



Initial Advice Statement

Capricornia Pumped
Hydro-electric Energy Storage
and Transmission Project



CAPRICORNIA ENERGY HUB
PUMPED HYDRO-ELECTRIC ENERGY STORAGE AND
TRANSMISSION PROJECT

INITIAL ADVICE STATEMENT

Application for Declaration of Co-ordinated Project Pursuant to *State Development and Public Works Organisation Act 1971*

Document history

Version	Date	Revisions
A	April 2023	Preliminary draft
0	28 July 2023	Address government comments on draft. Final submitted version.
1	5 Sept 2023	Update cadastral details following property boundary changes
2	13 Dec 2023	Update project CAPEX and EPBC references after referral decisions made under EPBC Act

EXECUTIVE SUMMARY

Queensland is undergoing a rapid energy transformation, moving away from its traditional energy sources of coal and gas towards a more sustainable energy future. The modernisation of the electricity generation and transmission system will be supported by a range of renewable energy projects delivering clean and efficient power.

An integral need in this new energy system will be energy storage, as it is essential for times when renewable energy generation is not available. Pumped hydroelectric energy storage schemes will act as powerful batteries, ensuring Queensland will have a reliable clean energy supply.

The Capricornia Energy Hub (CEH) Pumped Hydroelectric Energy Storage (PHES) and transmission project ('the project') is a proposed approximately 750MW pump/generation facility with a storage capacity of 12GWh (16hr) located about 80km west of Mackay, Queensland. The project is located on two large rural landholdings about 10km west of Eungella near the existing Eungella Dam.

The proponents are Eungella PHES Pty Ltd as trustee for Eungella PHES Trust and Eungella Infrastructure Pty Ltd ("the proponent companies"), which are special purpose vehicles established to deliver and control the project. The proponent companies are wholly owned and fund managed by Copenhagen Infrastructure Partners, a Danish fund management company dedicated to renewable energy projects.

The purpose of this Initial Advice Statement (IAS) is to support an application by the proponent companies to the Coordinator-General to declare the project a coordinated project under the *State Development and Public Works Organisation Act 1971 (SDPWO Act)*.

Field activities including securing land access, indigenous engagement, cultural heritage surveys and environmental survey works for the project commenced in 2019 and geotechnical investigations in 2021. These studies have advanced knowledge of the ecological, geological and cultural conditions in the project area to facilitate project design.

The PHES will comprise two reservoirs: an upper reservoir with a valley in-fill wall, and an in-stream lower reservoir in the Broken River downstream and proximate to the existing Eungella Dam. The transmission component of the project comprises a connection to the National Electricity Market by grid connection to the Nebo-Strathmore transmission line approximately 18km to the west of the reservoirs and powerhouse. Depending on operational requirements and market conditions, it will operate as a load or generator.

The project will have a total capital cost of approximately \$AUD 2.87bn and will create approximately 600 jobs during construction and 65 regional jobs during operations. It will take approximately four years to construct.

The project is considered to satisfy all four of the criteria required to be considered eligible for declaration (s27(2)(b) SDPWO Act):

- a) **Complex approval requirements:** Pumped hydro projects in Queensland interface with a range of complex and interdependent local, State and Commonwealth legislation, regulations and approval requirements. The project will require many permits, licences and approvals across all levels of government, and will benefit from a single, coordinated assessment process;
- b) **Strategic significance:** The project is aligned with and supports key energy policies identified by the Queensland Government, the Commonwealth Government and the Australian Energy Market Operator. It will provide a foundation project that will significantly contribute to the Queensland Government's renewable energy target of 70% renewables generation by 2032¹. Also, it will contribute to the modernisation of Queensland's energy system by providing a large energy storage asset to firm Variable Renewable Energy (VRE) generation such as wind and solar;
- c) **Significant Environmental Effects:** The project has the potential to affect species or ecological communities that are matters of state environmental significance or matters of national environmental significance. The project is being referred to the Commonwealth Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- d) **Significant Infrastructure Requirements:** The project is an infrastructure project that will directly benefit Queenslanders. Currently, the estimated capital cost of the project is approximately \$AUD 2.87bn and with a construction period of four years, it is significant and complex.

Key project issues relate to geotechnical matters, grid connection, securing water supply, workforce, time delays and provision of fish passage.

Key environmental matters that will be addressed by the environmental impact statement relate to waterway disturbance, water quality, threatened species habitat disturbance and environmental offsets.

¹ Queensland Energy and Jobs Plan, September 2022

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1 INTRODUCTION

1.1 Background

The project comprises two primary components, being:

- a) a pumped hydroelectric energy storage (PHES) which is proposed as an approximately 750MW pump/generation facility with a storage capacity of 12GWh (16hr) and a water transfer volume of approximately 18 GL. The PHES includes two reservoirs: the upper being a valley fill reservoir and the lower being an in-stream reservoir in the Broken River. There will also be a powerhouse and structures linking the reservoirs and the powerhouse; and
- b) a transmission line and substation, connecting the PHES to the national electricity grid at the Strathmore to Nebo 275kV transmission line approximately 18km from the powerhouse.

A full list of project components is included in section 3.4.

The project is anticipated to have a total capital cost of approximately \$AUD 2.87 bn and will create approximately 600 jobs during construction and 65 regional jobs during operations. The location of the project is shown in Figure 1 and the layout is shown in Figure 2.

The project will contribute toward local, State and Commonwealth government policies and goals relating to greenhouse gas reduction, renewable energy generation, the transformation of the electricity network, affordable energy and local employment.

