EnergyCo

Hunter Transmission Project

Executive summary

NSW GOVERNMENT

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.

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.

The Hunter Transmission Project is both a critical State significant infrastructure project and a Priority Transmission Infrastructure Project. As the remaining coal-fired power stations close, the Hunter Transmission Project is critical for energy security in NSW. To ensure energy security as our coal-fired power stations close, the Hunter Transmission Project must be built by by the end of 2029.

The Hunter Transmission Project

The Hunter Transmission Project:

- is an urgent NSW Actionable Project under the Australian Energy Market Operator's 2024 Integrated System Plan for the transition of the National Electricity Market to renewable energy over the next 20 years
- will 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 for NSW to support the delivery of the NSW Electricity Infrastructure Roadmap
- is a priority transmission infrastructure project under the NSW *Electricity Infrastructure Investment Act 2020* because it is essential for energy security and avoiding breaches of the NSW Energy Security Target.

The key elements of the Hunter Transmission Project 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 objectives of the Hunter Transmission Project are to:

- provide 5 gigawatts 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
- 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*
- harness and build on the region's diverse skill base and provide opportunities for the community to share in the project's benefits
- commence 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.

The Hunter Transmission Project 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.

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

Overview

An overview of the Hunter Transmission Project is provided in Table ES1 and shown in Figure ES1.

Table ES.1 Overview of the Hunter Transmission Project

Project element	Summary of the project
New transmission line and transmission towers	• Overhead 500 kV double circuit transmission line of around 110 kilometres between Bayswater South 500 kV switching station and Olney 500 kV switching station • Steel lattice towers up to 85 metres high and that are spaced anywhere between 75 metres to around 1.5 kilometres apart depending on topography (typically between 300 metres and 600 metres) • 500 kV transmission lines with a minimum vertical clearance of 13.5 metres • Construction corridor 140 metres 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: — 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 Training Area — Line 82: 330 kV: Tomago – Liddell 330 kV at Warkworth and again at the Singleton Training Area

Project element	Summary of the project
Upgrades – existing transmission lines and towers	• Upgrades to overhead earth wire on existing 500 kV transmission lines including: — around 10 kilometres of upgrades at Bayswater (Line 5A3 and Line 5A4) — around 17 kilometres 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 hectares • 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 hectares • 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

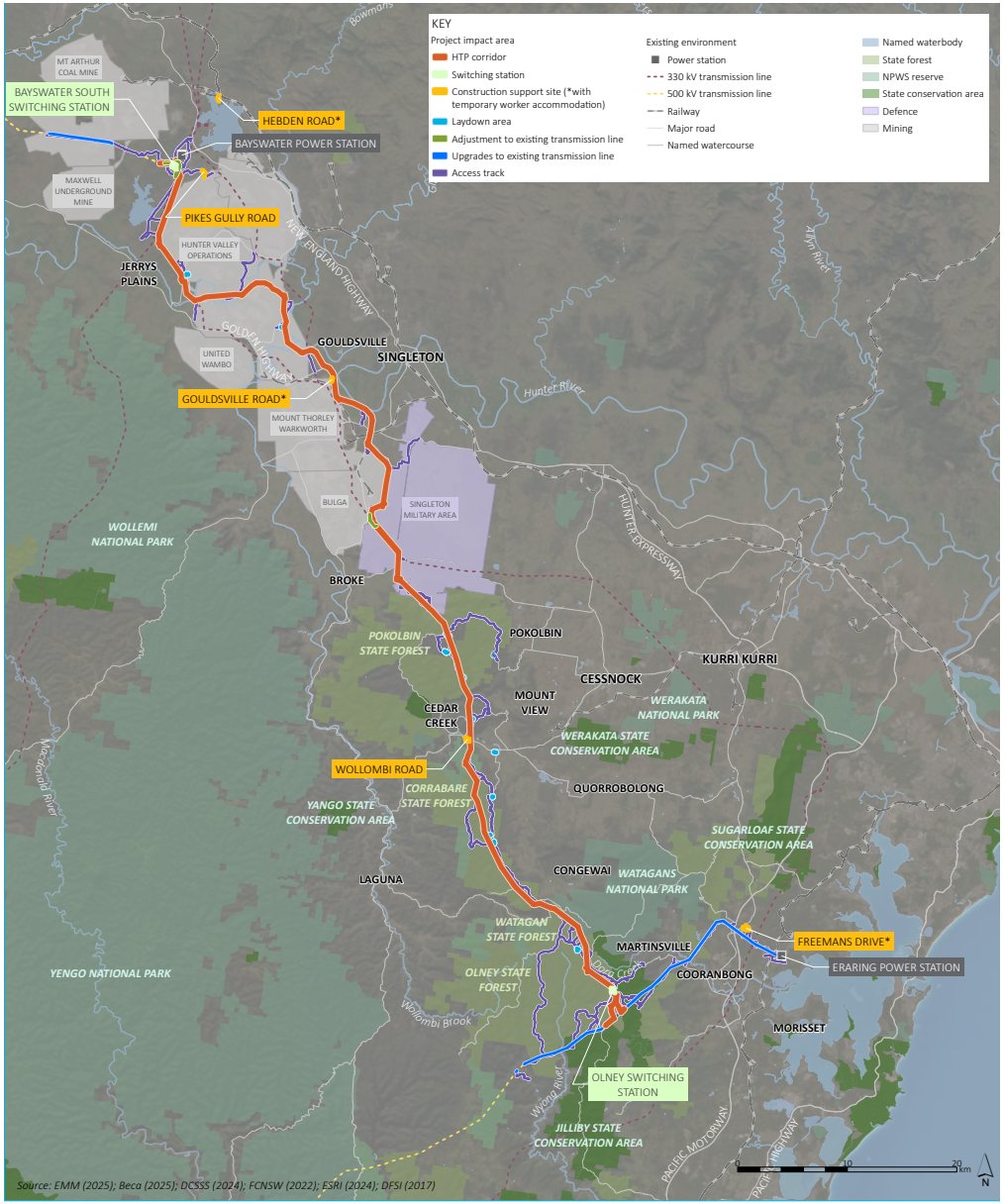


Figure ES.1 Project overview

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.

Construction

The construction of the Hunter Transmission Project is anticipated to start in 2027 and be operational by the end of 2029 (see Figure ES.2). Other construction details are outlined in Table ES.2.

Table ES.2 Construction details of the Hunter Transmission 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 metres 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 hectares of native vegetation cleared within a disturbance area of 1266 hectares
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 workers 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
Land requirements	• Total permanent areas (including transmission line easement and access road easements): 926 hectares • Total temporary areas (including construction leases within the HTP corridor and other temporary locations such as construction support sites and laydown areas): 1886 hectares • Total freehold acquisition areas (including whole of property and substation acquisition areas): 305 hectares
Utility adjustments	• Third party utility works including fibre optics, electricity, gas, telecommunication, water, sewer and stormwater

Construction	
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 ire system materials • Around 1580 megalitres of water (170 megalitres of potable water and 1410 megalitres of non-potable water). 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 project water supply hierarchy. The sources of water in the supply hierarchy demonstrate a potential water supply in excess of project water requirements.

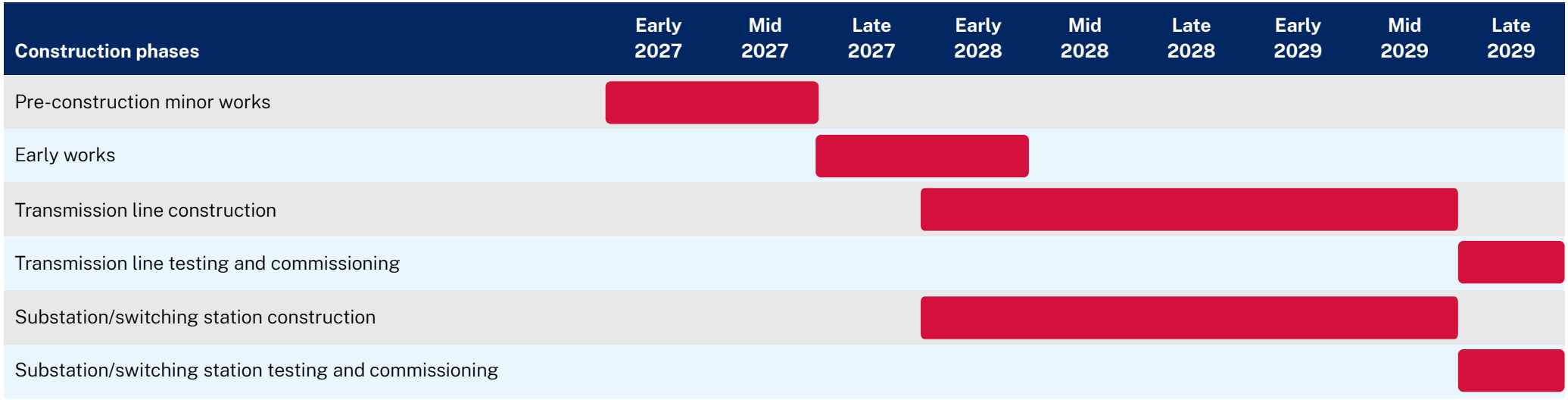


Figure ES.2 Construction program

Operation

The operation details of the Hunter Transmission Project are outlined in Table ES.3.

Table ES.3 Operation details of the Hunter Transmission Project

Operation	
Operation impact area	• Operation impact area around 1261 hectares • This is 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.
Operational transmission line easement	• Operational easement generally 70 metres 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 hectares • Total freehold acquisition areas (including whole of property and substation acquisition areas): 305 hectares
Vegetation management	• Vegetation within the easement would be maintained to achieve operational and safety requirements, including bushfire risk management (indicatively 13.5 metres 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 would be managed as needed on a cyclical basis over the life of the project

Operation	
Resource requirements	• Operational workforce of around 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 litres 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

Need for the project

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. Most of these power stations are reaching the end of their life and are scheduled to close 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 urgently needs new electricity supply, along with the infrastructure required to deliver it.

To manage this transition, the NSW Government has developed the NSW Electricity Infrastructure Roadmap, which sets out the pathway to a cleaner energy future and ensures reliable delivery of electricity to consumers. EnergyCo is responsible for coordinating its implementation.

As coal-fired power stations close, maintaining a reliable electricity supply to the load centres of the Hunter, Sydney and Illawarra will require new 500 kilovolt transmission connections between Bannaby sSubstation in Marulan, south of Sydney, and Bayswater Power Station in Liddell in the Upper Hunter Valley. These connections, together with existing 500 kilovolt transmission lines, are known as the 500 kilovolt Ring (see Figure ES.3).

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

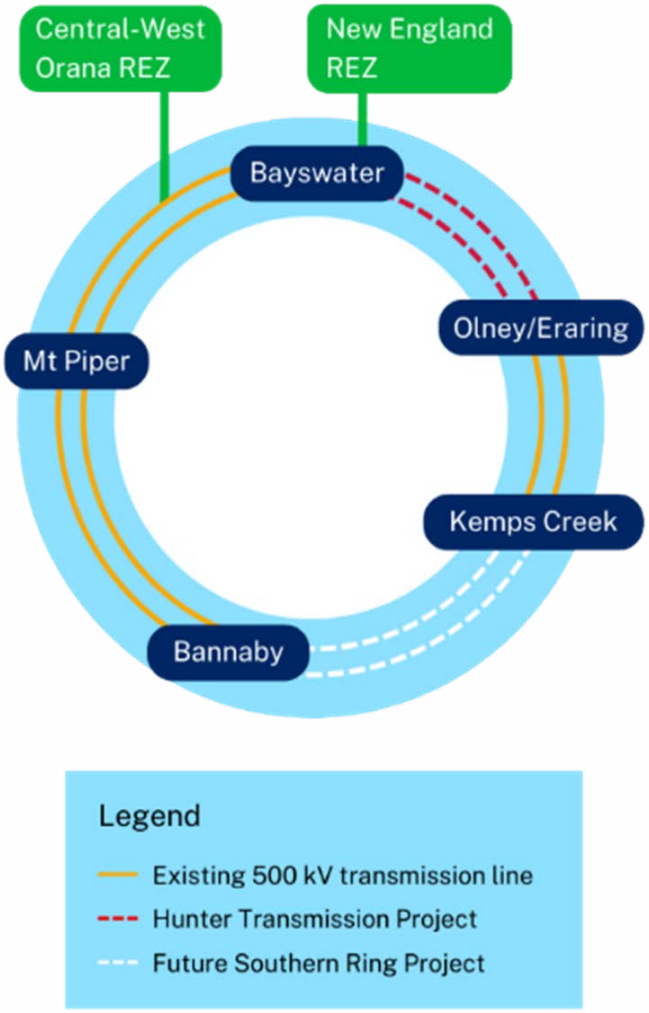


Figure ES.3 The 500 kV Ring

Approval pathway

The Hunter Transmission Project needs approval from both the NSW Government and Australian Government before it can proceed.

