on the disturbance area, this would likely include direct impacts on:

- around 762 hectares of native vegetation
- 7 threatened ecological communities (TECs) listed under the *NSW Biodiversity Conservation Act 2016* (BC Act)
- 3 TECs listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- 38 threatened flora species – 22 of these species are listed under the BC Act and EPBC Act, 14 are listed under the BC Act only and 2 are listed under the EPBC Act only
- 28 threatened fauna species – 15 of these species are listed under the BC Act and EPBC Act and 13 are listed under the BC Act only
- 16 serious and irreversible impact entities known or assumed to occur within the disturbance area.

Proposed management measures would aim to avoid and minimise impacts on biodiversity. However, there would be some residual impacts that would require offsetting in accordance with the NSW Biodiversity Offsets Scheme and HTP Biodiversity Offset Strategy (see *Chapter 8 (Biodiversity)* and *Technical Report 1 - Biodiversity development assessment report*).

Direct impacts on native vegetation and habitats of threatened species would continue to occur during operation. However, these impacts would be minor and substantially less than those that would occur during construction. Impacts would be caused by ongoing vegetation management, which would be required to maintain vegetation clearance and asset protection zones within the new transmission line easement and at switching stations.

Water

Impacts to water quality due to construction activities and ongoing maintenance activities would be minimal and managed through the implementation of standard mitigation measures such as erosion and sedimentation controls and procedures for the safe handling of materials.

Construction and operation would have only minor and localised impacts on flooding. The project would not increase flood hazard in the vicinity and would not have an adverse impact on the emergency response arrangements of the NSW State Emergency Services. Flooding impacts during construction would be managed in accordance with an environmental management strategy and the construction soil and water management plan which would set out flooding objectives to minimise impacts on watercourses.

Construction and operation would not result in permanent inflow or take of groundwater. The project is predicted to generally have a limited impact to groundwater, which would be further reduced with the implementation of mitigation measures outlined within the environmental management strategy and the construction soil and water management plan.

Hazards

Potential hazards during construction would be temporary and associated with the use, storage and transportation of low volumes of dangerous goods and hazardous materials. Mitigation measures, such as procedures for the safe handling and storage of dangerous goods, would be implemented to minimise these risks during construction of the HTP.

With proposed risk controls in place, the construction and operation of the project would have no material impact on bushfire public safety risk within or surrounding the project impact area. Specific measures to minimise bushfire risk include creating asset protection zones (areas of cleared or semi-cleared vegetation) within the transmission line easement and around switching stations sites, construction support sites and temporary worker accommodation. Other mitigation measures include maintaining proper setbacks from trees, establishing fire trails for firefighting and emergency services to access bushfire prone areas, as well as developing a bushfire safety system to detail the restrictions and procedures for preventing accidental fire ignition during construction and operation. A bushfire emergency management and evacuation plan will also be prepared to ensure workforce bushfire safety. Together, these measures would help ensure that any risk of fire ignition or spread is kept as low as reasonably practicable during construction and operation of the HTP.

25.5.2 Social

Key social impacts would be primarily associated with construction. Construction would create both social benefits and impacts. Further social benefits would be realised once the project is in operation. The key impacts would be:

- benefits associated with:
  - financial benefits through benefit sharing initiatives
  - employment and training opportunities for local and regional community
  - regional business opportunities
- negative social impacts associated with:
  - land use changes due to full or partial acquisition for the project (including some agricultural and forestry land uses and activities)
  - loss of property and relocation of landowners (7 landowners requested a whole of property acquisition over an easement or partial acquisition)

  - potential loss of residential amenity and changes to traffic movements during construction including potential (temporary) interruption of utilities
  - construction workforce presence affecting perceptions of safety and community cohesion
  - reduced health and wellbeing due to the stress associated with change, property devaluation and environmental values
  - impacts on rural lifestyles, environmental values, and biosecurity risks
- potential impacts on 27 Aboriginal cultural heritage sites and places (the number of sites to be directly impacted would be confirmed during detailed design, which would consider opportunities to avoid or minimise impacts). Potential impacts to around 88 hectares of Warkworth sands system (often correlated with the presence of cultural deposits) and around 2351 hectares of low-density stone artefact background scatter. Extensive tracts of these deposits are between proposed transmission towers and avoidance of substantive parts of the soil profile are probable where limited ground disturbance activities are proposed

Social impacts will be minimised and managed through the implementation of a social impact management plan and other strategies/plans including a community communication strategy, landowner engagement strategy, local business and employment strategy, an industry and Aboriginal participation plan and temporary worker accommodation management plan(s).

The project may provide increased opportunities for community support and investment through community benefits and support initiatives, which could have a positive social impact in the surrounding communities. EnergyCo is expecting to commence consultation with relevant communities in 2026 to inform the design and delivery of the Community and Employments Benefit Program in the Hunter-Central Coast region which reflects the regions needs and relative impact from the HTP.

The project would also be consistent with key strategic government policies and plans that support the energy market transition (with resulting social and economic benefits including the potential for new employment in related manufacturing and energy intensive industries) which are described in detail in *Chapter 2 (Strategic context).*

Potential negative social impacts associated with operation of the project would be associated with restrictions to activities within and near the easement and changes to amenity from the new transmission line. These impacts would be relatively localised to the landowners within and next to the project impact area. Work would be undertaken with local landowners to address potential negative impacts through the implementation of mitigation and management measures and micro-siting of transmission line towers.

All property acquisitions would occur in accordance with the requirements of NSW *Land Acquisition (Just Terms Compensation) Act 1991*.

25.5.3 Economic

Construction and operation of the project would provide positive economic activity to the regional and NSW economy. The benefits on the economy during construction are estimated at around $325 million in annual direct and indirect output and 789 direct and indirect jobs. The economic

benefits to the economy during operation are estimated at around $27 million in annual direct and indirect output and 40 direct and indirect jobs.

Construction of the project would result in a reduction in the land available for agricultural activity within the construction impact area, with the direct impact of construction on gross agricultural production estimated to be about $404,738 per year of construction. In addition, the construction of the project would impact 661 hectares of production native forests and 49 hectares of plantation forests. The direct impact of construction on gross forestry production is estimated to be around $35,902 per year of construction, with regional impacts associated with this level of reduced economic activity anticipated to be negligible.

The agricultural impacts of the project during operation are less than 0.02% of agricultural economic activity in the region and a fraction of the economic activity gains from the project, while forestry impacts are estimated to be around $23,387 per year of operation, with regional impacts associated with this level of reduced economic activity anticipated to be negligible.