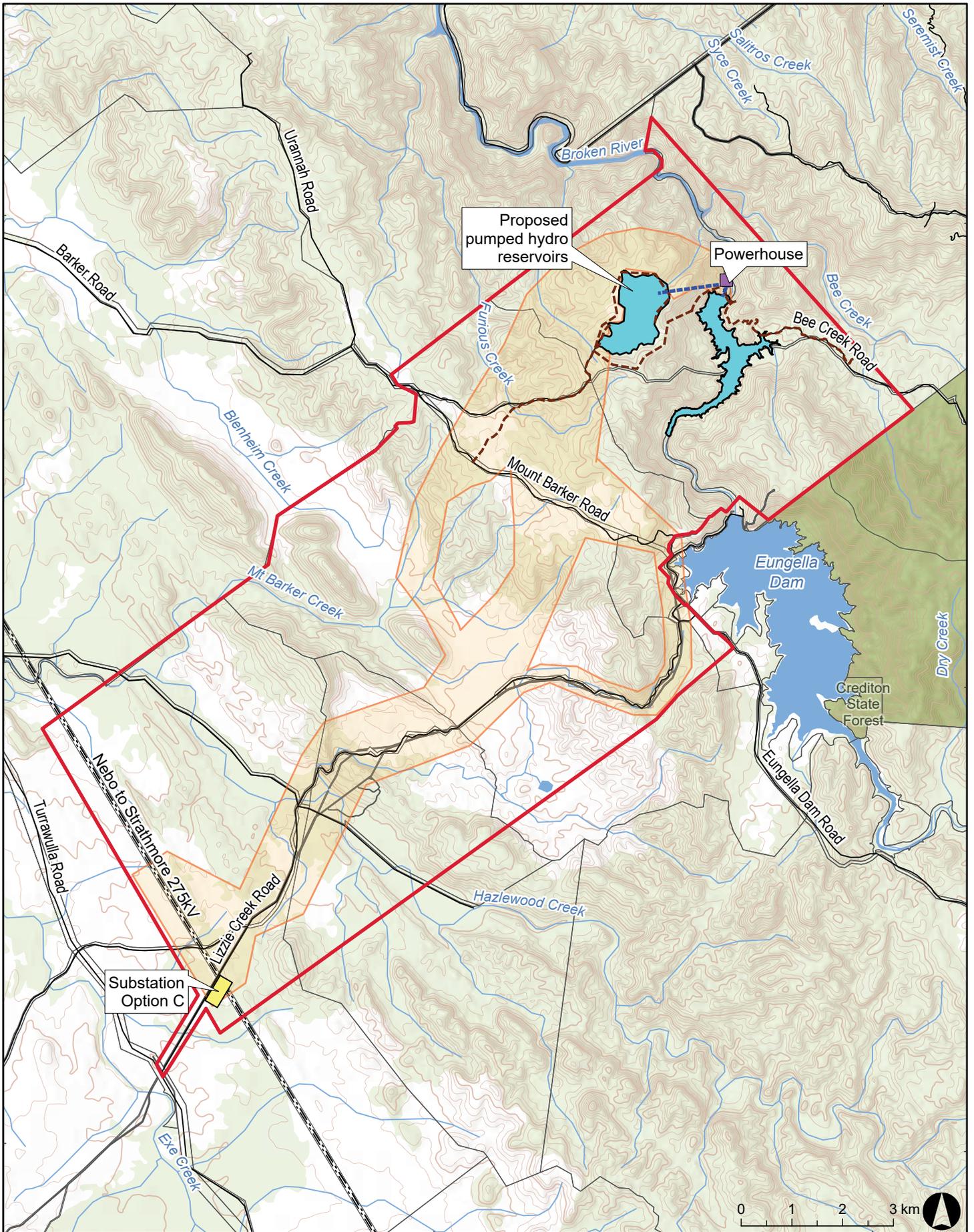
The project is part of the Capricornia Energy Hub (CEH), which has potential for other renewable energy components that could potentially supply the PHES or the grid. If developed, those additional renewable energy components would be subject to separate assessment and approvals processes at the appropriate time.



- LEGEND**
-  Capricornia PHES (the project)
 -  Major road
 -  Major watercourse
 -  Protected areas
 -  Built up areas

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PROJECT		
Capricornia PHES and Transmission		
TITLE		
LOCATION OF THE PROJECT		
DATE	STATUS	PRODUCED
29/08/2023	ISSUED FOR INFORMATION	AC
SCALE	DATUM	
1:700,000 at A3	GDA2020 MGA Zone 55	
FILE		FIG
CEH IAS - FIG 1 PROJECT LOCATION - IFI B		1



LEGEND

- Project area
- Transmission study area
- Proposed pumped hydro reservoirs
- Proposed powerhouse
- Proposed substation
- Proposed underground head/tail race
- Proposed access track
- Existing transmission powerline
- Existing road
- Watercourse / waterbody
- Cadastre
- Protected areas



Disclaimer: CIP makes no warranty in relation to the accuracy, reliability, completeness or suitability of the data and does not accept liability for any loss, damage or costs, including consequential damage, in relation to any use of the data in this map.

PROJECT Capricornia PHES and Transmission		
TITLE PROJECT AREA AND PROPOSED LAYOUT		
DATE 7/12/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
SCALE 1:100,000 at A3	DATUM GDA 1994 MGA Zone 55	
FILE CEH IAS - FIG 2 GENERAL ARRANGEMENT - IFI C	FIG 2	

1.2 Purpose and scope of the IAS

The proponent companies are seeking declaration of the project as a coordinated project for which an EIS is required under section 26(1)(a) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Accordingly, this IAS has been prepared to provide information as required under Section 27 of the SDPWO Act to inform the Coordinator-General's decision on whether to declare the project a 'coordinated project'.

1.2.1 Complex approval requirements

A list of required statutory approvals that are potentially triggered by the project are detailed in section 6.

Approvals are likely to be required from Commonwealth, State and two local government authorities (Mackay Regional Council and Isaac Regional Council).

Multiple State agencies will also be required to provide input into decision making for the project, with those agencies including, but not limited to:

- a) Department of Resources (DoR);
- b) Department of Energy and Public Works (DEPW);
- c) Department of Agriculture and Fisheries (DAF);
- d) Department of Environment and Science (DES);
- e) Queensland Health;
- f) Queensland Fire and Emergency Services (QFES); and
- g) Department of Transport and Main Roads (DTMR).

1.2.2 Strategic significance

Queensland's electricity demand forecast is expected to reach 55twh per annum in the 2030s². The project, generating 750MW for 16hrs per day, would dispatch enough energy to meet about 4% of Queensland's total demand, storing and shifting variable renewable energy such as wind and solar to make it available in periods where they are not generating.

When combined with variable renewable energy generation, the project would seek to replace or augment existing 24hr coal generation such as the 700MW Callide B coal fired power station in Central Queensland as they are decommissioned at the end of life, with Queensland generated dispatchable renewable energy.

The project supports key energy policy areas identified by the Queensland Government, the Commonwealth Government and the Australian Energy Market Operator (AEMO), including:

² AEMO Integrated System Plan 2022

- a) Providing a foundation project that will significantly contribute to Queensland Government's renewable energy target of 70% renewables generation by 2032, 80% by 2035, and net zero by 2050³;
- b) Contributing toward the Commonwealth Government's commitment to 43% emissions reduction on 2005 emission levels by 2030 and net zero by 2050 targets⁴, and Australia's Paris Agreement commitments⁵;
- c) Contributing to the modernisation of Queensland's energy system by providing a large energy storage asset to firm Variable Renewable Energy (VRE) generation such as wind and solar;
- d) Providing firming capacity to help address network stability issues associated with a higher input of renewable sources into the network;
- e) Maximising transmission utilisation;
- f) Diversification and growth of local and regional economies; and
- g) Contributing to resilience from energy security and reduced dependence on fossil fuel energy for urban, industrial and agricultural purposes.

The project is located in the Northern Queensland Renewable Energy Zone and AEMO's Renewable Energy Zone Q4 (Isaac).

1.2.3 Significant environmental effects

The project will affect Matters of State Environmental Significance (MSES) and studies will be conducted and assessed as part of the documentation addressing approval requirements pertaining to MSES.

The project will also affect Matters of National Environmental Significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Following the lodgement of referrals for the project, the Commonwealth Department of Climate Change, Energy, the Environment and Water have determined that both referrals are controlled actions. The controlling provision for both referrals is listed threatened species and communities. Ultimate approval will be required from the Commonwealth Minister for Environment before the project can commence.

1.2.4 Significant infrastructure requirements

Significant infrastructure will be required to be constructed as part of the project, including:

- a) Road and track development within the project area;
- b) Temporary construction facilities within the project area, including accommodation camp, quarry, concrete batching plants, and lay down areas;
- c) A transmission line with associated substation and switchyards;
- d) In-stream reservoir wall;

³ Queensland Energy and Jobs Plan, 2022

⁴ Climate Change Act 2022.