The *Environmental Planning and Assessment Act 1979* is the principal legislation regulating development in NSW. It establishes a regime for the making of development applications, assessment of their environmental impacts, and the determination of those applications. It also allows for the making of environmental planning instruments such as State Environmental Planning Policies and Local Environmental Plans.

Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* provides for declaration, assessment, and approval of State Significant Infrastructure and Critical State Significant Infrastructure. The environmental assessment and approval process for these projects is as follows:

- application to the Minister for Planning and Public Spaces to carry out development
- development of the Planning Secretary's Environmental Assessment Requirements
- preparation of an Environmental Impact Statement
- public exhibition of the Environmental Impact Statement
- response to submissions received during public exhibition
- preparation of Planning Secretary's Assessment Report
- determination by the Minister regarding the development.

The Hunter Transmission Project was declared Critical State Significant Infrastructure in July 2022 in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* and Schedule 5, section 30 of State Environmental Planning Policy (Planning Systems) 2021. The Minister for Planning and Public Spaces is the consent authority, and the project is to be assessed in accordance with the provisions of Division 5.2 of the *Environmental Planning and Assessment Act 1979*.

The Hunter Transmission Project would also impact on protected matters which require assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as it would affect federally protected threatened species and ecological communities, and Commonwealth land (the Department of Defence owned Singleton Military Area). The project will be assessed under the NSW Assessment Bilateral Agreement, which allows the project to be assessed by the NSW Government on behalf of the Australian Government.

The proponent

The Energy Corporation of NSW (EnergyCo) is a NSW Government statutory authority 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 renewable energy zones and associated infrastructure across NSW to facilitate coordinated investment in transmission and generation.

In 2022, the NSW Minister for Energy declared the Hunter Transmission Project to be a Priority Transmission Infrastructure Project under the NSW *Electricity Infrastructure Investment Act 2020* 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, selecting a network operator, consulting with the local community and key stakeholders, and securing the necessary environmental approvals.

The network operator

In January 2025, Transgrid was selected as the preferred network operator for the Hunter Transmission Project.

Subject to ministerial authorisation or direction, Transgrid would be the 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.

Engagement

Engagement to date

The Hunter Transmission Project is designed to strengthen NSW energy infrastructure while carefully considering environmental, social, and cultural responsibilities. To support the project, EnergyCo's approach has been to engage early and consistently, aiming to keep local communities, government agencies, landowners, Aboriginal groups, and other interested parties informed. This approach has involved broad community participation and provided valuable feedback that has helped to refine and shape the Hunter Transmission Project.

Meaningful engagement with stakeholders has been underway since mid-2022 during the early stages of the project's development (Phase 1). Subsequent phases of the engagement program which are aimed at ensuring meaningful engagement throughout the planning, assessment and construction stages of the Hunter Transmission Project (see Figure ES.4).

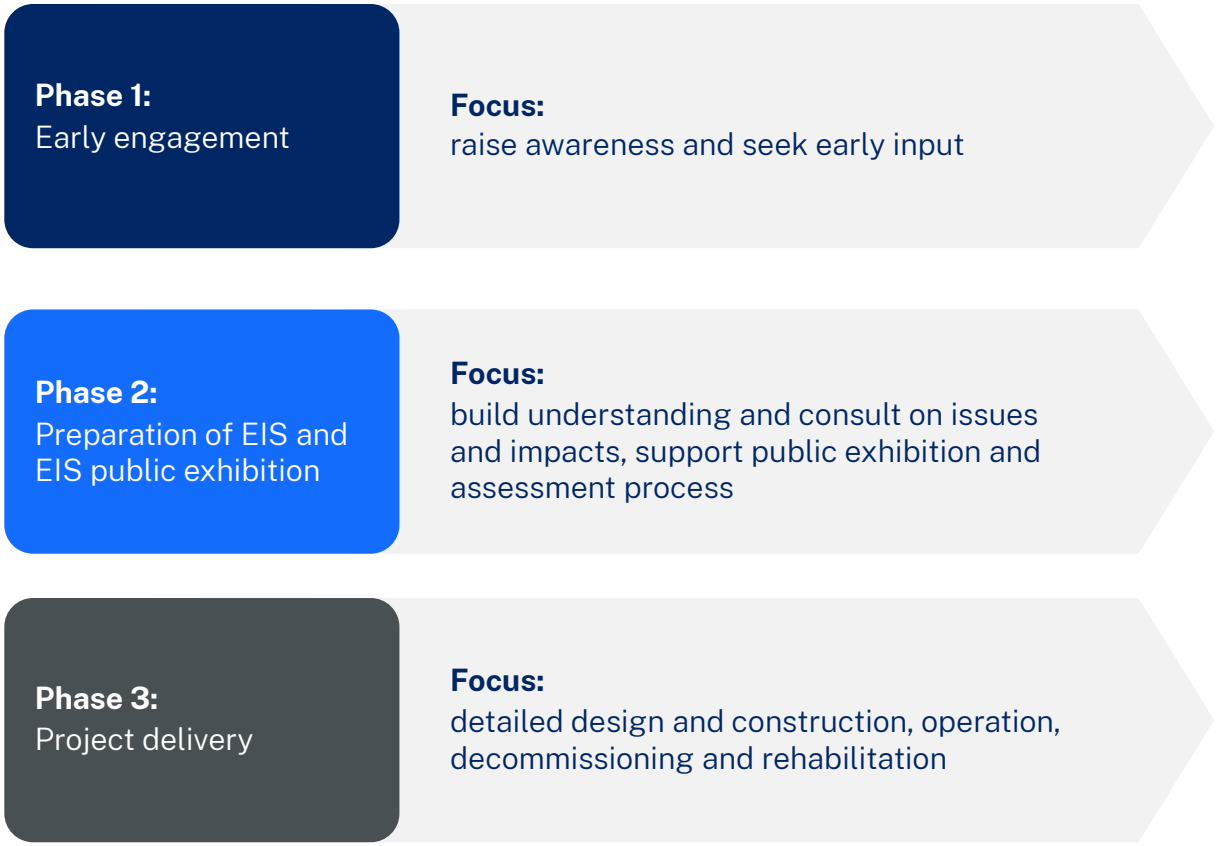


Figure ES.4 Phases of engagement

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).

EnergyCo has worked closely with local communities' members, affected landowners, Australian, State and local government agencies, and Aboriginal groups to ensure that concerns about the environment, cultural heritage, and quality of life were heard and addressed. This ongoing dialogue has helped shape the Hunter Transmission Project design and develop appropriate mitigation strategies so that the project not only meets energy needs but also helps protect the environment.

EnergyCo had more than 2,300 interactions with community members and other stakeholder groups including government agencies between mid-2022 and April-2025 (see Image ES.2). Feedback that has been received has been categorised into key themes. These include:

- project justification and alternatives
- design and route selection
- strategic context
- community engagement process
- construction impacts
- environmental impacts
- visual and landscape
- cultural heritage
- social and economic
- land use and property.

Feedback gathered through engagement has been incorporated in the Environmental Impact Statement.

Future engagement

Stakeholder engagement will continue during public exhibition of the Environmental Impact Statement. The Environmental Impact Statement will be publicly available online and community members, government agencies and other stakeholders will be able to make a formal submission via the Department of Planning, Housing and Infrastructure Major Projects Planning Portal.

All feedback will be reviewed and addressed in a Submissions Report.

If further engagement is required to respond to issues raised (e.g. to clarify issues of concern or to seek feedback on proposed refinements to the project), the details of that engagement will be outlined in the Submissions Report.

During and after public exhibition of the Environmental Impact Statement, regular updates (via the tools and techniques listed above) will be provided to stakeholders regarding the status of the Hunter Transmission Project.

If the project is approved, engagement with key stakeholders would continue through detailed design, construction, operation, and decommissioning and rehabilitation of the Hunter Transmission Project.

Community engagement session, Millfield

Environmental assessment

The Hunter Transmission Project design has prioritised the use of previously disturbed land, with the selection of a corridor within the State forests being a key strategy to avoid and minimise impacts on private properties and residential communities.

The Hunter Transmission Project corridor also avoids sensitive land uses including vineyards, tourist areas, and the Watagans and Werakata national parks.

There would be some temporary and permanent impacts during construction. The environmental assessment addresses the potential impacts associated with the construction, operation, decommissioning and rehabilitation of the project, as well as the mitigation measures to avoid and minimise potential impacts.

Key terms used to describe the Hunter Transmission Project and environmental assessments are defined in Table ES.4.

Aboriginal cultural heritage field survey encompassed over 1000 kilometres of field survey and more than 6000 discrete points of observation and recordings have been documented

Table ES.4 Key terms and definitions for the Hunter Transmission Project

Term	Description
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, workforce accommodation camps, construction compounds, laydown and utility adjustments.
Hunter Transmission Project, or 'the project'	The Hunter Transmission Project, or 'project' as described in Chapter 3 of the Environmental Impact Statement and identified in the overview figure of the Environmental Impact Statement.
Hunter Transmission Project 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 and the Olney switching station to the existing 500 kV transmission line between Eraring and Kemps Creek The Hunter Transmission Project corridor is around 140 metres wide. Both the construction impact area and operation impact area are within the Hunter Transmission Project corridor.
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 easement.
Project impact area	The area that has been assumed for the purpose of the Environmental Impact Statement 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.
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.

Biodiversity

Avoidance and minimisation of impacts

During the selection of the Hunter Transmission Project corridor, EnergyCo prioritised avoidance of high conservation value areas, including Watagans and Werakata National Parks, Warrawolong Flora Reserve, existing biodiversity offset sites, and intact remnants of the Central Hunter Valley Eucalypt Forest and Warkworth Sands Woodland threatened ecological communities. These communities support threatened species and critical habitat for the Regent Honeyeater and Swift Parrot.

Following corridor selection, the transmission line design underwent iterative refinement based on ecological field surveys and site constraints, resulting in substantial further avoidance and minimisation of biodiversity impacts. Cumulatively, these refinements are expected to reduce clearing of native vegetation by over 200 hectares, including avoidance of more than 100 hectares of threatened ecological communities and important habitat for a range of serious and irreversible impact entities which are most vulnerable to impacts from potential developments. Serious and irreversible impacts are impacts which are likely to contribute significantly to extinction risk of those species/communities.

Construction impacts

Construction of the project would directly impact about 762 hectares of native vegetation, comprising about 546 hectares of full clearing and 216 hectares of partial clearing. The 762 hectares of impacts to native vegetation are associated with 34 plant community types, of which approximately 40% are in a disturbed condition.

While significant efforts have been made to avoid and minimise impacts on biodiversity, the project requires vegetation clearing in some areas of high biodiversity value, including areas of threatened ecological communities and threatened species habitat listed under NSW *Biodiversity Conservation Act 2016* and the Australian *Environment Conservation and Biodiversity Conservation Act 1999*.

Around 207 hectares of native vegetation associated with 7 endangered ecological communities listed as endangered under the NSW *Biodiversity Conservation Act 2016* would be cleared. Three threatened ecological communities (158 hectares) are critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Two of the directly impacted threatened ecological communities are also identified as potential serious and irreversible impact entities, including 4.22 hectares of poor condition Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions and 12.37 hectares of Warkworth Sands Woodland in the Sydney Basin Bioregion.

Of the directly impacted threatened ecological communities, the largest portion of impact is to the Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions threatened ecological community, with around 141.38 hectares of thinned, poor or planted native vegetation to be cleared.