25.5.4 Cumulative

Cumulative impacts describe the impacts of the project together with the impacts of other relevant projects within an identified area.

Potential combined cumulative impacts would result due to the construction and operation of the HTP and relevant future projects, including New England REZ Transmission Project, Liddell Future Land Use and Enabling Works, Bayswater Power Station Upgrade, HVO continuation projects (North and South), Maison Dieu Solar Farm, Hunter-Central Coast REZ Transmission Project, Muswellbrook Solar Farm, Bowmans Creek Wind Farm, Central-West Orana REZ Transmission Project, Edderton Solar Farm, Intertrade Project, Muswellbrook Pumped Hydro Energy Storage Project and the Mandalong Road Upgrade.

The cumulative impact assessment for the project identified potential cumulative impacts with respect to biodiversity, Aboriginal cultural heritage, landscape and visual, traffic and transport, land use and property, social, noise and vibration, air quality and economics. These impacts and proposed mitigation measures are provided in *Chapter 23 (Cumulative impacts)* and *Appendix E (Proposed mitigation measures)*.

25.6 Ecologically sustainable development

25.6.1 Principles of ecologically sustainable development

Ecologically sustainable development involves the effective integration of social, economic and environmental considerations in decision making processes. In NSW, the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) adopts the definition of ecologically sustainable development contained in section 193 of the Environmental Planning and Assessment Regulation 2021 while the principles of ecologically sustainable development are also set out in clause 3A of the EPBC Act.

The principles of ecologically sustainable development include:

- the precautionary principle – where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- inter-generational equity – the present generation should ensure that the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations
- conservation of biological diversity and ecological integrity – conservation of biological diversity and ecological integrity should be a fundamental consideration
- improved valuation, pricing, and incentive mechanisms – includes the recognition of the principles that the costs of environmental externalities should be internalised, and that the polluter should bear the costs associated with environmental pollution.

Consideration of the principles of ecologically sustainable development and how they have been considered in the design and environmental impact assessment of the HTP is provided in Table 25.2.

Table 25.2 Ecologically sustainable development principles and how they are considered in this project

Principle	Considerations
Precautionary principle	The environmental impact assessment for the project is consistent with accepted scientific and assessment methodologies and good practice, has taken into account relevant statutory and agency requirements and has been informed by consultation with stakeholders including government agencies and the community. The assessments have applied a conservative approach with regard to construction and operational arrangements, and the modelling used (where relevant). This has included assessing worst-case impacts and scenarios including a project impact area that would be further refined during detailed design, which is likely to result in impacts that are less severe than those identified. Several mitigation and management measures have also been proposed to further avoid and minimise impacts on people and the environment. Emphasis has been placed on avoiding serious or irreversible damage to the environment. This has included avoidance and minimisation of impacts to critically endangered ecological communities such as the Warkworth Sands woodland and Central Hunter Valley eucalyptus forest and woodland, and habitat of listed threated species. A lack of full scientific certainty has not been used as a reason for postponing measures to prevent environmental degradation.
Inter-generational equity	The project would strengthen the State's core electricity grid by closing the gap in the 500 kV Ring, unlocking the supply of renewable energy from the Central-West Orana and New England REZs and create the backbone of the State's electricity grid, benefiting current and future generations as the State transitions to a net zero economy. This transition is essential to meet Australia's emissions reductions commitments and to meet the global goal of holding the increase in global average temperatures to well below 2°C of warming. The project would increase economic activity, provide regional job opportunities and assist in unlocking the development of large-scale renewable energy

Principle	Considerations
	generation. The project has been designed to meet the needs of both current and future generations with a design life of about 50 years (which could be extended to more than 70 years for some assets) and would contribute to an increase in resilience and capacity of the electricity network. During construction of the project, opportunities would be taken to reduce resource and material use and maximise the use of materials with low embodied environmental impact, where feasible. Initiatives to deliver benefits to local communities, including employment opportunities, have also been identified.
Conservation of biological diversity and ecological integrity	The development of the project has been carried out with the aim of identifying, avoiding, minimising and mitigating impacts on biological diversity and ecological integrity in accordance with relevant legislation. This includes field investigations and assessment, which have informed the concept design and project impact area to avoid and minimise impacts. Where potential impacts cannot be avoided, mitigation measures would be implemented to reduce the impact as far as possible. An offsets strategy has been developed to compensate for the potential threatened species impacted by the project.
Improved valuation, pricing and incentive mechanisms	The project has been designed to minimise adverse environmental impacts through a detailed alternatives and options assessment and design process that includes the consideration of environmental factors as a key objective. The environmental impact assessment has further identified environmental mitigation and management measures, where appropriate, with an objective of minimising potential impacts on the surrounding environment. Biodiversity offset credit costs have also been estimated as a way to value and price residual biodiversity impacts. Any project-related decisions will consider environmental factors in a cost-effective way and be guided by the whole-of-life costs of providing goods and services.

25.6.2 Sustainability in infrastructure development

Infrastructure is crucial to sustainability as it is a vital part of the workings of society. Ensuring it is planned, constructed, operated and adapted in a sustainable way is important. The Infrastructure Sustainability Council (ISC) defines infrastructure sustainability (IS) as infrastructure that is designed, constructed and operated to optimise environmental, social and economic outcomes in the long-term. The IS rating scheme includes ratings for the planning, design, as-built (construction) and operational stages of projects with a focus on improving sustainability outcomes. It evaluates sustainability initiatives and potential environmental, social and economic impacts of infrastructure projects and assets. Incorporating the IS rating scheme into the development of this project's design is discussed further below and detailed in Table 25.3.

Sustainability objectives and potential initiatives, which are applicable to this project, are included in Table 25.3. These objectives have been developed into themes which align with the Infrastructure Sustainability Council's IS rating scheme. The potential of an ISC rating under the rating scheme will be explored during detailed design of the HTP.