⁵ Australian Government Climate Change commitments, policies and programs, Australian Office of Financial Management, 2022

- e) Off-stream reservoir wall;
- f) Communications infrastructure; and
- g) Powerhouse and head/tail races connecting the reservoirs and powerhouse.

These are fully outlined in section 3.4.

Off-site infrastructure needs will generally be able to be met within existing networks and facilities, however upgrades to intersections and/or roads may be needed. These will be informed by traffic and transport studies.

1.3 Status of project and state of knowledge

1.3.1 Project status

A previous iteration of the project has been the subject of a coordinated project declaration and a preliminary draft Environmental Impact Statement was prepared and reviewed for adequacy by the Queensland and Commonwealth governments. Comments from the adequacy review were addressed but not submitted at the time of project withdrawal.

1.3.2 State of knowledge

As environmental studies for the project are significantly progressed, knowledge about the environmental conditions in which the project would occur are well advanced.

Environmental field studies have been completed to a standard where adequacy review comments have been addressed. Some infill studies are required where the project footprint has been adjusted. Impact assessments have also been completed to address the previous terms of reference and will require some updating to reflect changes to the project design.

2 THE PROPONENT

The proponents are Eungella PHES Pty Ltd as trustee for Eungella PHES Trust and Eungella Infrastructure Pty Ltd ("the proponent companies"), which are special purpose vehicles established to deliver and control the project. The proponent companies are wholly owned and fund managed by Copenhagen Infrastructure Partners (CIP), a Danish fund management company dedicated to renewable energy projects.

Contact details for the proponent companies are:

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Brisbane, QLD, 4000
info@capricorniaenergyhub.com.au

Eungella PHES Pty Ltd as trustee for Eungella PHES Trust and Eungella Infrastructure Pty Ltd have a satisfactory record of responsible environmental management. There are no past or present proceedings under any relevant Commonwealth, State or Territory law associated with Eungella PHES Pty Ltd as trustee for Eungella PHES Trust and Eungella Infrastructure Pty Ltd. The proponent companies will comply with all Commonwealth and State Legislation as it relates to environment, health, and safety legislation.

2.1 About Copenhagen Infrastructure Partners (CIP)

CIP is the world's largest dedicated clean energy fund manager and was founded in 2012. CIP manages eleven funds and currently has \$AUD 40 bn under management globally, with a target of \$AUD 150 bn under management by 2030. More than 150 international institutional investors are invested in CIP managed funds including pension and Australian superannuation funds such as Cbus.

CIP has a 90GW global pipeline of greenfield renewable development projects and 11GW of clean energy projects either operational or under construction. This includes 2GW of pumped hydro under development in America. CIP has a world-leading 50GW project pipeline for offshore wind, with this capacity split evenly across North America, Western Europe, and Asia. CIP's flagship project in Australia is the 2.2GW Star of the South - Australia's first and most progressed offshore wind farm. CIP is rapidly expanding its presence in the Australian market, with a development pipeline of large-scale renewables totalling more than 30GW and \$AUD100 bn of combined CAPEX value. In Australia, CIP is investing in and developing pumped hydro, onshore and offshore wind, solar PV, battery storage and green hydrogen.

2.2 Development Team and Corporate Arrangements

A dedicated project team has been established to design and deliver the project. The team is based in Brisbane and draws upon suitably qualified and experienced consultants.

Additionally, there are a range of external subject matter experts that will contribute to the project.

The project has adequate funding available to complete the development of the project.

The project has entered into a Memorandum of Understanding (MOU) with CS Energy, a Queensland government owned energy corporation. The MOU provides a framework for CS Energy to consider possible participation in the development and operation of the project.

3 NATURE OF THE PROPOSAL

3.1 Scope of the project

Hydroelectric power generation uses the gravitational potential energy stored in water, held at height (termed 'head'), to generate electricity. Unlike standard hydroelectric power

generation that requires an ongoing source of water from a river or lake as an energy supply, PHES like this project recycle the same volume of water back and forth between two storage reservoirs (see Figure 3). These schemes work by pumping water from a lower reservoir to an upper reservoir during periods where electricity generation from other sources exceeds demand thereby storing energy, and then releasing the water back to the lower reservoir to generate electricity during periods where demand for electricity exceeds production from other sources of generation.

The process of pumping water from the lower to the upper reservoir is typically done using electricity generated from other sources, such as solar or wind power that is otherwise unable to be stored for later use. When the stored water is released back to the lower reservoir, it flows through a turbine, which converts the gravitational potential energy stored in the water to mechanical energy as the water spins the turbine blades. The turbine is connected to a generator, which converts the mechanical energy from the turbine into electrical energy that can be fed into the grid.

The efficiency of a pumped hydroelectricity scheme depends on several factors, such as the height difference between the two reservoirs, the volume of water that can be stored, and the efficiency of the turbine and generator. A typical PHES has an efficiency of around 70-80%, meaning that for every 100 units of energy used to pump the water, around 70-80 units can be generated when the water is released.

In basic terms, PHES operate as giant batteries within the energy system. PHES are particularly useful for balancing the supply and demand of electricity on the grid, as they can quickly respond to changes in demand by releasing or pumping water as needed and to absorb excess energy production by reversing to pumping to store the excess energy for later use. They are also a reliable and long-lived form of energy storage, with established facilities operating for many decades. It is a proven technology.

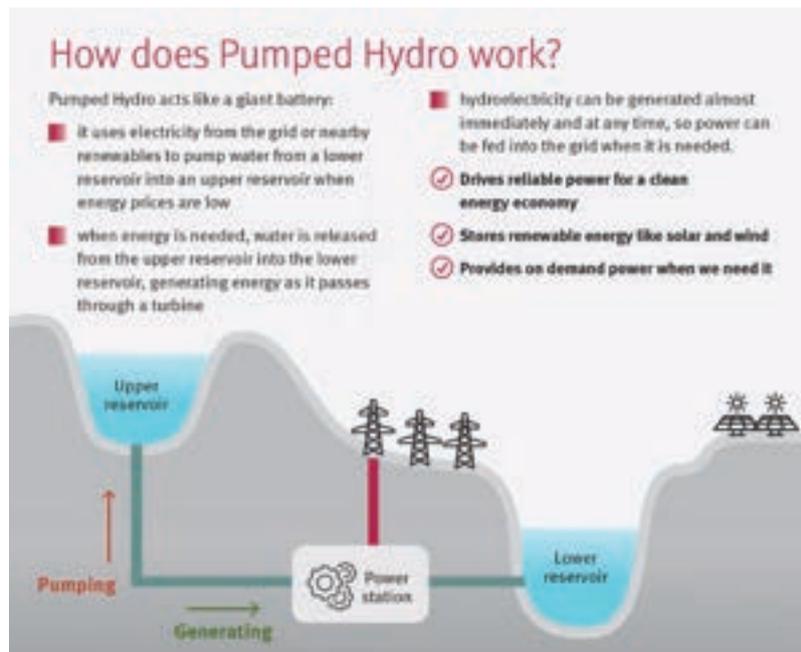


Figure 3: How pumped hydro works⁶

For this project, an upper valley-fill reservoir will be constructed, and the lower reservoir will be located in-stream in the Broken River.