A summary of the potential direct impacts on *Biodiversity Conservation Act 2016* and *Environment Conservation and Biodiversity Conservation Act 1999* listed threatened ecological communities is provided in Table ES.5.

Table ES.5 Summary of the potential direct impacts on listed threatened ecological communities from construction of the project

Threatened Ecological Community[1]	Conservation status[2]		SAII entity	Disturbance area (hectares)	
	BC Act status	EPBC Act status		BC Act status	EPBC Act status
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions[1]	E	CE	No	141.38	144.40
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	E	-	No	8.86	-
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	E	-	Yes	4.22	-
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	E	-	No	1.37	-
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	E	-	No	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	1.37	1.36
Warkworth Sands Woodland in the Sydney Basin Bioregion	E	CE	Yes	12.37	12.37
Total impact				207.43	158.13

(1) Threatened ecological community names reflect their listing under the NSW Biodiversity Conservation Act 2016
(2) 'CE' denotes critically endangered under the Environment Conservation and Biodiversity Conservation Act 1999 and 'E' denotes endangered under the Biodiversity Conservation Act 2016

Ridgetop overlooking the forest plateau

Construction of the project would also have potential direct impacts on:

- 38 threatened flora species, comprising:
  - 22 species listed under the both the NSW *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999*
  - 14 species listed under the NSW *Biodiversity Conservation Act 2016* only
  - 2 species listed under the *Environment Protection and Biodiversity Conservation Act 1999* only
  - Of these 38 threatened flora species, 8 are potential serious and irreversible impact entities
- 28 threatened fauna species, comprising:
  - 15 species listed under the both the NSW *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999*
  - 13 species listed under the *Biodiversity Conservation Act 2016* only
  - Of these 28 threatened fauna species, 6 are potential serious and irreversible impact entities

Not all threatened flora and fauna species have been recorded during field surveys. Twenty-nine threatened flora species and 2 threatened fauna species have been assumed present due to the presence of suitable habitat within the disturbance area and survey limitations. Around 16% of the disturbance area could not be surveyed in the seasonal survey window required for some of these species.

Construction of the project also has the potential to result in indirect impacts to native vegetation and threatened species habitat beyond the area of direct impact as well as prescribed impacts associated with regional habitat connectivity where the transmission line intersects native vegetation, including:

- 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 electric and magnetic field impacts from new infrastructure.

Operational impacts

During operation, potential direct impacts on native vegetation and threatened species habitat would be limited to selective vegetation management to ensure vegetation clearance requirements and asset protection zones are maintained. Some indirect impacts may also occur, however, given the limited scale of work associated with the operation of the project compared to construction, the extent of these impacts is considered to not be significant.

Management of impacts and biodiversity offsets

A range of mitigation and management measures have been proposed to improve biodiversity outcomes for the project including but not limited to:

- continued refinement of the project design where possible to further avoid impacts to areas of high biodiversity value, through micro siting of the transmission line infrastructure and associated work sites to avoid significant biodiversity and minimise impacts on serious and irreversible impact entities
- pre-clearing surveys to identify and relocate fauna prior to clearing
- retention and relocation of habitat features including hollow-bearing trees
- rehabilitation of vegetated riparian zones to minimise impacts to aquatic environments
- installation of bird diverters on transmission lines within 1 kilometre of wetland/riverine habitats to reduce impacts on aerial fauna species from collision with transmission lines and infrastructure
- establishment of biodiversity exclusion zones where no clearing is permitted.

Biodiversity offsets are required for impacts to native vegetation, threatened ecological communities, threatened species, and serious and irreversible impact entities. The estimated offset obligation for the project has been calculated based on the following biodiversity credits:

- 17,109 ecosystem credits associated with direct impacts
- 209,996 species credits associated with direct impacts
- 7670 additional species credits associated with indirect and prescribed impacts.

EnergyCo intends to enter into a Strategic Offset Delivery Agreement in accordance with Clause 6.2 and Schedule 1 of the Biodiversity Conservation Regulation 2017.

Aboriginal Heritage

Aboriginal participation

The Hunter Transmission Project is located on the lands of the Wonnarua, Awabakal and Darkinjung people (north to south) and neighbouring the Gomeroi, Darug and Worimi people. An Aboriginal cultural heritage assessment was prepared for the Hunter Transmission Project and involved meaningful engagement with Traditional Owners, field investigations and test excavations to understand the Aboriginal heritage values within and surrounding the project impact area. Consultation with 48 Registered Aboriginal Parties has been ongoing from November 2023 to July 2025, providing valuable input to the development and refinement of the project.

Consultation activities have included face-to-face meetings during key stages in project design development, Registered Aboriginal Parties participation in field surveys and test excavations, and interviews with an anthropologist to discuss cultural values within and surrounding the project impact area.

Field survey

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 (see Image ES.3). Due to a process of ongoing refinement of the project design, these investigations extended beyond the project impact area into the surrounding

Aboriginal cultural heritage assessment study area in several locations, with over 1,000 kilometres of field survey ultimately undertaken.

A targeted program of test excavations was carried out over 4 weeks between October and November 2024 to support the findings of the field survey in areas determined to potentially contain sub-surface artefactual material. Test excavations were largely focused on potential Warkworth sand system deposits as well as localised landforms identified during the field survey, usually in proximity to major watercourses.

Previous investigations across the region and the multiple engagement and survey activities for the project have identified a large number of Aboriginal 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. A predictive model was developed as part of the Aboriginal cultural heritage assessment to predict the potential presence and location of Aboriginal sites within the project impact area.

The field survey and test excavation program identified 32 Aboriginal sites or places within the project impact area and noted a wider background of dispersed cultural materials.

In the north cultural items found included artefact scatters (collections of stone tools and related objects) along watercourses and a cultural place.

Aboriginal cultural heritage surveys

The central and southern areas of the project impact area recorded sub-surface stone artefact deposits, rock shelters, grinding grooves (areas used for grinding food or processing materials), a stone arrangement, cultural places and a culturally modified tree.

The types of sites identified during the field survey aligned with the archaeological context of the project impact area and with the predictive model.

In addition to discrete cultural sites and places, a number of broader landscape values were identified within the project impact area, including the Warkworth sand system, cultural viewlines and viewscapes (most notable between Mount Yengo and Mount Sugarloaf and in the vicinity of Flat Rock) and cultural landscapes near Dora Pinnacles, Dora Creek, Flat Rock and Trig Road.

Avoidance and minimisation of harm

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.

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. Refinement of the design has also included:

- relocating transmission towers off prominent ridgelines and hilltops, reducing the visual prominence of the project from some culturally significant sites including along Congewai Creek, between Mount Sugarloaf and Mount Yengo and Lizard Rock
- adjustments to the alignment to
  - increase distances from key rockshelters off Broken Back Trail in Pokolbin State Forest
  - avoid a number of identified rockshelters and stone arrangements in Corrabare State Forest
  - avoid indirect impacts to significant archaeological rockshelters in the Watagan State Forest
  - reduce visual impacts from the Flat Rock Lookout and Abbotts Fall cultural landscape.

Construction impacts

Of the 32 Aboriginal sites or places identified within the project impact area, 5 areas of high Aboriginal cultural significance would be avoided. The remaining 27 sites have the potential to be directly impacted by construction of the project. However of these 27 sites, 12 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.

The project would also impact about 88 hectares of the Warkworth sand system and 2351 hectares of low-density background scatter found intermittently and disparately across the project impact area. However, 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 in these locales.

Potential indirect impacts to Aboriginal cultural heritage could include vibration impacts to cultural heritage items within 55 metres of the project impact area, obstruction of important viewlines and viewscapes as a result of the establishment of transmission towers and impacts to the broader cultural landscape as a result of vegetation clearance and construction of project infrastructure.

Operation impacts

Impacts to Aboriginal cultural heritage during operation may occur from maintenance activities ongoing visual impacts to cultural viewlines and viewscapes, vegetation maintenance and improved access by the general public and other users to Aboriginal sites and places through maintenance of a transmission easement. Mitigation measures to manage any operational impacts to Aboriginal cultural heritage, including potential impacts to viewlines and viewscapes, and to cultural landscapes, have been proposed.

Mitigation and management

A series of management measures are proposed to protect Aboriginal cultural heritage values. Prior to construction, an Aboriginal Cultural Heritage Management Plan will be developed by a heritage specialist in consultation with the Registered Aboriginal Parties, to manage and avoid impacts to Aboriginal heritage.

Landscape and visual

Due to the nature and scale of the project there are several landscape character zones across the study area which have similar characteristics in terms of geology, topography, vegetation cover, watercourses, built form and land use pattern. The landscapes located across the project impact area vary in terms of their scenic quality, contribution to sense of place and their heritage values. The project impact area also includes several sensitive locations such as rural dwellings and villages, viticultural and tourism areas and scenic routes that may be impacted by temporary or permanent changes to the visual amenity and landscape character as a result of the project. The study area for the assessment of landscape character impacts was divided into 12 landscape character zones, each with their own local characteristics. An additional 2 locations beyond the landscape character study area where temporary construction support sites would be located (Hebden Road and Freemans Drive) were also considered.

A visibility analysis was undertaken to identify the areas from which the project is potentially visible. This analysis, combined with a site inspection, informed the selection of 12 representative publicly accessible viewpoints. The viewpoints include representative significant views, mostly from a State highway and other public roads, a village and a lookout.

Opportunities to minimise the potential landscape and visual impacts of the Hunter Transmission Project have been considered in the design and alignment of permanent infrastructure such as transmission lines and towers through extensive consultation with landowners.

A landscape character and visual impact assessment was prepared to support the Hunter Transmission Project to identify and assess the potential impacts of the project to landscape character (the overall impact of the project on the area's character and sense of place), and to public and private views in sensitive locations.

Construction impacts

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, and the establishment and use of construction support sites.

During construction, daytime impacts to landscape character would be negligible to low in most landscape character zones as construction works would result in a negligible to low magnitude of change. In three landscape character zones (Wollombi Brook Valley (Image ES.5), Forested

LCZ 7 Wollombi Brook Valley

Hills and Narrow rural valley) moderate impacts are anticipated due to the contrast between the construction activity and the more remote rural landscapes which currently do not contain large scale electricity infrastructure. At night-time, construction is expected to result in negligible to low impacts with the exception of two landscape character zones (Forested Hills and Managed Forestry) which would experience a moderate impact due to the high sensitivity to change. One location beyond the study area on Freemans Drive, would also experience a moderate impact due to the introduction of low-level lighting at the temporary worker accommodation. During construction, views to the construction works would be more prominent and would contrast more noticeably with the existing setting in most rural and forested settings, because of the broader construction footprint, ground disturbance, the use of large-scale equipment and supporting infrastructure. These impacts would, however, be intermittent along the transmission line corridor, and temporary in all locations.

The level of impact to private views during construction would vary according to the visibility of proposed construction support sites and construction activities. 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. Generally, views of construction activities would be more prominent and would contrast more noticeably within existing rural and forested settings. These impacts would, however, be intermittent along the Hunter Transmission Project corridor, and temporary in all locations.

Operation impacts

During operation, daytime impacts to landscape character would be negligible to low in most landscape character zones however in three zones (Wollombi Brook rural valley, Forested Hills and Narrow rural valleys), moderate impacts are anticipated due to the introduction of large transmission line towers in rural valleys where there is currently no energy infrastructure. During night-time, operation is expected to result in negligible to low impacts with the exception of one landscape character zone (Managed Forestry) with a moderate impact due to the introduction of low-level lighting at the Olney switching station in an otherwise dark environment. No other permanent lighting is proposed along the transmission lines. While the magnitude of change at the Managed Forestry landscape character zone is low, the landscape character sensitivity is high which would result in a moderate landscape character impact.

All public viewpoints were assessed as experiencing very low to low visual impact associated with the project with the exception of views from Cessnock Road, which would have a moderate visual impact.

Private viewpoints associated with rural dwellings would experience a visual impact associated with permanent infrastructure including transmission lines and towers being introduced to the landscape.

Of the 68 private viewpoints identified for assessment:

- 62 private viewpoints would experience low or no visual impact
- 6 private viewpoints would experience moderate visual impact.