Table 25.3 Sustainability objectives and potential initiatives for the project

Sustainability theme (aligned with ISC rating scheme themes)	Sustainability objective	Potential sustainability initiative	Potential outcome
Management and governance	• Demonstrate sustainability leadership by embedding sustainability into decision making • Establish governance arrangements which support continuous improvement of sustainability performance • To reduce the adverse environmental, social and economic impacts of purchased goods and services throughout their life and disposal • To integrate sustainability into procurement systems	• Establish governance structures, processes and systems that ensure integration of sustainability considerations throughout all stages of the project • Couple sustainability risk and opportunities with overall project risk processes to drive consistency and improve project outcomes • Monitor project sustainability performance and report results • Ensure knowledge sharing is conducted across EnergyCo and wider industry covering lessons learnt, and environmental, social and economic aspects • Develop and implement a sustainable procurement plan to apply to contractors, subcontractors and suppliers • Partner with local suppliers where economically feasible and include social and environmental impacts in procurement strategies	• High-impact decisions will be guided by multi-criteria analysis, cost-benefit analysis and risk and opportunity assessment where relevant • Increased positive economic, environmental and social impacts from the project • Local skills development through the upskilling of local providers in the supply chain

Sustainability theme (aligned with ISC rating scheme themes)	Sustainability objective	Potential sustainability initiative	Potential outcome
Using resources	• Reduce energy use and carbon emissions during construction • Support innovative and cost-effective approaches to energy efficiency, low-carbon/ renewable energy sources and energy procurement • Optimise material use across the project • Optimise water use across the project	• Establish energy efficiency targets for the project during construction • Incorporate energy efficient construction plant and equipment, methods and practices • Set targets to maximise the re-use of materials • Use local sources of materials where feasible • Source materials that reduce the need for virgin material supply • Set targets for reductions in water use during construction and operation • Implement water efficiency measures with a focus on achieving water savings and targeting water recycling and reuse • Reuse, recycle or reclaim water (e.g. rainwater, stormwater, wastewater, groundwater) generated/collected • Ensure water monitoring across the project lifecycle is implemented	• Local materials are sourced and re-used • Monitoring and modelling of materials lifecycle impacts is undertaken • The need for potable water during the project lifecycle is minimised • Water is reused and recycled during construction and operation • Monitoring and modelling of water use is undertaken

Emissions, pollutions and waste	• Reduce generation of waste and maximise diversion from landfill • Minimise discharges to air, land and water • Optimise water use across the project • Optimise land use across the project	• Set targets for waste avoidance and reductions in waste to landfill • Reuse/recycle usable spoil (uncontaminated surplus excavated material), construction and demolition waste (uncontaminated) • Implement packaging take-back arrangements with suppliers (delivery contractors to pass target onto sub-contractors, where practicable) • Identify and implement measures to minimise adverse impacts to receiving water environmental values during construction and operation • Monitoring of water discharges and receiving waters must be undertaken at appropriate intervals and at times of discharge during construction • Identify and implement measures to mitigate noise during construction and operation • Monitoring of noise is undertaken at appropriate intervals and in response to complaints during construction • Identify and implement measures to minimise adverse impacts to local air quality during construction • Monitoring of air emissions and/or air quality is undertaken at appropriate intervals and in response to complaints during construction • Identify and implement measures to prevent light spill during construction. This must be shown through night audits of light spill	• Waste is minimised during construction • Waste monitoring and management has been managed, reviewed or audited • The need for potable water during the project lifecycle is minimised • Water is reused and recycled during construction and operation • Monitoring and modelling of water use is undertaken • All subsoil and topsoil impacted by the project is separated and protected from degradation, erosion or mixing with fill or waste • The run-off, flood risk, and potential increased flood risk elsewhere as a result of the project have all been assessed over their expected working life • Sources of pollution are reduced • Control at the source of pollution is optimised to minimise harm to the environment

Sustainability theme (aligned with ISC rating scheme themes)	Sustainability objective	Potential sustainability initiative	Potential outcome
Ecology	• Improve biodiversity outcomes by avoiding, mitigating or offsetting the potential impacts of the project on plants, animals and their environments	• Investigate opportunities to expand the distribution of threatened species (e.g. through propagation) • Work with private landowners to identify potential reuse opportunities for cleared vegetation and spoil • Reduce vegetation clearing to the smallest extent that is practical for the safe construction and operation of the project • Retain connectivity corridors around new and existing transmission lines • Partner with local wildlife organisations, government agencies or academic/research institutions to understand impacts of transmissions lines on threatened flora and fauna. This information could be shared across major projects to enhance uptake of preventative actions	• Protected and enhanced biodiversity values through appropriate planning and management

Sustainability theme (aligned with ISC rating scheme themes)	Sustainability objective	Potential sustainability initiative	Potential outcome
People and place	• Demonstrate best practice landscape design practices • Engage and involve the community and local stakeholders in the development of the project • Make a positive contribution to community health and wellbeing • Create opportunities for local business involvement during construction and operation • Protect and promote local heritage through appropriate design, planning, and management controls	• Identify innovative measures during design and construction to mitigate impacts to landscape character and visual amenity • Use native plantings as long-term visual screening/mitigation in highly impacted vistas • Implement a stakeholder engagement strategy, to be reviewed annually, for all stages of the project • Seek input from the community and stakeholder representatives throughout the planning, design and delivery stages of the project • Conduct regular stakeholder meetings across the broad range of project stakeholders (both internal and external) • Adopt a collaborative approach with key stakeholders on the resolution of key issues • Investigate opportunities to form strategic partnerships with universities and regional training centres to upskill the local community and create employment opportunities locally • Have all contractors undertake cultural awareness training where possible on-country and with community • Share local cultural stories collected as part of cultural values assessment (with permission and where appropriate) with the community • Identify and map Aboriginal stakeholders including Aboriginal communities, businesses, employment services, community advocates and agencies • Continue to build relationships with local Aboriginal communities prior to project commencement	• Enhanced landscapes that benefit the community and private landowners • Landowners and community groups are engaged throughout the project • Engagement activities with stakeholders and the community to encourage and facilitate community participation in the project's planning • Contribution to economic activity in regional NSW, generating major benefits for local communities • Protected and enhanced heritage through appropriate planning and management • Impacts on Aboriginal and non-Aboriginal heritage significance have been minimised, avoided and mitigated where practicable

25.7 Statutory considerations

The project is critical State significant infrastructure (CSSI) and requires approval from the NSW Minister for Planning and Public Spaces under Division 5.2, Part 5 of the EP&A Act. The project is also a controlled action under the EPBC Act and has been assessed under the NSW Assessment Bilateral Agreement, which provides for certain actions that are State significant within the meaning of the EP&A Act to be accredited for the purposes of meeting the requirements for assessment and public exhibition of an action under the provisions of the EPBC Act. Although the project will be assessed under the NSW Assessment Bilateral Agreement, a separate EPBC Act approval from the Australian Minister for the Environment and Water is still required before the project can proceed.