The upper and lower reservoirs will be formed behind dam walls. For the upper reservoir, the dam wall will be constructed across a minor watercourse and the reservoir will form in a natural depression and in a quarry to be developed to supply materials for wall construction. The lower reservoir will be developed by forming a dam wall across the Broken River and the project will address matters of fish passage during the EIS.

A powerhouse will be located between the two reservoirs and will house all pumping, generating and associated equipment. This equipment will generate power when the upper reservoir releases and pump water from the lower reservoir to the upper when renewable energy is available.

Connections between the reservoirs and the powerhouse enables water transfer between each. This may be achieved by underground tunnels, surface pipework or a combination of each.

When power is being generated, it will be delivered to the grid by a transmission line connecting the powerhouse to the existing high voltage Strathmore-Nebo transmission line. When power is needed for pumping, it can be drawn from the grid using the same transmission line.

A range of associated equipment and activities are required to support the project. An outline of key of project components is provided in section 3.4.

⁶ Queensland Energy and Jobs Plan 2022.

Figure 4 displays an approximation of the surface and underground works required for the project (possible surface pipework not shown) and Figure 5 shows an approximation of the inundation area required for the PHES.

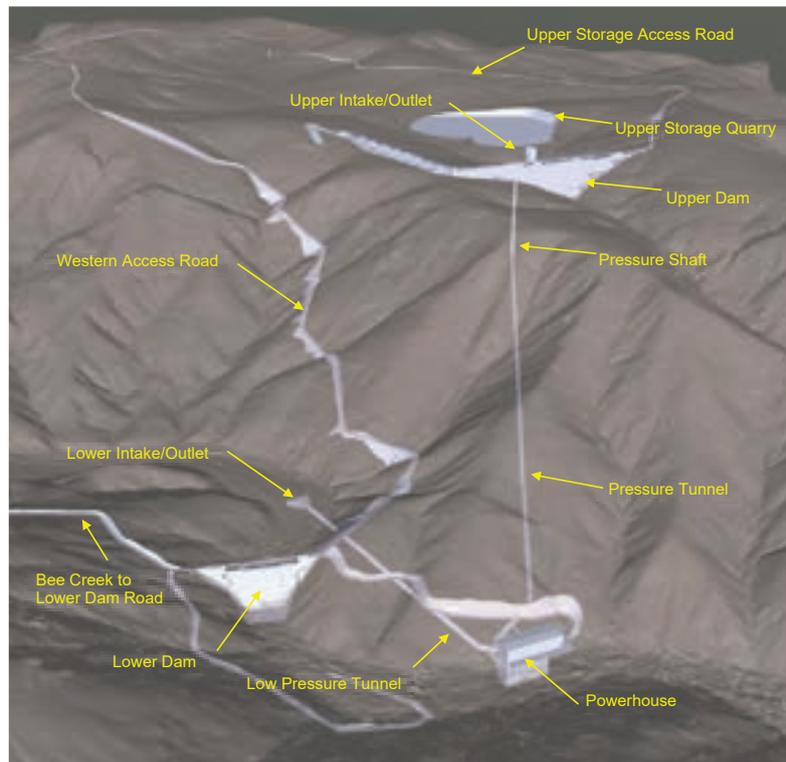


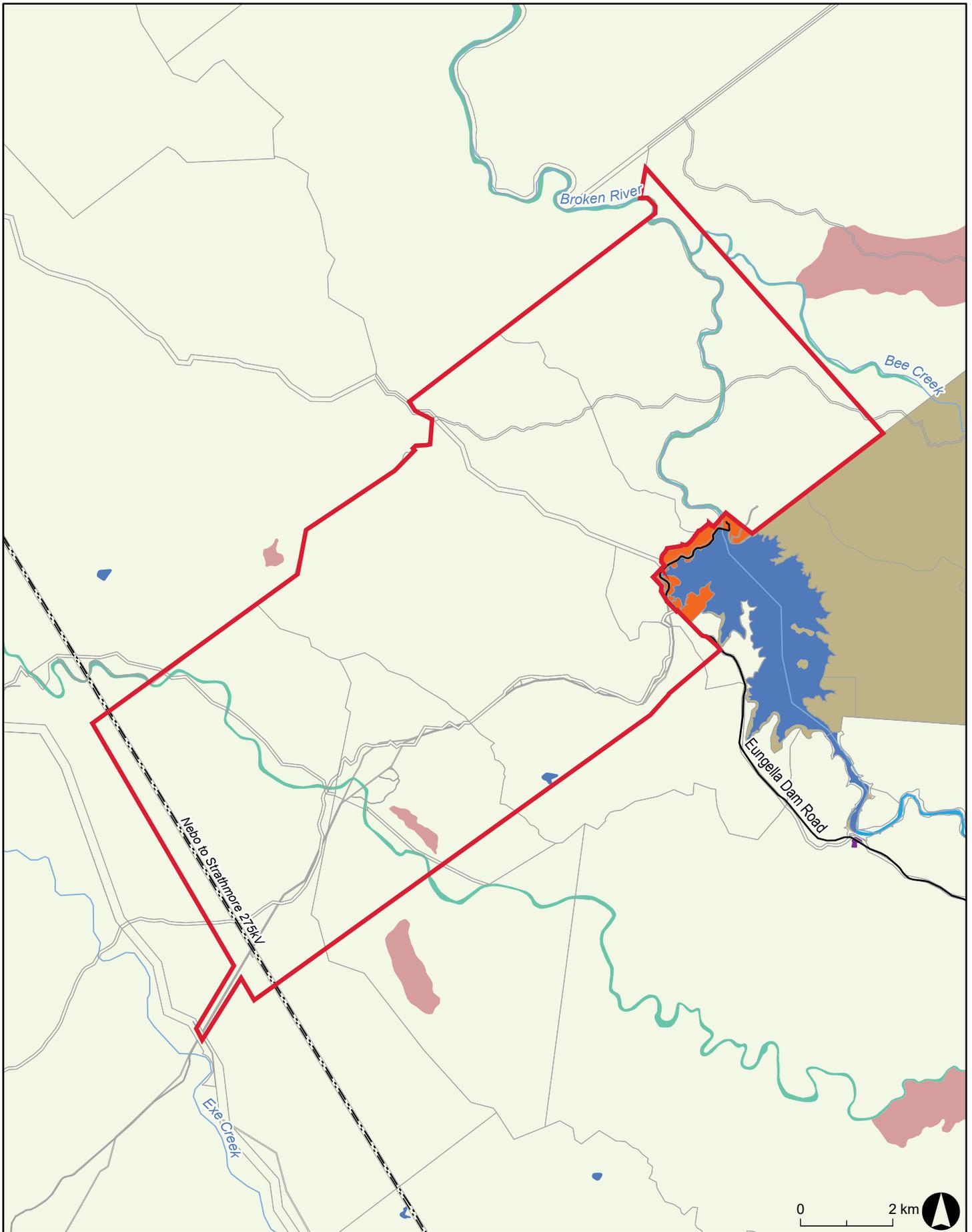
Figure 4: Visualisation of proposed components of the PHES



Figure 5: Visualisation of the proposed PHEs inundation areas

3.2 Land use

All lands subject to the project footprint are currently utilised for grazing. The intended land use will not change substantively, except in the areas directly utilised for reservoirs and the powerhouse, where the proposed land use will reflect that purpose. Land use and tenure matters are further detailed in section 4.2. Figure 6 shows the current land use of the project area and surrounding properties.