Mitigation and management

To manage these impacts, a Landscape Character and Visual Impact Management Plan will be developed. This plan will include measures such as retaining as much vegetation as possible to screen the Hunter Transmission Project infrastructure, designing construction lighting so it doesn't create excessive glare, offering screening options for private properties if their views are noticeably affected and carefully positioning permanent structures so they blend in with the local landscape. EnergyCo will continue considering transmission line structure location, and vegetation screening within the design to further minimise visual impacts.

In accordance with the Transmission Guideline, Technical Supplement for Landscape Character and Visual Assessment (DPHI 2024), private receivers with a moderate viewpoint should be offered mitigation (e.g. screening) to reduce the visual impact. Photomontages incorporating screening vegetation to reduce visibility of the project were created and used to determine the residual impact on these viewpoints. The revised assessment found there would be two remaining moderate visual impacts.

Proposed construction route – Golden Highway/Putty Road Mt Thorley (Top). Proposed construction route – Cessnock Road, near Singleton Military Area (Bottom).

Traffic and transport

The existing road network surrounding the Hunter Transmission Project consists of a combination of National, State, regional, local and forest roads.

Construction impacts

During construction, the Hunter Transmission Project would generate additional vehicle movements, including both light and heavy vehicles (as well as some oversize overmass vehicle movements). The road capacity assessment undertaken to assess potential impacts of the project's construction traffic, utilised predicted peak year (2028) traffic volumes with and without the project's construction vehicle volumes. The results indicate that almost all nominated construction routes would operate at a good level even during peak times, with the exception of New England Highway (west of Lemington Road) and Freemans Drive (south of Martinsville Road) which would operate at a satisfactory level or near operating capacity, respectively

Based on the traffic analysis for construction undertaken by EnergyCo, some roads would require widening and some intersections would require upgrades to include turning lanes or additional safety features. Temporary full or partial road closures would also be required to allow for stringing of the new transmission line across identified roads.

Stringing activities would also occur over roads in State forests, power station land and mining land which would temporarily impact private mine access and haulage roads. Stringing would also occur over rail lines, including the Whittingham to Mount Thorley rail line at 2 locations near the corner of Putty Road and Broke Road in Mount Thorley and the Sydney to Newcastle rail line near the Eraring Power Station. Stringing over rail corridors would occur during rail maintenance periods or during rail possessions.

Further consultation with road and rail authorities and impacted mine operators will be undertaken to confirm specific arrangements to manage disruptions to these roads and rail lines during detailed design.

Operation impacts

During operation of the Hunter Transmission Project, the ongoing traffic generated by maintenance and routine access would be very low. Long-term impact on roads and transport would be negligible compared to the temporary increases during construction. All road upgrade works would remain permanently and be managed by the relevant road authority.

Mitigation and management

A Traffic Management Plan will be developed for the Hunter Transmission Project. The plan will outline mitigation measures to manage traffic and transport impacts, including:

- measures to maintain access to local roads and properties
- site specific traffic control measures (including signage) to manage and regulate traffic movement
- 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
- measures to maintain pedestrian and cyclist access
- requirements and methods to consult and inform the local community of impacts on the local road network
- requirements to obtain relevant approvals for any potential works in the road corridor and access by restricted access vehicles or over-sized vehicles required
- coordination with TfNSW and councils for road and intersection works and road crossings
- coordination with ARTC for rail line crossings
- access to construction sites including entry and exit locations and measures to prevent construction vehicles queueing on public roads
- response plan for any construction traffic incident or complaints management process.

The project runs through government land used for forestry purposes (Pokolbin, Corrabare, Watagan and Olney State forests).

Land use and property

Land use and property impacts as a result of the Hunter Transmission Project were assessed in relation to how the project will affect land use, management and ownership.

Land zoning and use

In the northern portion of the project impact area, most areas are zoned for primary production (used for farming and grazing) with some space allocated for infrastructure near power stations. The Singleton Military Area is also located in the northern portion of the project impact area, encompassing the Department of Defence training infrastructure and housing. In the central portion of the project impact area, the land is mainly used for forestry and rural residential purposes, while in the southern portion of the project impact area, there is a mix of forest, conservation (including National parks) and rural areas.

Land ownership and acquisition

Land in the project impact area is owned by a mix of parties. Some is freehold property owned by private individuals or companies (often connected with mining and energy operations), some is government-owned (including State forests and Crown land), and some forms part of the Singleton Military Area which is Commonwealth land owned by the Department of Defence.

The Hunter Transmission Project would require some permanent landownership changes and temporary lease arrangements to enable construction activities. The acquisition of permanent transmission easements on private owned land would be required. All acquisitions would be negotiated with landowners and would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991.*

While construction would bring about temporary changes in land use and property conditions, in most cases previous land use would resume including in agricultural grazing lands. Continuous consultation with landowners and stakeholders, along with detailed property management plans, will help ensure that any adverse effects on agricultural, forestry, mining, and other land uses are minimised and managed effectively.

Agriculture

Agricultural land use covers around 874 hectares or 37% of the project impact area. Of this, 817 hectares is considered dryland agriculture, while 57 hectares is considered irrigated land.

Around 98% of agricultural lands that intersect the project impact area are located in the Singleton local government area with the remaining 2% of agricultural lands located across the Muswellbrook, Cessnock, Central Coast, and Lake Macquarie local government areas. Livestock grazing is the predominant agricultural activity accounting for 93% of agricultural land intersecting the project impact area.

The Muswellbrook, Singleton and Cessnock local government areas are also known for supporting internationally renowned viticultural and horse breeding industries and their closely associated support industries. For the Central Coast and Lake Macquarie local government areas, cropping including nurseries, nuts and vegetable farming are more common.

Construction impacts

The NSW Government has mapped biophysical strategic agricultural land which has been identified as land with a rare combination of natural resources which are highly suitable for agriculture. There is around 213 hectares of mapped biophysical strategic agricultural land within the project impact area along the Hunter River in the northern extent of the project impact area. Biophysical strategic agricultural land accounts for around 9% of the project impact area. Temporary impacts on biophysical strategic agricultural land would occur within the project impact area to facilitate construction and would be rehabilitated following construction in areas where permanent project infrastructure is not located.

The project would require the use of land currently used for agricultural purposes both temporarily for construction, and permanently for operation in areas where permanent infrastructure is proposed. During construction around 874 hectares of agricultural land is would to be temporarily disrupted, representing around 0.4% of the total land used for agriculture in the 5 local government areas within which the project is located. Construction of the project would result in $404,738 per year of economic impacts due to the temporary loss of agricultural land. This represents approximately 0.1% of the gross value of agriculture across the 5 local government areas within which the project is located.

Property management plans will be prepared to minimise impacts to landowners during construction

Agricultural activity could continue during most periods of the overall construction program. Dryland grazing including the movement agricultural workers, their livestock and equipment would still be able to occur within or through the construction impact area subject to the timing and location of planned construction activities. Some movements 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.

Minor restrictions are anticipated for cropping operations in irrigated areas where operations would be adjusted to avoid the construction of transmission towers in the project impact area. At the property level, restrictions during construction may include:

- the movement of livestock
- areas available for cropping
- use of irrigation and other large scale farm equipment
- placement and type of livestock fencing
- aerial applications and activity
- seeding/spraying activities.

Operation impacts

Operation of the project would involve the permanent removal of around 13 hectares of irrigated lands and 176 hectares of drylands. Operation of the project and the permanent removal of agricultural land would result in losses of economic activity of around $88,937 per year. However, this represents approximately 0.03% of the gross value of agriculture in the 5 local government areas within which the project is located.

Permanent infrastructure including transmission towers on irrigated agricultural land has the potential to disrupt normal on-ground operations with affected farms becoming isolated or inefficiently operated, and potentially requiring crop establishment, spraying travel patterns, farm vehicle movements and aerial operations to be adjusted. Operation of the project would also impact less than 2 hectares of travelling stock reserves (land used for the movement of livestock) which would include small, isolated parcels of land near Warkworth and Gouldsville. However, given the isolated nature of these parcels of land, it is likely that they are no longer being used for livestock movements.

Negligible impacts (if any) to agricultural land and soil capability across the remaining parts of the operation impact area are expected. Some minor and localised disturbances may be experienced irregularly during maintenance activities. Impacts to agriculture because of the construction and operation of the project were determined to be minor in the context of agriculture within the project impact area and wider local government areas.

Mitigation and management

EnergyCo will work with affected landowners to develop property management plans that sequence construction activities to avoid or minimise impacts to agricultural operations to the greatest extent possible (see Image ES.6). Once construction is complete, agricultural land use can resume.

Industry briefing session with ICN Gateway

Social

Engagement activities and feedback

Targeted engagement to support the assessment of potential social impacts was carried out between December 2024 and March 2025. This process sought to gather in-depth insights from key stakeholders likely to experience the project's impacts and benefits, with a focus on identifying key socio-economic issues.

Engagement activities informing the Social Impact Assessment included semi-structured interviews, meetings, emails and an online survey. In total, 92 in-person, online and phone interviews were conducted specifically for the Social Impact Assessment, 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.

Key insights from stakeholder engagement activities highlights the importance of balancing the project's benefits, such as regional economic growth and energy decarbonisation, with proactive management of potential negative impacts, with a focus on improving the quality of community engagement, addressing mental health concerns, cultural heritage preservation, protecting rural livelihoods, identity and environmental values.

The local government areas of the Central Coast, Lake Macquarie, Muswellbrook, Singleton and Cessnock comprise diverse communities with shared values of connection to place, heritage and the natural environment. These values are rooted in the region's history, economic drivers, natural environment, and cultural heritage.

Construction impacts and management

Some benefits would be realised during construction, including the economic benefits to the local and regional communities and businesses, however most social benefits would be realised once the project is in operation, including increased energy security and energy system decarbonisation. Key social benefits associated with the project include:

- financial benefits through benefit sharing initiatives
- opportunities to enhance regional employment and workforce participation through the generation of employment and training opportunities for local and regional residents
- increased demand for goods and services specialising in electricity generation and construction services sectors, and associated supply chain and regional business participation.

Construction of the project is considered likely to have some negative social impacts. With the implementation of mitigation, potential impacts to way of life from a loss of property and relocation have been assessed as high for 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.

With the implementation of mitigation measures, the following potential social impacts have been assessed as medium in significance:

- decision-making systems, associated with the perceived lack of ability to influence project and government decision-making processes
- impacts to way of life, associated within:
  - land use changes as a result of land acquisition for landowners within 1.5 kilometres of the project (the corridor extent of the social locality)
  - temporary changes to amenity during construction, including noise, vibration, dust and interruption of utilities for landowners within the corridor and local (within 10 kilometres of the project) extents of the social locality
- community impacts within the corridor and local extents of the social locality, associated with perceptions of safety and community cohesion from the presence of the construction workforce, and the perceived unequal distribution of project benefits
- for landowners within the corridor extent of the social locality, changed access to recreational infrastructure due to road network changes
- for landowners within the corridor extent of the social locality, impacts on rural livelihoods and biosecurity risks
- impacts to health and wellbeing within the corridor and local extents of the social locality associated with:
  - the stress associated with change, property devaluation and environmental values
  - Impacts on environmental values, being the changes to setting of the project impact area from construction of the project to the aesthetic appeal and wellbeing attributes of the Hunter region's natural environment
  - Changes to traffic movements, potentially creating new road safety risks
- potential impacts to Aboriginal cultural heritage, cultural landscapes and wellbeing.

HTP Drop in session, Singleton

Operation impacts

The operation of the project has been assessed as having a high to very high potential social benefit through the projects positive contribution to intergenerational equity by enabling NSW's transition to a more sustainable, reliable and affordable energy system

With the implementation of mitigation measures, the project has been assessed as having a medium social impact within the corridor social locality. 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.

Management of social impacts

Mitigation measures will address the potential social impacts of the project and maximise social benefits. Key measures to be implemented during construction of the project include the development and implementation of a social impact management plan, community communication strategy, landowner engagement strategy, local business and employment strategy, an industry and Aboriginal participation plan and temporary worker accommodation management plan(s).