This EIS has been prepared to meet the requirements of the EP&A Act and the EPBC Act in addition to addressing relevant requirements of other Australian Government and NSW Government legislation. This EIS has been prepared to address the Planning Secretary's environmental assessment requirements (SEARs) (including the supplementary SEARs regarding Commonwealth requirements) and has been guided by the *State significant infrastructure guidelines – preparing an environmental impact statement* (DPIE 2022a). Further details on how the EIS has addressed these requirements are provided in *Appendix A (Assessment requirements compliance)* and *Appendix C (Statutory compliance).*

Technical studies provided in the EIS have been completed in accordance with the applicable technical requirements and guidelines and informed by consultation with relevant government agencies and other stakeholders. The EIS has also been reviewed and contains the appropriate declaration of a Registered Environmental Assessment Practitioner.

Should the project be approved, an environmental management strategy will be developed to provide the overall strategic framework for environmental management during construction of the HTP. This would include tracking and monitoring to ensure compliance with the conditions of approval for the project and the mitigation and management measures detailed in this EIS (see *Chapter 24 (Environmental management)*). Operational management would be in accordance with the network operator's certified environmental management system.

25.8 Evaluation and conclusion

The HTP would close the northern gap between the existing 500 kV transmission lines at Bayswater to the existing 500 kV transmission line in the Olney State Forest near Eraring and unlock the supply of electricity from the Central-West Orana and New England REZs. As the remaining coal-fired power stations in NSW close, the HTP is necessary to protect energy security in NSW for current and future generations.

Both the NSW Government and the Australian Government recognise the strategic importance of the project and require it to be built as quickly as possible.

The HTP has been developed following a robust and iterative process that has involved substantial alternatives and options analysis, environmental impact assessment and stakeholder engagement. Where feasible and reasonable, the project has aimed to avoid and minimise impacts to people and the environment. This has included refining the HTP corridor to reduce and balance impacts to private landowners, communities, biodiversity, recreation areas, and Aboriginal cultural heritage.

However, given the nature and scale of the project, unavoidable impacts remain. Key residual impacts include:

- **biodiversity from vegetation clearance** – impacts would be offset in accordance with a Strategic Offset Delivery Agreement under Clause 6.2 of the Biodiversity Conservation Regulation
- **Aboriginal cultural heritage from ground disturbance during construction** – some Aboriginal heritage sites may not be able to be avoided and there remains the possibility that potential unrecorded Aboriginal heritage sites and/or potential archaeological deposits were not identified and could be impacted during construction of the project. However, impacts would be minimised through management measures including the implementation of an unexpected finds protocol
- **landscape and visual impacts** – the new transmission infrastructure would be visible from public and private viewpoints. For easement affected landowners, compensation would consider residual visual impacts. For non-easement affected properties and for residences where the project is predicted to have a moderate to high visual impact, opportunities for screening vegetation would be investigated. Appropriate visual screening or other options would be confirmed in consultation with the affected landowner and implemented where practicable
- **traffic and transport impacts** – there is the potential for impacts associated with the movement of construction vehicles, plant and equipment, materials delivery and workers moving between work sites and construction support sites, though the road network would continue to perform at acceptable levels of service and intersection performance would not be impacted at most locations. Upgrades to several intersections would be required to avoid/minimise traffic impacts
- **land use and property** – impacts would include restrictions on some agricultural and forestry land uses in the new transmission line easement. Numerous refinements have been (and would continue to be) made to minimise impacts, and compensation would be provided for all directly affected landowners for the acquisition and use of transmission line easements.

The project includes a range of mitigation and management measures to reduce the likelihood, magnitude and consequences of any residual impacts. The design and construction methodology for the project would also be refined with the objective of further avoiding and minimising potential impacts on people and the environment.

Not proceeding with the project would reduce the security of electricity supply in NSW as coal-fired power stations close. It would also discourage investment in renewable energy generation and storage within the emerging REZs. The provision of appropriate infrastructure to these zones is required to allow the adoption of new renewable technologies in the future, which is required to support the delivery of commitments and policies at a NSW Government, Australian Government and international level.

Overall, the HTP is a critical component in strengthening the supply of clean and reliable electricity to consumers and delivering long-term benefits to the NEM. On balance, it is considered that the strategic need and benefits of the project outweigh the mitigated project impacts and, therefore, the HTP is justified and would be in the public interest.

References

References

ABS (Australian Bureau of Statistics) (2006) *Australian and New Zealand Standard Industrial Classification (ANZSIC) (Revision 1.0)*, accessed 7 May 2025.

ABS (Australian Bureau of Statistics) (2022a) *Agricultural Commodities, Australia 2020-2021,* accessed 27 February 2025.

ABS (Australian Bureau of Statistics) (2022b) *Value of Agricultural Commodities Produced,* Australia | Australian Bureau of Statistics, accessed 27 February 2025.

AEMO (Australian Energy Market Operator) (2024) *2024 Integrated System Plan*, accessed 11 December 2024.

AEMO Services (Australian Energy Market Operator Services) (2021) *2021 Infrastructure Investment Objectives Report*, accessed 11 December 2024.

AEMO Services (Australian Energy Market Operator Services) (2022) *2022 Infrastructure Investment Objectives Report,* accessed 11 December 2024.

AEMO Services (Australian Energy Market Operator Services) (2023) *2023 Infrastructure Investment Objectives Report,* accessed 11 December 2024.

AGL (AGL Energy) (2022) *Climate Transition Action Plan,* accessed 27 February 2025.

Airservices Australia (2002) *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise,* accessed 21 May 2025.

ANZECC (Australian and New Zealand Environment and Conservation Council) (2000) *Water quality guidelines,* accessed 11 December 2024.

ANZG (Australian and New Zealand Governments) (2018) *Australian and New Zealand guidelines for fresh and marine water quality,* accessed 7 May 2025.

ASSMAC (Acid Sulfate Soil Management Advisory Committee) (1998) *Acid Sulfate Soil Manual,* accessed 7 May 2025.

Ausgrid (2025) *Hunter-Central Coast Renewable Energy Zone,* Ausgrid website, accessed 7 May 2025.

Australian Government (2018) *National Water Quality Management Strategy,* accessed 16 July 2025.

Australian Government: Geoscience Australia (2019) *Australian Rainfall and Runoff (2019) Guideline,* accessed 7 May 2025.

Australian Institute of Landscape Architects (2018) *Guidance Note for Landscape and Visual Assessment,* accessed 16 July 2025.

Austroads (2022) *Guide to Traffic Management and Road Design,* accessed 7 May 2025

Bayne B and West G (1988) *GRIT - Generation of regional input-output tables: Users Reference Manual,* Canberra: Australian Government Public Service.

Beca (2025) *Hunter Transmission Project Audible Noise and Frequency Interference Study,* accessed 16 July 2025.