 <p>Sources: Land use mapping - 1999 to 2016 - Burdekin.</p> <p>Disclaimer: CIP makes no warranty in relation to the accuracy, reliability, completeness or suitability of the data and does not accept liability for any loss, damage or costs, including consequential damage, in relation to any use of the data in this map.</p>	LEGEND  Project area  Existing transmission powerline  Existing road  Watercourse / waterbody  Cadastre		Land use  Grazing native vegetation  Managed resource protection  Marsh/wetland  Mining  Other minimal use  Reservoir/dam  River  Services		PROJECT Capricornia PHES and Transmission TITLE LAND USE OF THE PROJECT AREA <table border="1"> <tr> <td>DATE</td> <td>STATUS</td> <td>PRODUCED</td> </tr> <tr> <td>7/12/2023</td> <td>ISSUED FOR INFORMATION</td> <td>AC</td> </tr> <tr> <td>SCALE</td> <td colspan="2">DATUM</td> </tr> <tr> <td>1:110,000 at A3</td> <td colspan="2">GDA2020 MGA Zone 55</td> </tr> <tr> <td>FILE</td> <td colspan="2">FIG</td> </tr> <tr> <td>CEH IAS - FIG 6 LAND USE - IFI C</td> <td colspan="2">6</td> </tr> </table>			DATE	STATUS	PRODUCED	7/12/2023	ISSUED FOR INFORMATION	AC	SCALE	DATUM		1:110,000 at A3	GDA2020 MGA Zone 55		FILE	FIG		CEH IAS - FIG 6 LAND USE - IFI C	6	
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3.3 Project need, justification and alternatives considered

The national electricity grid has a demonstrated⁷ need for more dispatchable energy sources to improve the security of the grid and provide energy to customers when required. Variable renewable energy generating methods such as wind and solar fluctuate based on local wind and solar resource conditions and do not provide storage ability. They are therefore unable to address fluctuations in energy demand throughout the day.

The existing energy system relies heavily on energy stored in the form of fossil fuels (coal, oil and gas). When demand requires more energy, this is achieved through the on-demand burning of these fuels to release the stored energy. To facilitate the retirement of fossil fuel generation therefore requires alternative forms of energy production and energy storage. Figure 9 shows AEMO's expected energy transition to 2050.

Variable renewable generation (wind, solar etc) can provide much of the energy production needed to replace fossil fuel sources but do not store energy. This must come from specific energy storage infrastructure.

While utility scale batteries play an important role as an effective storage option in the National Electricity Market (NEM), it cannot provide the medium and deep storage that will be needed as large fossil fuel based thermal generators exit the market and variable renewable generation such as wind and solar proliferate.

PHES schemes are therefore the only currently technically mature and demonstrated alternative to provide long-duration storage for smoothing variable daily and seasonal patterns of renewable generation, as well as to meet demand during longer periods of lower-than-expected renewable energy generation. See also section 3.3.3.1.

The project will be located west of Mackay and will connect into the electricity grid between the large electricity load centres of Townsville, the Bowen Basin, Mackay and north of the Gladstone area load centre (see Figure 14).

AEMO currently forecasts that the next Queensland coal-fired generator to be decommissioned will be Callide B in 2028, followed by Gladstone Power Station in 2035 (as shown in Figure 7). Local industry in Townsville, Mackay and Gladstone regions are expected to continue to provide a significant local demand for base-load power generation north of Gladstone. Additional green hydrogen load is proposed at Abbot Point.

Significant amounts of VRE have been connected into the NEM north of Gladstone which will require firming.

⁷ 2022 Integrated System Plan, AEMO

Figure 20 Forecast coal retirements, Step Change technology and regional outlook

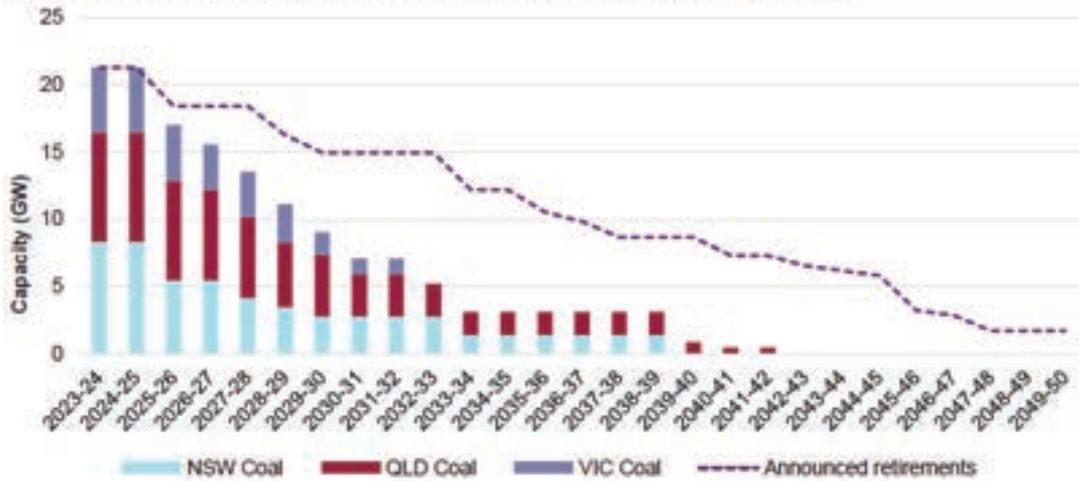


Figure 7: Announced retirements and corresponding builds in Central scenario to help firm VRE in AEMO System Plan 2022

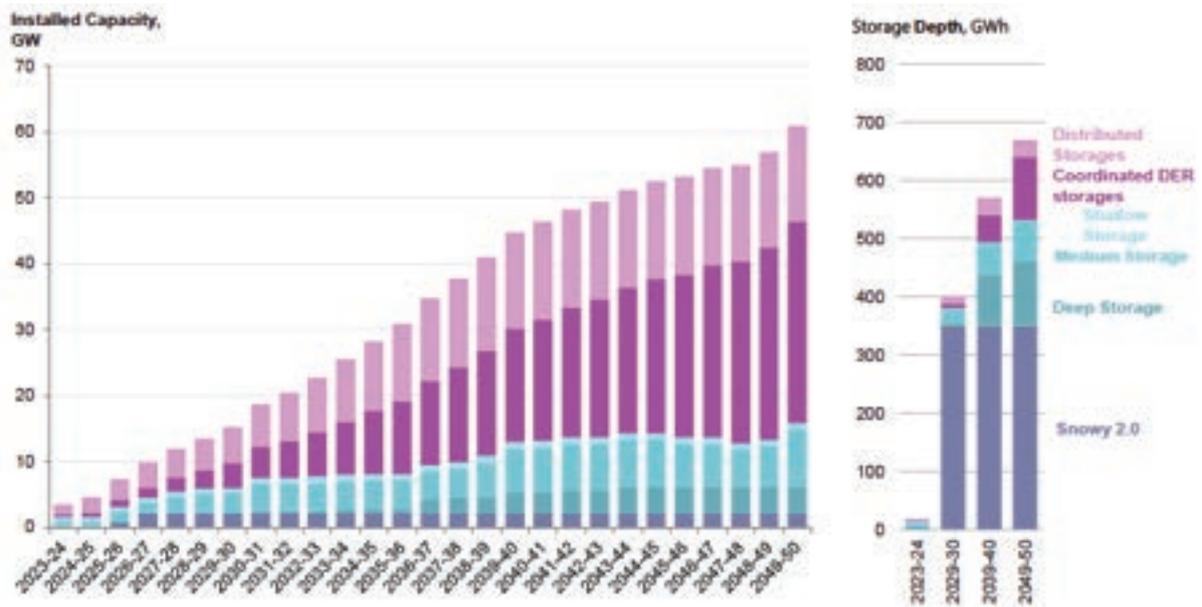


Figure 8: Forecast need for each storage type in AEMO Integrated System Plan 2022