Historic heritage

Twenty-seven historic heritage sites were identified through a desktop review and field survey, and include a mixture of homesteads, archaeological sites, farm buildings, religious buildings and cemeteries (see Image ES.4).

This includes 7 historic heritage sites of Commonwealth heritage significance, located within the Singleton Military Area, owned by the Department of Defence.

Construction impacts

Of the 27 historic heritage sites identified through the desktop review, 12 of these historic heritage sites are partially or wholly located within the project impact area that have the potential to be directly impacted by construction of the project, including:

- five sites of Commonwealth heritage significance within the Singleton Military Area
- one National Parks and Wildlife Services heritage item listed under the section 170 of the NSW *Heritage Act 1977*
- two local heritage items listed under the Muswellbrook Local Environmental Plan 2009
- one local heritage item listed under the Singleton Local Environmental Plan 2013

Historic heritage surveys – 'Stafford' homestead, Warkworth

- two local heritage items listed under Lake Macquarie Local Environmental Plan 2014
- one local heritage item listed under Central Coast Local Environmental Plan 2022.

Direct impacts include potential physical changes caused by construction work such as earthworks, access track upgrades, and infrastructure installation, which might disturb or even demolish parts of some heritage sites. Most heritage sites would only experience minor to moderate changes. However one historic site, the Wishing Well (Osf 26), would require demolition.

There are no heritage items listed on the Commonwealth Heritage List, National Heritage List and Register of National Estate within the project impact area.

Operation impacts

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, towers and easements.

There are an additional 15 historic heritage sites within the visual study area (around 1.5 kilometres from the project) with the potential to experience indirect visual impacts from the presence of permanent project infrastructure during operation. These elements have potential to change the landscape character of the historic heritage items.

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 moderate permanent visual impact is anticipated at 2 heritage sites (Oakley Estate (170126/170127) and 'Stafford' homestead and 'Clifford' homestead (ruins) (I42). Negligible/minor visual impacts are anticipated at the remaining heritage sites.

Mitigation and management

Mitigation measures have been developed to protect the heritage values of these sites. A Historic Heritage Management Plan will be developed to implement appropriate management measures to minimise potential impacts. These include installing physical barriers to protect the immediate area (curtilage) of heritage items, restoring ground conditions post-construction, photographic recording of key features before any work begins, and implementing an unexpected archaeological finds protocol.

Noise and vibration

The Hunter Transmission Project has the potential to generate noise and vibration impacts to sensitive receivers during construction and operation. A noise and vibration assessment was undertaken which identified sensitive noise receivers including residential buildings, commercial/industrial buildings or 'other sensitive' land uses (e.g. places of worship, active recreation areas, etc). Most noise sensitive receivers are residential receivers.

Construction impacts

Construction activities, such as operation of plant and equipment, construction traffic and workforce accommodation facilities have the potential to temporarily impact sensitive receivers. The assessment used on-site monitoring and models to assess noise and vibration impacts from construction activities. In some cases, short-term activities may exceed the typical background noise that residents experience. However, these "worst-case" scenarios would only occur temporarily during peak construction activities.

The construction noise assessment was based on noise catchment areas which reflect groups of sensitive receivers that have a similar noise environment. There were 14 noise catchment areas included in the assessment, they include:

Noise catchment area

01	Liddell and Bayswater
02	Jerrys Plains West and Howick
03	Jerrys Plains
04	Maison Dieu West
05	Mount Thorley
06	Broke
07	Pokolbin
08	HTP Central
09	Millfield and Wollombi Road
10	Cessnock
11	Olney
12	Cooranbong West
13	Eraring
14	Dora Creek

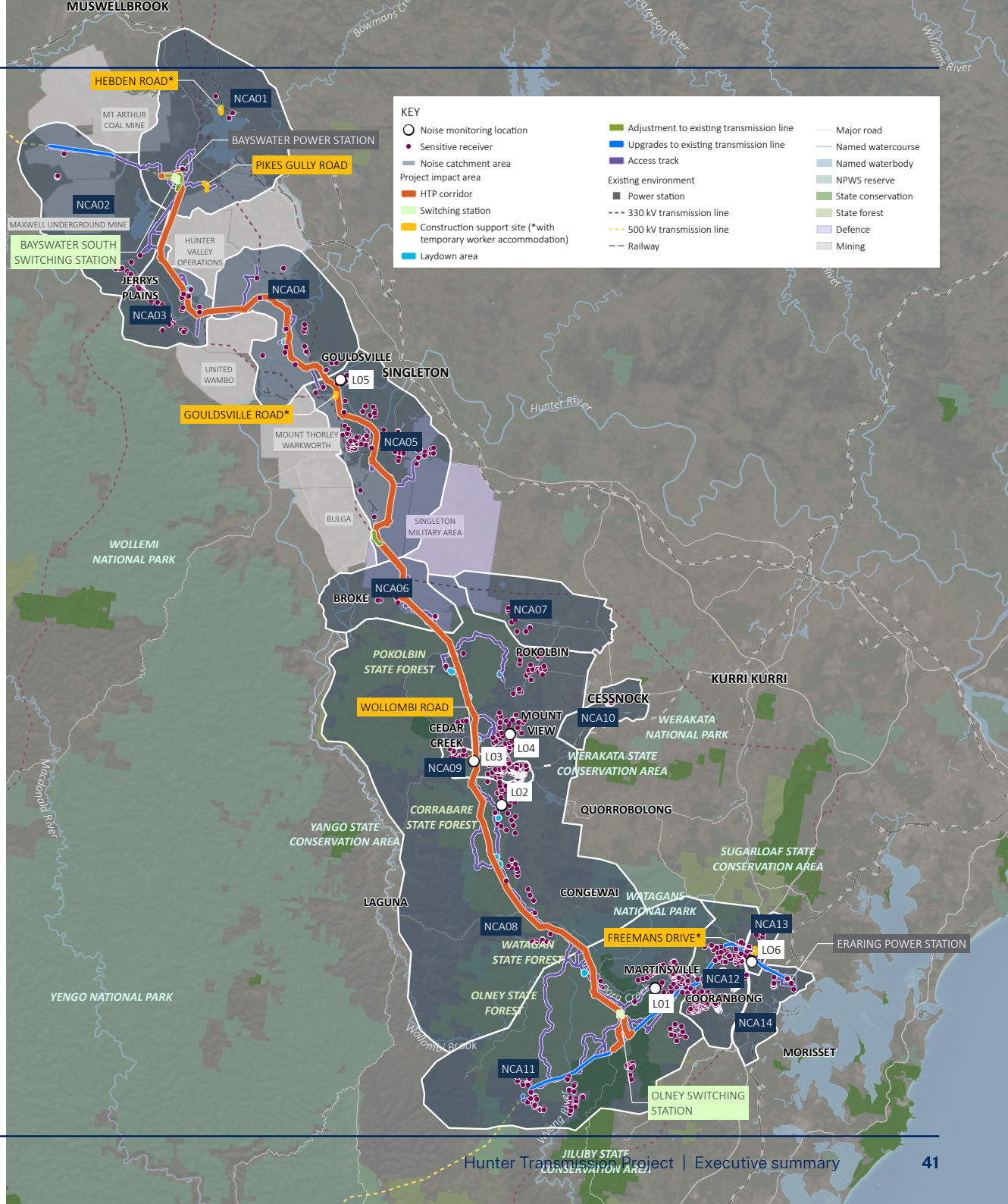


Figure ES.5 Noise study area and sensitive receivers

Exceedances are predicted at noise sensitive receivers within all noise catchment areas apart from areas 01 (Lidell and Bayswater), 07 (Pokolbin) and 10 (Cessnock).

A summary of noise catchment areas that would be impacted by construction activities for the Hunter Transmission Project is outlined in Table ES.6.

Table ES.6 Summary of noise impacts during construction

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.
Accommodation facilities	NCA 1, NCA 4, NCA 5, NCA 12, NCA 13, NCA 14	Out of hours operation	Nighttime operation of the accommodation facilities including vehicle movements and power generators.
Access tracks 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.
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.

Potential noise impacts to sensitive receivers range from negligible to clearly audible. Some receivers may experience highly intrusive noise during the highest impact work such as earthworks during site establishment and when transmission line construction is closest to each receiver. However, impacts will be temporary for the construction period and would involve consultation with affected landowners and sensitive receivers.

During construction, vibration impacts have been assessed for potential damage or discomfort to receivers. The vibration assessment identified that 58 nearby receivers may experience impacts to human comfort from loss of amenity due to perceptible vibration. Of these 58 nearby receivers, 10 receivers may also experience vibration levels sufficient to cause cosmetic damage (minor impacts readily repairable that does not affect a building's structural integrity) to building structures. Human comfort impacts would be short term and temporary. For receivers that are predicted to potentially experience cosmetic damage to buildings further consultation will be undertaken including pre construction dilapidation surveys to ensure suitable measures are implemented ahead of construction to protect building structures. Where construction works are planned outside of standard working hours, an out of hours work protocol will be in place to keep any disruptions to a minimum.

Operation impacts

During operations of the Hunter Transmission Project, noise from transmission lines and switching stations is expected to be low. During fair weather conditions (for example no rain), noise levels are predicted to be under 35 dBA at the edge of the Hunter Transmission Project corridor. All receivers are likely to not experience any noise and vibration impacts/disturbances during these types of fair weather conditions. Operational noise from switching stations is predicted to be well within acceptable levels and should not disturb local communities or sensitive receivers.

The noise generated by the high-voltage lines is mainly a soft hum which becomes more detectable under certain weather conditions (for example during light mist or rain). Conservatively, up to 10 receivers could experience operational noise exceedances/ disturbance for those closest to the Hunter Transmission Project corridor.

Potential operational transmission line noise impacts on affected receivers will continue to be considered as the Hunter Transmission Project progresses. Impacts to receivers will be confirmed with noise monitoring post construction. Individual receiver agreements are expected to be the most feasible and reasonable mitigation option where operational noise impacts remain.

Mitigation and management

A Construction Noise and Vibration Management Plan will be developed for the Hunter Transmission Project. The Construction Noise and Vibration Management Plan will set out management measures including:

- confirming proximity to residences and other sensitive land uses once detailed design is complete
- using quieter equipment and alternative construction methods to minimise noise levels
- turning off equipment when not in use
- operate machinery in a manner which reduces occurrence of maximum noise level events
- scheduling noisy activities to minimise number of plant operating at one time
- installing temporary barriers or screens to block sound
- where exceedances are detected examining feasible and reasonable noise mitigation and develop associated noise and vibration monitoring programs, as required
- keeping a safe distance between noisy activities and sensitive locations like homes or heritage sites
- continuously monitoring noise and vibration levels to ensure that they remain within required limits
- notify and consult with potentially affected receivers about upcoming noisy activities.

Surface water sampling was undertaken to determine baseline water quality in the project impact area

Surface water

The Hunter Transmission Project may affect surface water sources during both construction and operation. Impacts to surface water and soils have been considered and minimised through the project design and would be a key consideration throughout detailed design, project construction and operations.

An assessment of potential impacts to surface water during construction and operation included consideration of water quality, streamflow regime, watercourses and riparian corridors. The assessment included existing water quality data, historical conditions, and baseline information from various watercourses and riparian zones. Current conditions were compared against State water quality and river flow objectives, which set the necessary standards for aquatic ecosystems, recreation, and water uses.

The surface water study area is partially located within the major surface water catchments of the Hunter River, Lake Macquarie and Tuggerah Lakes. 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.

The existing geomorphic conditions of waterways that intersect the project impact area vary from good to poor condition with varying recovery potential. Several waterways 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.

Surface water quality within the surface water study area exhibits significant variability, influenced by the diverse land uses present. A review of water quality against the NSW Water Quality and River Flow Objectives that existing water quality across the study area is variable and does not consistently achieve the derived guideline values for water quality under existing conditions.

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. Generally, the sensitivity of the receiving environment in the north of the study area is low where ecosystems are highly disturbed by coal mining and energy generation industries.

The sensitivity of the receiving environment is highest in the elevated State forests where receiving watercourses and/or their catchments are largely undisturbed, watercourses are more susceptible to instabilities and watercourses contain threatened amphibian species.