Bell, S.A.J (2015) Ecology Report for the Continuation of Rix's Creek Mine, Singleton LGA.

BoM (Australian Bureau of Meteorology) (2022a) *Atlas of Groundwater Dependent Ecosystems mapping,* accessed 26 February 2025.

BoM (Australian Bureau of Meteorology) (2022b) *National Groundwater Information System database,* accessed 27 February 2025.

BoM (Australian Bureau of Meteorology) (2024) *Groundwater Dependent Ecosystems Atlas,* accessed 25 February 2025.

British Cochlear Impact Group (n.d.) *Safety & MRI,* British Cochlear Impact Group website, accessed 7 May 2025.

British Standards Institution (1993) *Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration* (BS 7385-2:1993).

British Standards Institution (2008) *Guide to evaluation of human exposure to vibration in buildings* (BS 6472-1:2008).

Buy NSW (2021) *Small and Medium Enterprise and Regional Procurement Policy,* accessed 16 July 2025.

Cumberland Ecology (2014a) *Warkworth Coal Mine Continuation Project - Biodiversity Assessment Report.*

Cumberland Ecology (2014b) *Bengalla Mine Continuation - Biodiversity Assessment Report.*

DAWE (Commonwealth Department of Agriculture, Water and the Environment) (2012) *Interim biogeographic regionalisation for Australia Mapping, version 7.0.*

Cth DCCEEW (Commonwealth Department of Climate Change, Energy, the Environment and Water) (2021) *Australian Heritage Database,* accessed 15 November 2024

Cth DCCEEW (Commonwealth Department of Climate Change, Energy, the Environment and Water) (2023) National Light Pollution Guidelines for Wildlife, accessed 25 February 2025.

Cth DCCEEW (Commonwealth Department of Climate Change, Energy, the Environment and Water) (2024a) *Commonwealth Species Profiles and Threats Database.*

Cth DCCEEW (Commonwealth Department of Climate Change, Energy, the Environment and Water) (2024b) *National Greenhouse Accounts Factors Workbook,* accessed 7 May 2025.

DCCEEW (NSW Department of Climate Change, Energy, the Environment and Water) (2024a) *Biodiversity Assessment Method Calculator User guide*, accessed 26 February 2025.

DCCEEW (NSW Department of Climate Change, Energy, the Environment and Water) (2024b) *Spatial layer of HEVAE vegetation groundwater dependent ecosystems value in NSW,* accessed 27 February 2025.

DCCEEW (NSW Department of Climate Change, Energy, the Environment and Water) (2025) *Remote assessment of biodiversity values,* accessed 21 May 2025.

DEC (NSW Department of Environment and Conservation) (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft),* accessed 26 February 2025.

DEC (NSW Department of Environment and Conservation) (2006) *Assessing Vibration: A Technical Guideline,* accessed 7 May 2025.

DECC (NSW Department of Environment and Climate Change) (2005) *Liquid Chemical Storage, Handling and Spill Management: Review of Best Practice Regulation,* accessed 7 May 2025.

DECC (NSW Department of Environment and Climate Change) (2007a) *Storing and Handling Liquids: Environmental Protection: Participants Manual,* accessed 7 May 2025.

DECC (NSW Department of Environment and Climate Change) (2007b) *Floodplain Risk Management Guideline: Practical Considerations of Climate Change,* accessed 7 May 2025.

DECC (NSW Department of Environment and Climate Change) (2008a) NSW (Mitchell) Landscapes mapping and landscape descriptions.

DECC (NSW Department of Environment and Climate Change) (2008b) *Managing Urban Stormwater: Soils and Construction, Volume 2A, Installation of services,* accessed 11 December 2024.

DECC (NSW Department of Environment and Climate Change) (2008c) *Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads,* accessed 11 December 2024.

DECC (NSW Department of Environment and Climate Change) (2008d) *Book 4 Dryland Salinity: Productive Use of Saline Land and Water,* accessed 16 July 2025.

DECC (NSW Department of Environment and Climate Change) (2009) *Interim Construction Noise Guideline,* accessed 11 December 2024.

DECCW (NSW Department of Environment, Climate Change and Water) (2006) *NSW Water Quality and River Flow Objectives,* accessed 7 May 2025.

DECCW (NSW Department of Environment, Climate Change and Water) (2010a) *Aboriginal Cultural Heritage Consultation Requirements for Proponents,* accessed 12 December 2024.

DECCW (NSW Department of Environment, Climate Change and Water) (2010b) *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW*, accessed 12 December 2024.

DECCW (NSW Department of Environment, Climate Change and Water) (2011) *NSW Road Noise Policy,* accessed 7 May 2025.

Deloitte Access Economics (2011) *Economic and social impacts of the Warkworth Extension Project,* accessed 7 May 2025.

Department of Agriculture, Water and the Environment (2020) *Per- and Poly-fluorinated Alkyl Substances (PFAS) National Environmental Management Plan 2.0,* accessed 7 May 2025.

Department of Defence (2020) *Environmental incident reporting and management guideline,* accessed 16 July 2025.

Department of Land & Water Conservation (1994) *Guidelines for the planning, construction and maintenance of tracks,* accessed 21 May 2025.

Department of the Environment (2013a) *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance,* accessed 26 February 2025.

Department of the Environment (2013b) *Significant Impact Guidelines 1.2: Actions on, or impacting upon, Commonwealth Land and actions by Commonwealth agencies*, accessed 21 May 2025.

Department of the Environment (2016) *Commonwealth Engage Early: Guidance for proponents on best practice Indigenous engagement for environmental assessments,* accessed 21 May 2025.

DIN (Deutsches Institut für Normun) (1999) *Structural Vibration Part 3: Effects of Vibration on Structures* (DIN 4150-3).

DISER (Australian Department of Industry, Science, Energy and Resources) (2021) *Australia's Long-term Emissions Reduction Plan,* accessed 11 December 2024.

DISER (Australian Department of Industry, Science, Energy and Resources) (2022) *Australia's Nationally Determined Contribution Communication 2022,* accessed 11 December 2024.

DoP (NSW Department of Planning (2011a) *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33,* accessed 7 May 2025.

DoP (NSW Department of Planning) (2011b) *Hazardous Industry Planning Advisory Paper No. 6,* accessed 7 May 2025.

DoP Heritage (NSW Department of Planning - Heritage branch) (2009) Assessing significance for historical archaeological sites and 'relics', accessed 12 December 2024.

DPE (NSW Department of Planning and Environment) (2018) *NSW Transmission Infrastructure Strategy,* accessed 19 February 2025.