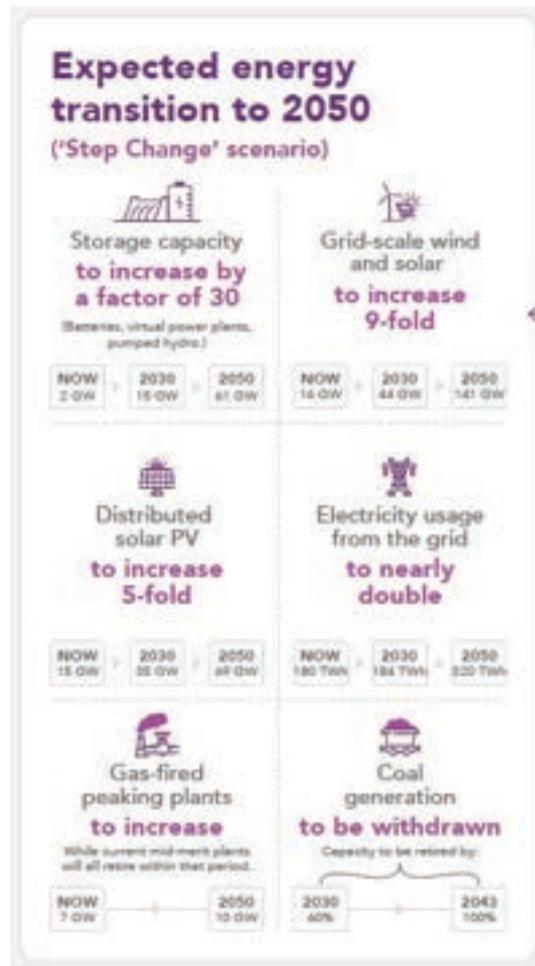


Figure 9: Expected energy transition to 2050⁸

The 2022 AEMO Integrated System Plan (ISP) identifies a need for deep storage in Queensland within the next decade under the *step change* scenario. This will provide several benefits:

- Allow firming of VRE by shifting supply from the period in which it is produced (for solar during the day, or for wind, periodically with intervening periods of calm) to periods of demand (typically in the evenings after sunset), which will add value to the energy produced and continue the incentive for more VRE to be installed;
- In doing so, to reduce the marginal losses experienced by congested supply from multiple VRE installations during peak generation periods by consuming some of the produced power locally for pumping;
- Provide a reliable dispatchable supply during the transition from fossil fuelled power to VRE, particularly as fossil fuelled power stations become less reliable as they approach their end of life;
- Enable the more efficient and reliable operation of major coal fired power stations by allowing them to operate with less variation in output;
- Provide some degree of reserve against sudden price shocks when major coal fired power stations are withdrawn from service; and

⁸ AEMO, ISP 2022

- f) Supply essential network support such as voltage and frequency regulation services, system restart, system strength and inertia which are not being supplied by all forms of VRE.

3.3.1 Project objectives

The project delivery strategy is to address the need for PHES projects which will contribute to the requirement forecast in AEMO's ISP. Commercial Operation Date (COD) of the PHES is targeted in 2029, similar to the forecast retirement time of Callide B power station.

The project objectives will benefit the NEM, Queensland, and the Mackay and Isaac local government areas.

These objectives include to:

- a) Support the Queensland Government's 70% Renewable Energy Target by 2032;
- b) Underpin the Renewable Energy Zone (AEMO's REZ Q4) through the provision of medium to long-term duration energy storage;
- c) Facilitate the buildout of additional modern renewables in the Northern Queensland Renewable Energy Zone (QREZ);
- d) Improve reliability of the NEM grid in Queensland through the project acting as a synchronous generator once operational;
- e) Underwrite the lowering of carbon emissions by enabling additional wind and solar generation in Queensland;
- f) Benefit the local and regional community through employment opportunities during construction and through the life span of operations;
- g) Replace system inertia in the NEM grid that will be left by retiring coal-fired thermal generation; and
- h) Reduce electricity prices during peak hours, by moderating the current trend of oversupply of solar generation in the middle of the day and undersupply of firm and dispatchable generation during peak hours in the morning and evening.

3.3.2 Project pre-feasibility assessment

In January 2020, the project was one of three recipients awarded a grant from the Commonwealth Department of Industry's *Supporting Reliable Energy Infrastructure Program*. This grant was used to complete the pre-feasibility study for the project (focused on additional EIS work required for the project, geotechnical, hydrology, grid connection, economic, electricity market and financial modelling).

These assessments, conducted by tier 1 professional services firms, commenced in July 2020 and completed in April 2021.

The feasibility study has commenced and is anticipated to be completed during 2024. Feasibility study activity completed or underway includes:

- a) Configuration of the generation and capacity to meet operational needs;

- b) Environmental impact assessment studies;
- c) Detailed geotechnical assessment; and
- d) Engagement with the Original Equipment Manufacturers for the pump/generator sets.

The project has secured the land required for the project and has entered into an Indigenous Land Use Agreement (ILUA) with the Widi people who are the Registered Native Title party of the country on which the PHES is proposed to be built (see also sections 4.3 and 5.3).

Key project issues relate to geotechnical matters, grid connection, securing water supply, workforce, time delays and provision of fish passage.

Key environmental matters that will be addressed by the EIS relate to waterway disturbance, water quality, threatened species habitat disturbance and environmental offsets.

3.3.3 Project alternatives

3.3.3.1 Alternative activities

The project addresses key elements of government policy as it relates to storage of renewable energy and firming of the grid (see section 1.2.2 for a description of these policies). PHES has been specifically targeted as being a favourable technology to meet these needs.

There are many novel and emerging technologies to store energy at grid scale⁹, however utility scale batteries and PHES are proven and ready to dispatch in the short time periods needed to address grid firming requirements.

While utility scale batteries are conceptually a feasible alternative to PHES projects, they tend to be smaller scale with the largest batteries in Australia being in the 200-300MW range. The ISP 2022 foresees that in order to meet storage goals, the energy storage capabilities for the grid will require a mix of batteries and PHES.

The area west and north-west of Mackay has been identified as a specific area of interest for PHES projects to be explored¹⁰. Consequently, a do nothing approach will not further the goals of government to specifically address this need in this location.