Construction impacts

Risks to surface water environments are higher in 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 where the existing 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 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.

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. Clearing of vegetation within riparian corridors would be undertaken in accordance with modified clearing methods designed to reduce impacts to riparian corridors and maximise stability of the watercourses.

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.

Operation impacts

During operations of the Hunter Transmission Project, impacts to water quality may arise 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 waterways.

Mitigation and 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, and 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.

The Soil and Water Management Plan will be developed for the Hunter Transmission Project to manage surface water and groundwater. The plan will outline mitigation measures including:

- a water quality monitoring program will be implemented to establish baseline conditions and keep track of any changes during construction. If water quality indicators exceed acceptable thresholds, immediate corrective action will be taken
- erosion and sediment control plans will be developed in consultation with a Certified Professional in Erosion and Sediment Control. Erosion and sediment control plans 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 Olney switching station
- stormwater management practices will be used to control runoff from new impervious surfaces and to protect riparian corridors.

The implementation of mitigation measures would effectively manage key risks to water quality, streamflow regime and riparian zones during construction and operation of the project.

Groundwater

The groundwater impact assessment for the project was undertaken using the methodology outlined in the Groundwater Assessment Toolbox for Major Projects in NSW. A site conceptual model was developed, which characterises the existing hydrogeological and groundwater conditions in the groundwater study area and describes the key processes and mechanisms in the hydrological and hydrogeological environment. An assessment of potential risks to sensitive groundwater environments, culturally significant sites and groundwater users from construction and operation of the project was also undertaken.

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
- 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.

There are 232 groundwater bores listed within the groundwater study area described as active, in use 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 there are 24 located within the project impact area, including two exploration bores listed as abandoned.

There are no high priority culturally significant sites listed in the schedules of the Hunter Unregulated and Alluvial Water Sources Water Sharing Plan and North Coast Fractured and Porous Rock Groundwater Sources Water Sharing Plan.

One groundwater-related culturally significant site was identified within the project area; 'The Wishing Well' listed on the National Parks and Wildlife Services Historical Heritage Information Management System site.

Construction impacts

Potential impacts to groundwater quantity from construction of the project may occur where the depth of piling for transmission 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.

During construction, activities such as excavating for transmission tower foundations may temporarily intercept groundwater or require dewatering. Any groundwater drawdown from dewatering is expected to be limited to only a small, localised reduction in water levels. Groundwater levels from registered groundwater bores would recover quickly due to the high groundwater replenishment rate for affected bores and the very short duration of the incidental groundwater take.

There are 4 existing landholder bores within 16 metres of the closest transmission tower, all located within the alluvium which may experience temporary and localised groundwater drawdown from construction of the project. The construction of project infrastructure is not expected to obstruct or alter local and regional groundwater flow paths. 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,

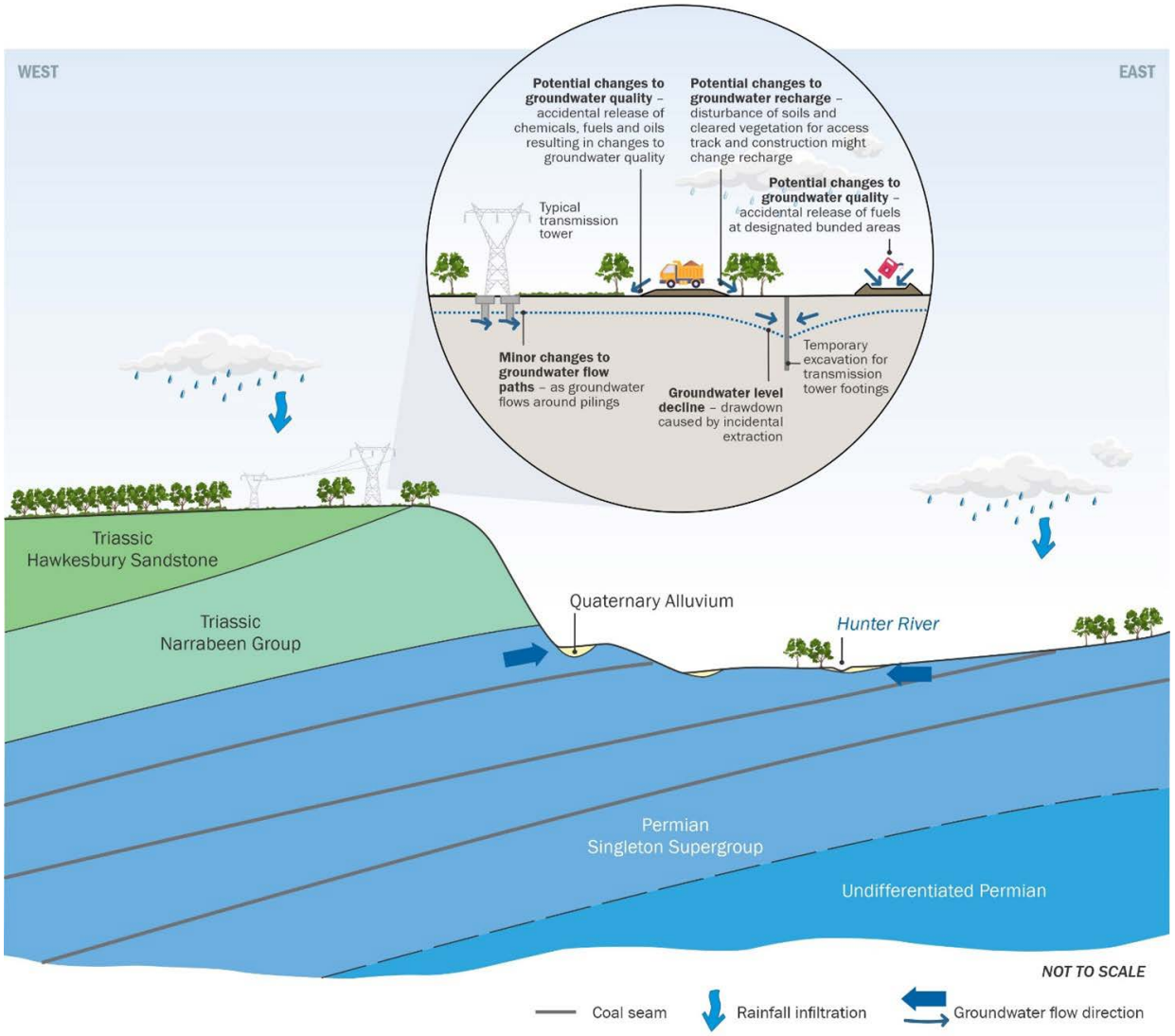


Figure ES.7 Hydrogeological conceptual site model

there remains a medium risk of encountering contamination in these areas, should dewatering be required during piling activities.

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 that are not required to be removed will be clearly demarcated to protect the infrastructure from any accidental damage.

There is a very low risk of changes to groundwater quality as any spills or chemical releases from construction equipment would be closely controlled through the implementation of proposed mitigation measures.

Operation impacts

Operation of the Hunter Transmission Project is not expected to impact on groundwater as there is no planned extraction of groundwater for the project's operation. This means that no long-term changes in groundwater levels or flow are expected, and any incidental, short-term impacts, during construction would not carry over into regular operation.

Flooding

The flooding assessment focused on three main river systems within the project impact area — the Hunter River, Lake Macquarie, and Wyong River catchments — and examined how floodwaters behave during different storm events.

The project impact area experiences a range of flood behaviours which vary based on prevailing weather conditions. Smaller tributaries and local drainage channels can experience brief flash flooding from heavy local rains, while major rivers like the Hunter River can produce broader, more sustained flooding. The largest flood plain crossed by the project impact area is the Hunter River. Based on the hydraulic modelling during a 1 in 100-year flood event (1% annual exceedance probability) the downstream area of the Hunter River experiences widespread flood flow. Where the project intersects the Hunter River flood plain the flood extent is about 1.1 kilometres wide, and the river is a maximum depth of about 15 metres. The river can increase to a width of 1.4 kilometres and depth of 19 metres during the probable maximum flood. 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.

Construction impacts

Temporary works such as earthmoving, material storage, and the construction of support facilities might slightly alter drainage patterns and temporarily change flood depths during construction. In areas where construction takes place on flood-prone land, there is a potential risk that the work could obstruct water flow, leading to minor increases in water depth or delaying the passage of floodwater. These impacts are expected to be short term and manageable with careful construction planning. The flooding assessment shows that while the project does cross several active floodplains, the potential impacts on flood behaviour are minor and largely localised.

Flood emergency management measures for construction of the project would be prepared and incorporated into relevant environmental and/or safety management documentation.

Operation impacts

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. Modelling shows

that even during a 1% annual exceedance probability event, any increase in probable maximum flood depth or flow velocity would be minor and localised around the footings and tower legs of transmission towers.

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) annual exceedance probability 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.

Operation of the project would not increase the overall flood hazard and emergency response arrangement for existing developments under a 1% annual exceedance probability event. The operation of the project is expected to have only a minor and localised impact on peak flood levels and flow velocities during flood events.

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
- would not increase the overall flood hazard for existing developments for events up to the 1% AEP
- would not have an adverse impact on the NSW State Emergency Services' emergency response arrangements as set out in the local flood plans for each local government area.

Climate change is expected to lead to an increase in flood-producing rainfall intensities, which would increase flood risks to the Hunter Transmission 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.

Bayswater Power Station in the north of the project

Soils and contamination

The Hunter Transmission Project has the potential to impact soil quality and mobilise contaminants during construction and operation. The assessment of potential impacts to soils and contamination considered the project impact area with a 500-meter buffer zone.

Soils

Soil maps, databases and previous reports were reviewed and a field survey conducted to gain an understanding of the soil types present in the project impact area and identify potential contaminants from past activities. The northern part of the project impact area has been extensively cleared to enable livestock grazing and coal mining, while the central and southern areas of the project impact area 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. Four key soil management units were identified within the project impact area, grouped together to represent similar soil properties.

Existing sources of potential contamination

Potentially contaminating activities historically conducted in the project impact area include mining, power production, chemicals storage, and military activities. These activities may have resulted in levels of contamination being present from heavy metals, hydrocarbons, and other pollutants.

Areas of contamination concern were identified from desktop assessment and field survey. Areas of contamination concern are primarily associated with existing power stations, coal mining areas and Singleton Military Area. Of the identified areas of contamination concern, 8 present a medium to high likelihood for contamination based on preliminary risk assessment findings. These include:

- Bayswater and Eraring power stations
- Mining lease areas (inside and outside active mining areas)
- Singleton Military Area
- Farm dams.

The majority of project impact area is not located on or near areas identified as containing acid sulfate soils. There is potential for localised areas of acid sulfate soils in low lying waterlogged areas, such a surrounding creeks or dams.