DPE (NSW Department of Planning, Industry and Environment) (2022a) *Biodiversity Assessment Method 2020 Operational Manual Stage 1*, accessed 26 February 2025.

DPE (NSW Department of Planning, Industry and Environment) (2022b) *Guidance for the Biodiversity Development Assessment Report Template,* accessed 26 February 2025.

DPE (NSW Department of Planning, Industry and Environment) (2022c) *Biodiversity Assessment Method Calculator Version 1.4.0.00*.

DPE (NSW Department of Planning, Industry and Environment) (2022d) *NSW BioNet Threatened Biodiversity Data Collection,* accessed 26 February 2025.

DPE (NSW Department of Planning, Industry and Environment) (2022e) *Threatened reptiles: Biodiversity Assessment Method survey guide,* accessed 26 February 2025.

DPE (NSW Department of Planning, Industry and Environment) (2022f) *Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide*, accessed 26 February 2026.

DPE (NSW Department of Planning, Industry and Environment) (2022g) *NSW Biodiversity Values Map and Threshold Tool,* accessed 26 February 2025.

DPE (NSW Department of Planning, Industry and Environment) (2022h) *NSW BioNet Vegetation Classification PCT mapping.*

DPE (NSW Department of Planning and Environment) (2022i) *Practice Note - Engaging with Aboriginal Communities, Social Impact Assessment Practice Notes,* accessed 27 February 2025.

DPE (NSW Department of Planning and Environment) (2022j) *Hunter Regional Plan 2041,* accessed 27 February 2025.

DPE (NSW Department of Planning and Environment) (2022k) *Groundwater Assessment Toolbox for Major Projects in NSW*, accessed 27 February 2025.

DPE (NSW Department of Planning and Environment) (2023a) *Biodiversity Assessment Method Operational Manual Stage 2*, accessed 26 February 2025.

DPE (NSW Department of Planning and Environment) (2023b) *Social impact assessment guideline*, accessed 11 December 2024.

DPE (NSW Department of Planning and Environment) (2023c) *Technical Supplement, Social Impact Assessment Guideline for State Significant Projects,* accessed 27 February 2025.

DPE (NSW Department of Planning and Environment) (2023d) *Flood risk management manual,* accessed 16 July 2025.

DPE (NSW Department of Planning and Environment) (2023d) *Guidelines for preparing a statement of heritage impact*, accessed 27 February 2025.

DPE (NSW Department of Planning and Environment) (2023e) *Assessing Heritage Significance*, accessed 27 February 2025.

DPE Water (NSW Department of Planning and Environment - Water) (2022a) *Controlled activities - guidelines for riparian corridors on waterfront land,* Fact sheet INT22/173814 , accessed 11 December 2024.

DPE Water (NSW Department of Planning and Environment - Water) (2022b) *Controlled activities - guidelines for watercourse crossings on waterfront land*, Fact sheet INT22/159001, accessed 11 December 2024.

DPE Water (NSW Department of Planning and Environment - Water) (2022c) *Controlled activities - guidelines for instream works on waterfront land*, Fact sheet INT22/159006 , accessed 11 December 2024.

DPE Water (NSW Department of Planning and Environment - Water) (2022d) *Controlled activities - guidelines for laying pipes and cables on waterfront land,* Fact sheet INT22/159009, accessed 7 May 2025.

DPE Water (NSW Department of Planning and Environment - Water) (2022e) *Controlled activities - guidelines for outlet structures on waterfront land,* Fact sheet INT22/159009, accessed 7 May 2025.

DPE Water (NSW Department of Planning and Environment - Water) (2022f) *Controlled activities - guidelines for vegetation management plans on waterfront land,* Fact sheet INT22/159010, accessed 7 May 2025.

DPE Water (NSW Department of Planning and Environment - Water) (2023) *Groundwater impact assessment criteria,* accessed 27 February 2025.

DPHI (NSW Department of Planning, Housing, and Infrastructure) (2024a) *Transmission Guideline*, *Technical Supplement for Landscape Character and Visual Assessment,* accessed 11 December 2024.

DPHI (NSW Department of Planning, Housing, and Infrastructure) (2024b) *Undertaking Engagement Guidelines for State Significant Projects*, accessed 11 December 2024.

DPHI (NSW Department of Planning, Housing, and Infrastructure) (2024c) *State Significant Infrastructure Guidelines*, accessed 19 February 2025.

DPHI (NSW Department of Planning, Housing and Infrastructure) (2025) *Guidelines for construction workers accommodation,* accessed 16 July 2025.

DPI (NSW Department of Primary Industries) (2003) *Policy and Guidelines for Fish Friendly Waterway Crossings,* accessed 11 December 2024.

DPI (NSW Department of Primary Industries) (2012) *Upper Hunter Strategic Regional Land Use Plan,* accessed 27 February 2025.

DPI (NSW Department of Primary Industries) (2013) *Policy and guidelines for fish habitat conservation and management - Update 2013*, accessed 11 December 2024.

DPI (NSW Department of Primary Industries) (2022) *Fisheries Spatial Data Portal mapping,* accessed 26 February 2025.

DPI Water (NSW Department of Primary Industries - Office of Water) (2012a) *NSW Aquifer Interference Policy*, accessed 27 February 2025.

DPI Water (NSW Department of Primary Industries - Office of Water) (2012b) *Risk assessment guidelines for groundwater dependent ecosystems,* accessed 7 May 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2019a) *NSW Electricity Strategy,* accessed 11 December 2024.

DPIE (NSW Department of Planning, Industry and Environment) (2019b) NSW River Styles Database, accessed 11 December 2024.

DPIE (NSW Department of Planning, Industry and Environment) (2019c) *Guidance to assist a decision-maker to determine a serious and irreversible impact,* accessed 21 May 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2020a) *Net Zero Plan Stage 1: 2020-2030,* accessed 11 December 2024.

DPIE (NSW Department of Planning, Industry and Environment) (2020b) *NSW Electricity Infrastructure Roadmap,* accessed 11 December 2024.

DPIE (NSW Department of Planning, Industry and Environment) (2020c) *Biodiversity Assessment Method*, accessed 26 February 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2020d) *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method*, accessed 26 February 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2020e) *NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method,* accessed 7 May 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2020f) *Soil and Land Resources of the Hunter Region,* version 1.5, accessed 7 May 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2020g) *NSW Environmental management guidelines for construction (edition 4),* accessed 21 May 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2021a) *Cumulative Impact Assessment Guidelines for State Significant Projects*, accessed 19 February 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2021b) *Undertaking Engagement: Guidelines for State Significant Projects,* accessed 26 February 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2021c) *'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method,* accessed 26 February 2025.