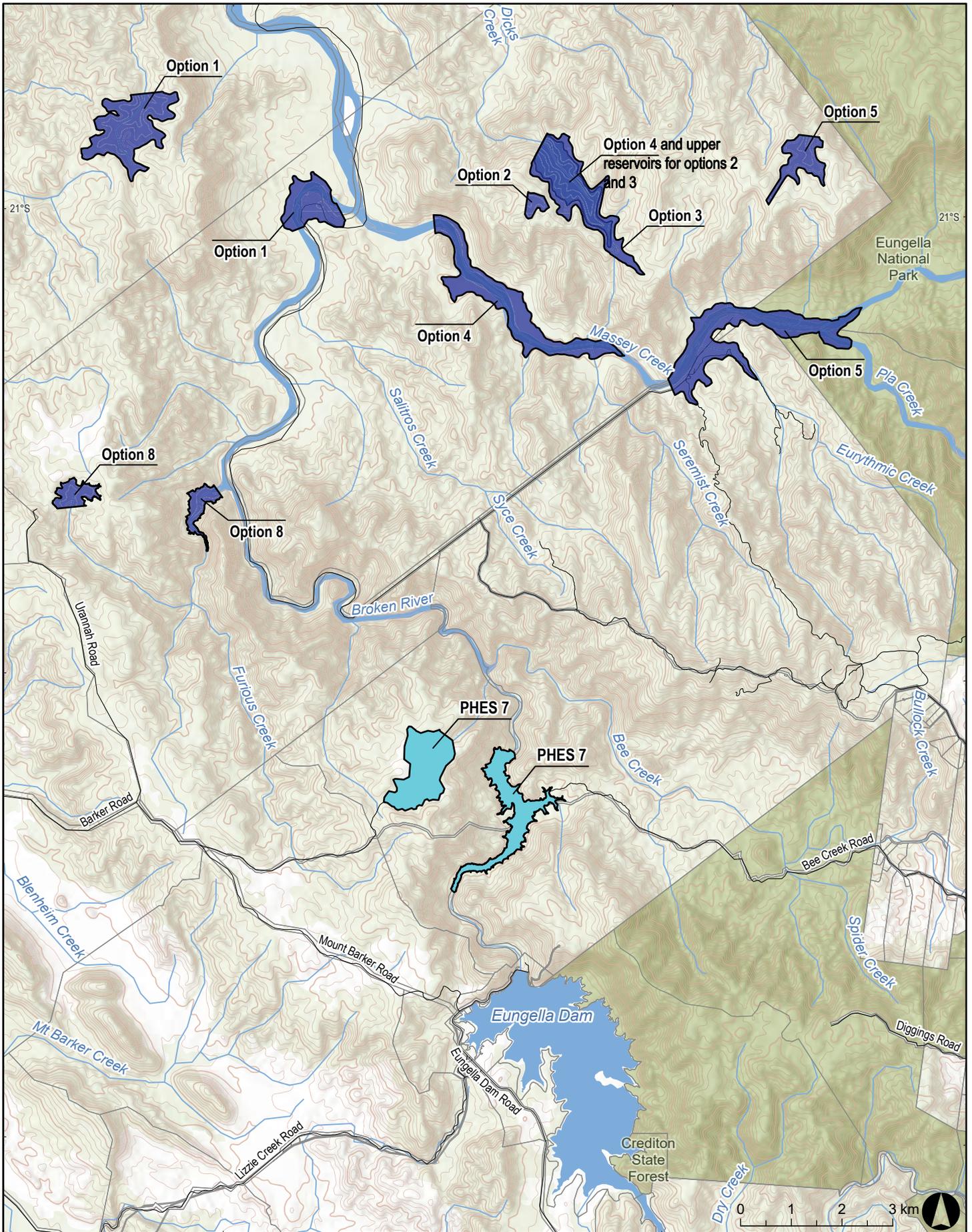
3.3.3.2 Project options

Several areas within the broader landscape of the project have been investigated for a PHES. Investigation of these locations included criteria such as ability to meet project objectives, overall viability, geotechnical suitability, environmental constraints, constructability and operability. Eight options were considered as shown in Figure 10.

⁹ For example, compressed air, thermal storage, magnetic superconductors, gravitational storage.

¹⁰ Queensland Energy and Jobs Plan 2022

PHES options 1-6 do not currently meet the assessment criteria for the project requirements and have been discounted. Options 7 and 8 were both considered viable with an overall preference for option 7 (the option ultimately chosen that is the subject of this application). Option 8 remains viable and may form a later stage of this project for which separate approvals would be sought at the appropriate time.