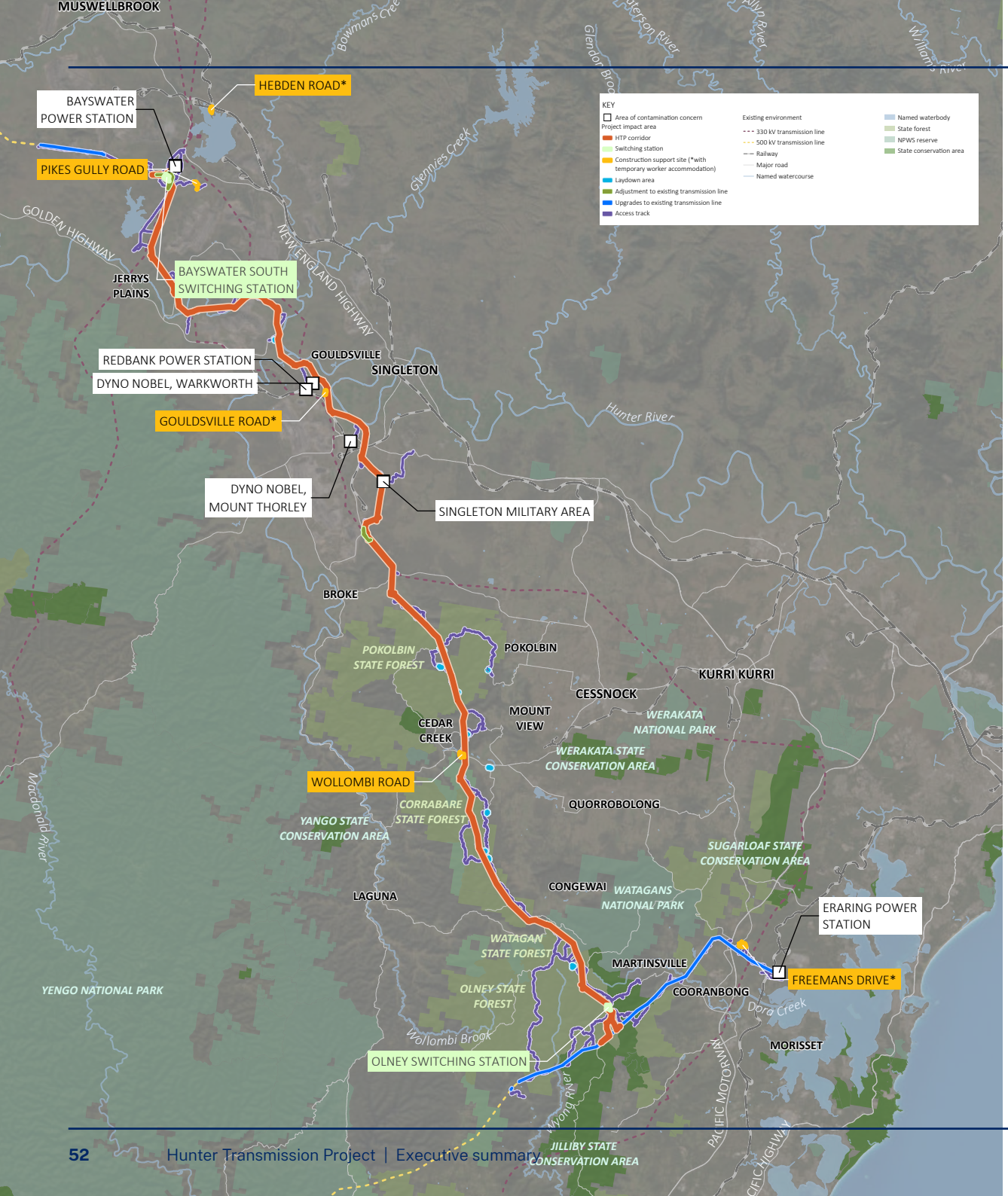
There are no known occurrences of naturally occurring asbestos within the project impact area.

Construction impacts and management

Soils

Soil management units 1 (Uncleared Rises, Hills and Escarpments) and 2 (Undulating midlands) which collectively account for 88% of the project impact area have a high erosion risk from ground disturbance during construction. While the high erosion risk for soil management unit 1 is due to the nature of the terrain, the risk in soil management unit 2 is due to the presence of sodic soils (soils with an exchangeable sodium percentage) which are prone to dispersion and erosion.

The exposure of soil to surface water runoff and wind can increase soil erosion potential in locations where construction would temporarily expose the natural ground surface and sub-surface through activities such as vegetation clearance and earthworks and excavation activities. This risk is especially high for all exposed surfaces, especially on the steeper inclines of soil management unit 1, or where the sodic, dispersive subsoils are exposed in soil management unit 2.



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 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.

Figure ES.6 Areas of contamination concern

Contamination

Almost all construction activities would disturb the ground surface. In most of the project impact area, the risk of spreading contaminants is low. However, in areas identified as having a medium or high risk dust or contaminated soil may become mobilised.

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 receiving environments
- increase the risk of exposure to contaminants (direct contact, ingestion and/or inhalation) for workers, visitors, the local community and biodiversity values in the surrounding environment.

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.

Following the implementation of management measures, it is anticipated that the potential risks from encountering contaminated soil and/or groundwater would be effectively managed during construction.

Operation impacts

During operation, the risk of disturbing soils is unlikely. The Hunter Transmission Project infrastructure (transmission towers and switching stations) would not require any large-scale excavation or ground disturbance as part of operation and maintenance activities. Standard maintenance practices and design measures will ensure that erosion, sediment runoff, or accidental spills do not lead to new contamination.

Operation of the project is unlikely to result in any significant impacts on soils or contamination.

Mitigation and management

A Contamination Management Plan will be developed for the Hunter Transmission Project. The plan will outline mitigation measures to manage contamination risk, including:

- measures to avoid or minimise disturbance to areas of medium to high risk of contamination where possible
- testing of areas of medium to high contamination risk to confirm the presence/absence of contaminants of concern
- 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)
- measures for the proper storage of chemicals, fuels and hazardous substances and incident response measures would also be implemented to minimise the potential for soil and/or water pollution to occur.

The risk of encountering unexploded ordnance within the Singleton Military Area would be managed in accordance with the Defence Unexploded Ordnance Management Manual and in consultation with the Department of Defence.

Bushfire expert briefing the NSW Rural Fire Service

Hazards and risk

Potential hazards and risks associated with the Hunter Transmission Project include bushfire, dangerous goods, electric and magnetic fields, telecommunications, and aviation. The potential risks were assessed on an issue-by-issue basis and strategies to minimise risks were incorporated into the project design.

Bushfire

The majority of the Hunter Transmission Project corridor lies in bushfire prone areas that include forests, grasslands, and some rainforest patches. Although the construction process (which involves vegetation clearing and earthworks) and ongoing maintenance activities will take place in these areas, the project has been designed in accordance with best practice bushfire protection standards. The transmission line infrastructure is designed to achieve high network resilience against bushfire impact. Towers would be constructed from non-combustible materials and placed in cleared or partially cleared easements (70 metres wide). 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.

Construction and operation of the Hunter Transmission Project has the potential to start fires associated with construction and maintenance activities including hot works (metal grinding, cutting, welding), vehicle movement as well as vehicle, helicopter or drone accidents. Reliable and proven risk controls would be implemented during construction activities such that the likelihood of fire ignition during construction activities would be very low.

Specific measures to minimise bushfire risk include creating asset protection zones (areas of cleared or semi-cleared vegetation) 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 outlining the restrictions and procedures for preventing accidental fire ignition during construction. A bushfire emergency management and evacuation plan will be prepared in line with NSW Rural Fire Service requirements to ensure workforce bushfire safety. Together, these measures help ensure that any risk of fire ignition or spread is kept as low as reasonably practicable.

Dangerous goods

During construction and operation and maintenance of the Hunter Transmission Project, various hazardous materials (for example, fuels, lubricants, cleaning chemicals, and other dangerous goods) would be used and stored. A thorough risk screening has shown that materials would be handled, stored, and transported according to relevant guidelines and regulatory thresholds, such that the risk to people or the environment is minimised to acceptable standards. In practice, dangerous goods would be stored in secure, specially designed areas, and likely spread over several locations, to prevent any concentration of risk. Emergency response measures, including spill kits and clear handling procedures would also be in place.

Electric and magnetic fields

During construction of the Hunter Transmission Project the new transmission lines would not be energised until commissioning of the project, meaning there would be no electric and magnetic field risk during construction.

Design of transmission infrastructure includes sufficient clearance between the conductors and the ground, as well as between the equipment and nearby dwellings such that electric and magnetic field levels would be within applicable safe limits as outlined in the Australian Radiation Protection and Nuclear Safety Agency recommended Guidelines on Limiting Exposure to Electromagnetic Fields.

Telecommunications

The Hunter Transmission Project has been assessed for the ability of high-voltage transmission infrastructure to interfere with radio and other communication equipment. During operation, calculations indicate that wet conditions would result in some minor impacts on AM radio reception within 131 metres of the centre of the transmission line easement. However other services such as FM radio, digital television, and communications for aviation are not expected to be impacted. The design and placement of the Hunter Transmission Project has been planned such that any interference is minimised and remains within acceptable levels.

Aviation

The Hunter Transmission Project would not infringe on the operations of any certified airports during operation and is not anticipated to impact non-certified aerodromes including Warkworth Aerodrome which is used by the Hunter Valley Gliding Club. Similarly, the operation of the Hunter Transmission Project would not impact air routes and aviation navigation and communication facilities which are a sufficient distance from the operation impact area (the closest being at Maitland Aerodrome).

During construction of the Hunter Transmission Project, potential aviation hazards are related to the construction of towers (using cranes and aerial lifts) and the use of helicopters or drones for stringing works (the process of installing pulling the transmission wires between towers). Cranes are unlikely to present a hazard provided they are clearly visible colour against the background terrain and/or have an obstacle light fitted near the top of the crane. Helicopters and drones would also be used during construction for stringing activities. Relevant stakeholders, including Airservices Australia, the Australian Department of Defence, the Hunter Valley Gliding Club, NSW Ambulance Service, NSW Parks and Wildlife Service, Forestry Corporation of NSW and NSW Rural Fire Service have been engaged during the development of the environmental impact statement on potential aviation hazards arising from the project and would be engaged during detailed design and prior to the commencement of construction.

During operations, the transmission line would not infringe on the obstacle clearance zones of nearby certified or non-certified aerodromes. The transmission towers would be 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. Local aviation groups and regulatory bodies have been consulted so that any potential risks will be managed, and flight paths remain clear.

Mitigation and management measures have been developed for the above hazards and risks. These include design features to meet required Australian Standards, safety management systems, A bushfire emergency management and evacuation plan and consultation and coordination with relevant stakeholders.

Hunter valley floor vegetation

Other matters

Potential impacts the Hunter Transmission Project has on other matters related to air quality, greenhouse gas emissions, waste management and economic impacts are described below.

Air quality and greenhouse gas emissions

Construction activities for the Hunter Transmission Project such as demolition, earthworks and vehicle movements would generate dust. Air quality impacts from the project would largely relate to the generation of dust and this would vary depending on certain factors such as the duration of activity, size of the work site, weather conditions and how close sensitive receivers are.

Risks to human health and impacts to ecological receivers from construction activities were assessed as negligible to medium. A Construction Air Quality Management Plan will be developed for the Hunter Transmission Project to manage impacts to air quality. Potential air quality impacts during operation would be limited to dust disturbance from vehicles. The assessment found that operational air quality impacts from the project would be negligible.

The project would contribute a small amount of greenhouse gas emissions, primarily from construction activities like diesel use, material transport, and vegetation clearing. However, greenhouse gas emissions from construction are expected to be minimal compared to State and National totals. Operation of the project would contribute to the 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.

Waste management

Construction and operation of the Hunter Transmission Project would generate different types of waste. Waste streams generated by the project include green waste, concrete, metals, packaging, and general waste from temporary worker accommodation.

The waste assessment for the project considered the following to identify waste streams and developing appropriate management measures:

- 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.

During construction, waste types and estimated quantities generated from construction activities have been identified in Table ES.7.

Table ES.7 Waste types and estimated quantities

Construction activity	Waste type	Indicative quantity
Clearing and grubbing	Green waste, including timber, shrubs, grasses, leaves and weeds	3500 cubic metres
General earthworks and excavation activities	Spoil from excavations that is unsuitable for reuse	48,540 cubic metres
Concrete batching plants	Concrete waste	8000 tonnes
Construction of access roads	Asphalt, road base, concrete and gravel	Less than 150 tonnes
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
Construction of project infrastructure (transmission line and switching stations)	Steel and other metals	2250 tonnes
	Timber used in forming of foundations or piles	400 tonnes
	Conductor, earthing and tower waste materials, pipe and conduit, and electrical cabling	708 tonnes
	Hazardous waste and/or contaminated waste	50 tonnes
Transportation of materials required for construction	Transportation and packaging waste, including plastic, paper, cardboard, pallets, fumigated timber cable drums	Less than 300 tonnes
Activities at construction support sites, including temporary worker accommodation	General domestic waste, including food waste, paper, cardboard, plastic and glass	80 tonnes
Dewatering, dust suppression, washdown of plant and equipment and staff amenities	Wastewater, including concrete washouts and sewage	70 megalitres

Minimal quantities of waste would be generated during operation given the small number of site personnel and minimal ongoing maintenance requirements of the Hunter Transmission Project.