DPIE (NSW Department of Planning, Industry and Environment) (2022a) *State significant infrastructure guidelines - preparing an environmental impact statement Appendix B to the State significant infrastructure guidelines*, accessed 11 December 2024.

DPIE (NSW Department of Planning, Industry and Environment) (2022b) *eSPADE online Soil landscapes mapping tool*, accessed 25 February 2026.

DPIE NSW Department of Planning, Industry and Environment (2024) *eSPADE Database:* retrieved of following layers: soil landscapes, soil types, inherent soil fertility, land and soil capability, acid sulfate risk. espade.environment.nsw.gov.au

EDF Renewables (2024) *Edderton Solar Project Scoping Report,* accessed 7 May 2025.

EMM (EMM Consulting Pty Ltd) (2022) *Hunter Valley Operations Continuation Project Environmental Impact Statement,* accessed 7 May 2025.

EMM (EMM Consulting Pty Ltd) (2022b) *Hunter Valley Operations Continuation Project - Noise Impact Assessment,* accessed 16 July 2025.

EMM (EMM Consulting Pty Ltd) (2023a) *Muswellbrook Solar Farm Environmental Impact Statement,* accessed 7 May 2025.

Epuron (2021) *Bowmans Creek Wind Farm Environmental Impact Statement,* accessed 7 May 2025.

EnergyCo (Energy Corporation of New South Wales) (2022) *Living and working near transmission line easements,* accessed 7 May 2025.

EnergyCo (Energy Corporation of New South Wales) (2023a) *Network Infrastructure Strategy*, accessed 11 December 2024.

EnergyCo (2023b), *Inquiry into the feasibility of undergrounding the transmission infrastructure for renewable energy projects,* accessed 10 June 2025.

EPA (NSW Environment Protection Authority) (2014) *Waste classification guidelines*, accessed 12 December 2024.

EPA (NSW Environment Protection Authority) (2016) *Approved Methods for Modelling and Assessment of Air Quality in New South Wales,* accessed 7 May 2025.

EPA (NSW Environment Protection Authority) (2017a) *Noise Policy for Industry,* accessed 7 May 2025.

EPA (NSW Environment Protection Authority) (2017b) *Guidelines for the NSW Site Auditor Scheme (3rd Edition),* accessed 7 May 2025.

EPA (NSW Environment Protection Authority) (2019) *NSW Circular Economy Policy Statement: Too Good to Waste*, accessed 12 December 2024.

EPA (NSW Environment Protection Authority) (2021) *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021 -2027*, accessed 12 December 2024.

EPA (NSW Environment Protection Authority) (2024) *Draft Guide for Large Emitters,* accessed 7 May 2025.

Fairfull, S & Witheridge, G (2003) *Why do fish need to cross the road? Fish passage requirements for waterway crossings,* accessed 25 February 2025.

Fernie K and Reynolds S J (2005) 'The Effects of Electromagnetic Fields From Power Lines on Avian Reproductive Biology and Physiology: A Review', *Journal of Toxicology and Environmental Health Part B,* 8(2):127-140, doi:10.1080/10937400590909022.

Forestry Corporation of NSW (2024) *Annual Report 2023-24,* accessed 7 May 2025.

GHD (2023) *Liddell Future Use and Enabling Works Environmental Impact Statement,* accessed 7 May 2025.

GHD (2025) *Stockpile Extension Project – Noise Impact Assessment – Cooranbong Entry Site,* accessed 16 July 2025.Heritage NSW (NSW Department of Environment and Heritage - Heritage) (2024) *State Heritage Inventory Search,* accessed 27 February 2025.

Hunter Eco (Hunter Ecology) (2021) *Mt Pleasant Optimisation Project - Appendix E - Biodiversity Development Assessment Report.*

IAQM (Institute of Air Quality Management) (2024) *Guidance on the assessment of dust from demolition and construction* v2.2, accessed 12 December 2024.

ICNIRP (International Commission for Non-Ionizing Radiation Protection) (2010) *Guidelines for Limiting Exposure to Electro and magnetic Fields,* accessed 7 May 2025.

ICOMOS (International Council on Monuments and Sites) (2011) *Guidance on heritage impact assessments for Cultural World Heritage Properties,* accessed 12 December 2024.

ICOMOS (International Council on Monuments and Sites) (2013) The Burra Charter: *The Australia ICOMOS Charter for Places of Cultural Significance*, accessed 12 December 2024.

IECA (International Erosion Control Association, Australasian Chapter) (2008) Best Practice Erosion and Sediment Control, accessed 11 December 2024.

Industry and Investment NSW (2011) *Industry and Investment MDG Spontaneous Combustion Management Guideline,* accessed 16 July 2025.

Infrastructure NSW (2022) *Staying ahead: State Infrastructure Strategy 2022-2042*, accessed 19 February 2025.

Isbell R F (2021) *The Australian Soil Classification Third Edition*, CSIRO Publication, Australia.

ISO (International Organisation for Standardisation) (2014) *Asset Management - Management Systems - Requirements* (ISO 55001:2014).

ISO (International Organisation for Standardisation) (2016) *Environmental management systems* (ISO 14001:2016).

Jacobs (2021) *Lidell Battery and Bayswater Ancillary Works Project - Noise and Vibration*

assessment report number IS334000, accessed 16 July 2025. Jemena Limited (2021) *Designing, constructing and operating assets near Jemena gas pipelines,* accessed 21 May 2025.

Landcom (2004) *Managing Urban Stormwater: Soils and Construction - Volume 1, 4th Edition*, accessed 11 December 2024.

Landscape Institute and Institute of Environmental Management & Assessment (2013) *Guidelines for Landscape and Visual Impact Assessment,* third edition.

MAC (Muller Acoustic Consulting) (2024) *Noise and Vibration Impact Assessment - Maison Dieu Solar Farm,* accessed 7 May 2025.

Maynard, J (2013) *Aboriginal History Journal*, 37(2013:77-92), doi: 10.22459/ah.37.2013.04.

Muller Acoustic Consulting (2022) *Noise Assessment – Proposed Child Care Centre 695 Freemans Drive Cooranbong, NSW,* accessed 16 July 2025. National Transport Commission (2018) *Australian Code for the Transport of Dangerous Goods by Road and Rail,* accessed 21 May 2025.

NEPM (2013) *National Environment Protection (Assessment of Site Contamination) Measure 2013,* accessed 16 July 2025.

NHVR (National Heavy Vehicle Regulator) (2020) *NSW Heavy Vehicle Access Policy Framework.*

NPWS (NSW National Parks and Wildlife Service) (2010) *Watagans National Park and Jilliby State Conservation Area Plan of Management,* accessed 7 May 2025.

NSW Office of Energy and Climate Change (2020) *NSW Renewable Energy Sector Board ' s Plan,* accessed 16 July 2025.

NSW Treasury (2023) *NSW Procurement Board Direction PBD-2023-03 Procurement opportunities for small (and medium) businesses,* accessed 16 July 2025.

OEH (NSW Office of Environment and Heritage) (2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*, accessed 26 February 2025.

OEH (NSW Office of Environment and Heritage) (2012) *Land and Soil Capability Assessment Scheme*, accessed 27 February 2025.

RAPT (RAPT Consulting) (2024) *Acoustic Assessment - Wollombi Road Upgrade,* accessed 16 July 2025.

Regional NSW (Department of Regional NSW) (2023) Hunter Regional Economic Development Strategy - 2023, accessed 27 February 2025.

Renew Economy (2024) *Hunter Valley wind farm gets federal approval as developer sets sights on second stage,* accessed 10 June 2025.

RFS (NSW Rural Fire Service) (2019) *Planning for Bush Fire Protection: A guide for councils, planners, fire authorities and developers,* accessed 12 December 2024.

RPS (2024) *Maison Dieu Solar Farm Environmental Impact Assessment,* accessed 7 May 2025.

SafeWork NSW (2014) *Managing asbestos in or on soil,* accessed 7 May 2025.

SES (NSW State Emergency Service) (2013) *Wyong Shire Local Flood Plan.*

SES (NSW State Emergency Service) (2018) *Singleton Local Flood Plan.*

SES (NSW State Emergency Service) (2022a) *Muswellbrook Shire Local Flood Plan.*

SES (NSW State Emergency Service) (2022b) *Cessnock LGA Local Flood Emergency Sub Plan.*

SES (NSW State Emergency Service) (2022c) *Lake Macquarie LGA Local Flood Emergency Sub Plan.*

Standards Australia (2004) *The storage and handling of flammable and combustible liquids* (AS 1940:2004).

Standards Australia (2008) *Substation and high voltage installations exceeding 1 kV AC* (AS 2067:2008).

Standards Australia (2009) *Protection of Trees in Development Sites* (AS 4970:2009).

Standards Australia (2010) *Guide to noise and vibration control on construction, demolition and maintenance sites* (AS 2436:2010).

Standards Australia (2013) *Electricity Network Safety Management Systems* (AS 5577:2013).

Standards Australia (2016) *Limits of electromagnetic interference from overhead A.C. powerlines and high voltage equipment installations in the frequency range 0.15 MHz to 3000 MHz* (AS 2344:2016).

Standards Australia (2018) Construction of buildings in bushfire prone areas (AS 3959:2018).

Standards Australia and Standards New Zealand (2009) Risk management - Principles and guidelines (AS/NZS ISO 31000:2009).

Standards Australia and Standards New Zealand (2016) Overhead line design (AS/NZS 7000:2016).

Standards Australia and Standards New Zealand (2016) Acoustics - recommended design sound levels and reverberation times for building interiors (AS/NZS 2107:2016).

Standards Australia and Standards New Zealand (2019) Control of the obtrusive effects of outdoor lighting (AS/NZS 4282).

State Heritage Inventory (2008) *Eraring Power Station, State Heritage Inventory - Heritage NSW,* accessed 8 November 2023.

Sorensen A D (1990) *Virtuous Cycles of Growth and Vicious Cycles of Decline: Regional Economic Change in Northern NSW. In Change and Adjustment in Northern New South Wales.* Ed D.J. Walmsley, University of New England, Armidale.

Spectrum Acoustics (2018) *Noise Impact Assessment - Proposed Tourist Accommodation and Function Centre - 226 Gillards Road Pokolbin NSW,* accessed 16 July 2025.

SQM Research (2024) Vacancy rates by postcode, viewed 15 November 2024. TfNSW (Transport for New South Wales) (2022a) *Traffic Control at Work Sites - Technical Manual,* accessed 27 February 2025.

TfNSW (Transport for New South Wales) (2022b) *2026 Road Safety Action Plan*, accessed 27 February 2025.

TfNSW (Transport for New South Wales) (2023) *Construction Noise and Vibration Guideline,* accessed 7 May 2025.

TfNSW (Transport for New South Wales) (2024) *Guide to Transport Impact Assessment*, accessed 27 February 2025.

TfNSW (Transport for New South Wales) (2025a) *Level Crossing Finder,* accessed 27 February 2025.

TfNSW (Transport for New South Wales) (2025b) *Infrastructure Cycleway Data*, accessed 27 February 2025.

Transgrid (2022) Fencing Guidelines, accessed 27 February 2025.

Transgrid (2023) ISP Preparatory Activities - Reinforcing Sydney, Newcastle and Wollongong Supply (Southern Ring), accessed 11 December 2024.

Transgrid (2024) *Transmission Annual Planning Report 2023,* accessed 10 June 2025.

UK Department for Energy Security & Net Zero (2011) *National Policy Statement for Electricity Networks Infrastructure.*

UK National Radiological Protection Board (2001) 'ELF ElectroMagnetic Fields and the Risk of Cancer: Report of an Advisory Group on Non-Ionising Radiation', *Documents of the NRPB,* 12(1).

Umwelt (Umwelt Australia Pty Ltd.) (2013) *Bulga Coal Mine Optimisation - Ecological Impact Assessment,* accessed 16 July 2025.

Umwelt (Umwelt Australia Pty Ltd.) (2019) *Mangoola Coal Continued Operations Project - Biodiversity Assessment Report,* accessed 16 July 2025.

Umwelt (Umwelt Australia Pty Ltd.) (2022) *Hunter Valley Operations Continuation Project, Biodiversity Development Assessment Report,* accessed 16 July 2025.

WA Department of Health (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos - Contaminated Sites in Western Australia,* accessed 7 May 2025.

WA Department of Health (2021) *Revised Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia,* accessed 7 May 2025.

West G (1993) *Input-Output Analysis for Practitioners, V7.1, User's Guide,* University of Queensland, accessed 16 July 2025.

WorkCover NSW (2005) *Storage and Handling of Dangerous Goods Code of Practice,* accessed 7 May 2025.

World Health Organisation (2007) *Environmental health criteria Vol 238: Extremely low frequency fields,* World Health Organisation, accessed 7 May 2025.