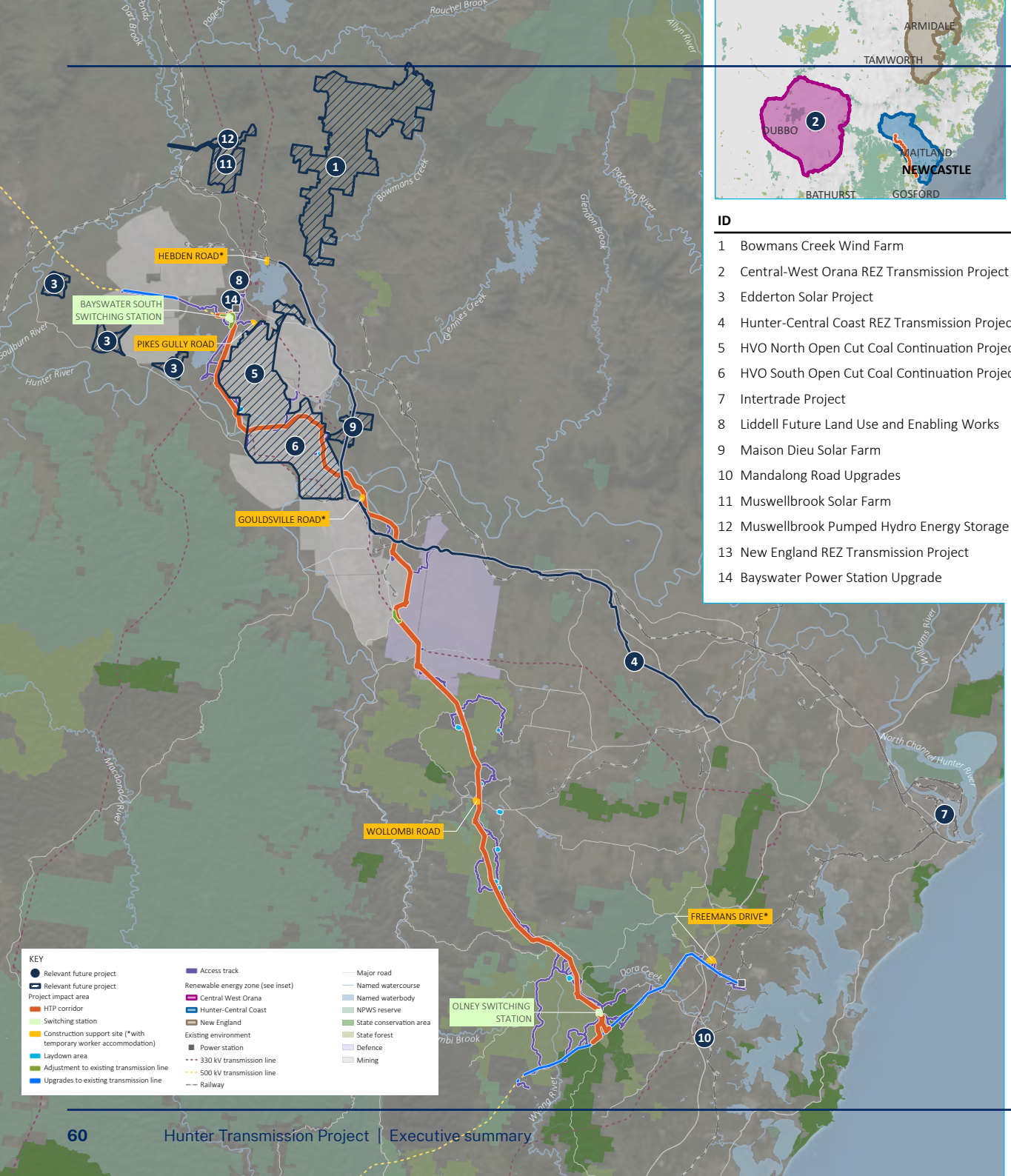
The project would follow best practices in waste management such as avoiding/reducing waste generation, managing, reusing and recycling and safe disposal of waste before consideration is given to disposal. Dedicated waste management plans will be implemented to ensure responsible handling of all waste types and volumes.

Economic impacts

The Hunter Transmission Project would deliver significant economic benefits during construction and operation within the regional and NSW economy. The project is expected to support local jobs and businesses through millions of dollars of expenditure for equipment, materials and labour in the heavy and civil engineering construction sector, the construction services sector, and the non-residential building construction sector. The average annual impacts on the NSW economy from construction of the Hunter Transmission Project over 2 years are estimated to produce up to $551 million in annual direct and indirect output. Additionally, construction of the Hunter Transmission Project is estimated to produce $150 million in annual direct and indirect household income from 1524 direct and indirect jobs.

Additionally, operation of the Hunter Transmission Project would contribute to and enable economic activity in the electricity transmission, distribution, on selling and electricity market operation sector. The average annual impacts on the NSW economy from the operation of the Hunter Transmission Project are estimated to produce up to $37 million in annual direct and indirect output. This also includes $7 million in household income from 67 direct and indirect jobs.

Some agricultural and forestry land would be temporarily impacted during construction, resulting in minor losses in gross agricultural production in the regional and NSW economy. However, estimated losses would be negligible in the context of total gross agricultural production and the overall economic gain associated with the construction and operation of the Hunter Transmission Project far outweighs these effects. Strategic benefit-sharing initiatives, including payments to affected landowners and investments in local community projects, will ensure long-term positive impacts.



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

Cumulative impacts

The cumulative impact assessment examined how the Hunter Transmission Project might contribute to cumulative environmental, social, and economic impacts when combined with other projects in the region. The assessment considers potential effects during construction and operation and outlines strategies to manage cumulative impacts.

The Hunter Transmission Project is one of several infrastructure projects occurring throughout the Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie local government areas, including new energy developments, mining activities, and transport upgrades. Some of these projects have overlapping timelines, which could amplify impacts such as traffic congestion, community wellbeing and disruption, as well as construction fatigue.

ES.8 Relevant projects for cumulative impact assessment

Combined construction activities from the Hunter Transmission Project and other nearby projects have the potential to create cumulative impacts for:

- noise and vibration and dust - overlapping construction activities and timeframes have the potential to affect the amenity for rural dwellings. EnergyCo will coordinate with construction contractors and affected landowners to sequence construction activities from the Hunter Transmission Project and other surrounding projects to minimise exposure to impacts associated with overlapping construction activities
- traffic and transport - in Muswellbrook, Singleton, Cessnock and Lake Macquarie local government areas. Construction traffic and heavy vehicle movements would share key arterial and local roads, potentially causing congestion, reducing road safety, limiting access and causing delays
- workforce and skilled-labour resources - the increased competition for local skilled workers has the potential to result labour shortages, wage competition, and project delays. Cumulative impacts to labour demand would be managed in accordance with the Hunter Transmission Project Community and Stakeholder Engagement Plan
- demand for short-term housing and accommodation to support construction workers – reduced supply in short-term housing and accommodation has the potential to reduce the availability of housing and accommodation for seasonal workers, residents and tourists. Temporary worker accommodation facilities have been proposed as part of the Hunter Transmission Project which would mitigate potential impacts to short-term housing and accommodation supply in the region.

On balance the Hunter Transmission Project would result in more positive outcomes than cumulative impacts specifically through its contribution to the National Electricity Market's transition to renewable energy. The project would provide increased transmission capacity and critical energy security as coal-fired power stations, including Liddell Power Station, Eraring Power Station and Bayswater Power Station, close. Additionally, the Hunter Transmission Project would contribute to the growth, investment, supply-chain participation, as well as employment and training opportunities for local and regional businesses and services in the renewable energy and civil works sectors.

Environmental management

The environmental management strategy would be developed to set out a clear management framework for the delivery of the project in accordance with applicable guidelines/policies/standards, such as Australian Standards (AS)/New Zealand Standards (NZS) ISO 14001:2016 Environmental management systems.

The environmental management strategy would allocate responsibilities to key personnel, establishes processes for communicating with the local community and government agencies as well as detail procedures for receiving, handling, and resolving complaints, environmental non-compliances, and environmental emergencies.

Issue-specific environmental management plans would be developed to be consistent with applicable policies/standards/guidelines, including:

- *AS/NZS ISO 14001:2016 Environmental management systems*
- *NSW Environmental management guidelines for construction* (Edition 4).

Operation of the project would be managed through the accredited environmental management system maintained by the network operator. Environmental monitoring programs, inspections and independent auditing would be implemented to confirm the effectiveness of mitigation and management measures. Further measures would be developed and implemented for corrective and preventative actions for any actual or potential environmental non-compliant activities or environmental emergencies.

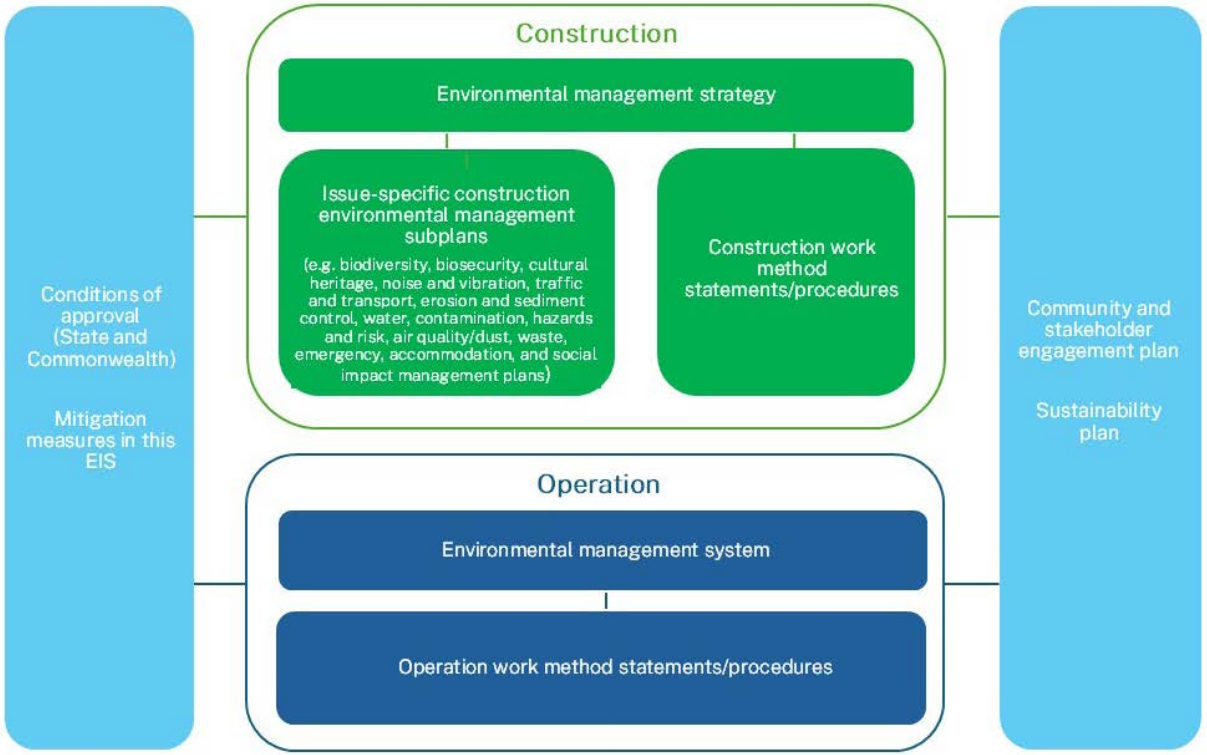


Figure ES.9 Environmental management of the HTP

Project justification and conclusion

Robust environmental management measures are in place to oversee all aspects of the project. This includes regular monitoring, adherence to best practices for air quality and waste management, and strategies to mitigate any social or economic impacts.

In plain terms, the project is designed not only to strengthen the electricity network, but also to do so in a way that protects the local environment and brings benefits to the community.

Overall, the Environmental Impact Statement shows that while the project introduces a few manageable environmental and social impacts, the positive outcomes, improved energy infrastructure, enhanced reliability for a low-carbon future, and significant regional economic benefits, far outweigh these challenges. The Hunter Transmission Project is, therefore, justified and supported by effective mitigation and management strategies.

EnergyCo

Hunter Transmission Project

Executive summary

NSW GOVERNMENT