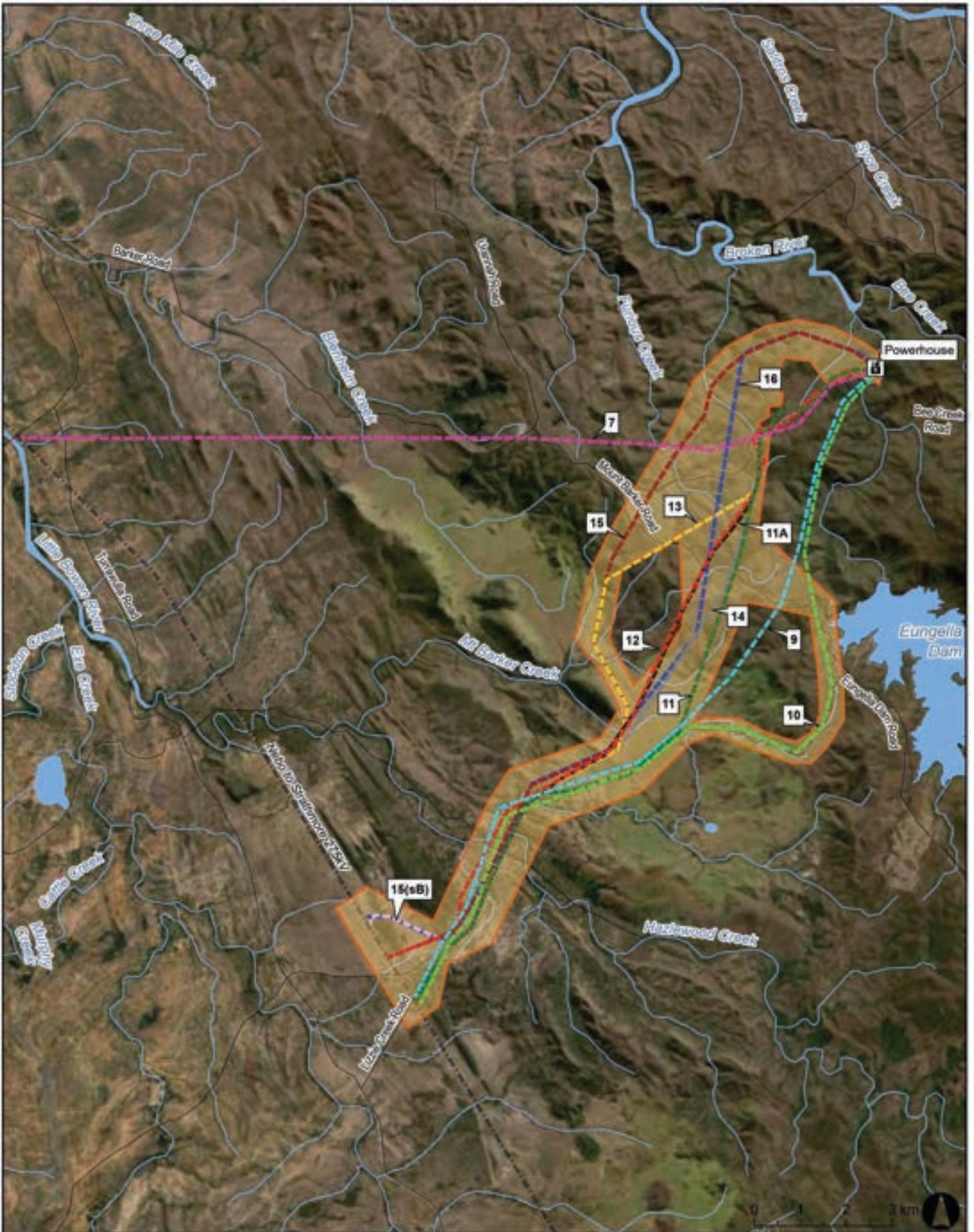
LEGEND

- Pumped Hydro Reservoirs - PHEs 7 (preferred option)
- Pumped Hydro Reservoirs - previous options considered

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PROJECT		
Capricornia PHEs and Transmission		
TITLE		
PRE-FEASIBILITY STUDY PHEs OPTIONS CONSIDERED		
DATE	STATUS	PRODUCED
29/08/2023	ISSUED FOR INFORMATION	AC
SCALE	DATUM	
1:100,000 at A3	GDA2020 MGA Zone 55	
FILE		FIG
CEH IAS - FIG 10 PHEs OPTIONS - IFI B		10

Preferred options for the transmission line have been identified through desktop analysis and considered topography, geology, environmental and infrastructure constraints. Ten options have been actively considered as shown in Figure 11. While options 15 and 16 are the current preferred options, the study area for the transmission line (see Figure 12) remains large enough to make changes to the route following further studies and consultation with the relevant stakeholders. It is intended to refine the route prior to lodging an EIS. In the refinement of transmission line route, impacts to environmental values are to be avoided where possible, or minimised and mitigated if unavoidable.

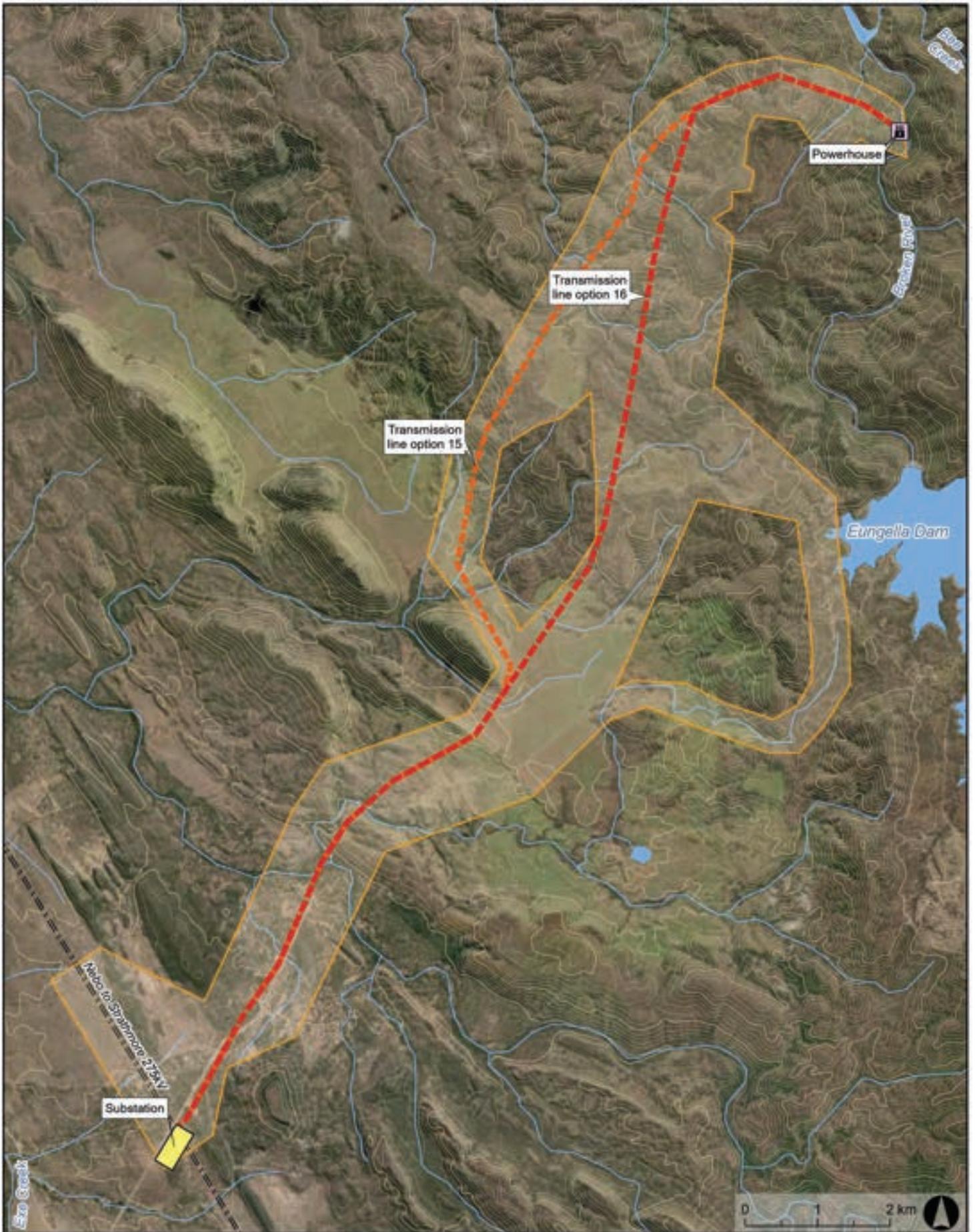


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- LEGEND**
- Existing transmission powerline
 - Existing road
 - Watercourse / waterbody
 - Proposed powerhouse
 - Transmission study areas
 - Option 7
 - Option 9

- Option 10
- Option 11
- Option 11A
- Option 12
- Option 13
- Option 14
- Option 15
- Option 15 Substation B Connection
- Option 16

PROJECT		
Capricornia PHES and Transmission		
TITLE		
TRANSMISSION LINE OPTIONS CONSIDERED		
DATE	STATUS	PRODUCED
31/08/2023	ISSUED FOR INFORMATION	AC
SCALE	DATUM	
1:110,000 at A3	GDA2020 MGA Zone 55	
FILE		FIG
CEH IAS - FIG 11 TX LINE OPTIONS - IFI B		11



LEGEND

- Transmission study area
- Proposed transmission line option 16
- Proposed transmission line option 15
- Proposed substation
- ⚡ Proposed powerhouse
- Existing transmission powerline
- Watercourse / waterbody

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PROJECT Capricornia PHES and Transmission

TITLE
**TRANSMISSION STUDY AREA
(with preferred options 15 and 16)**

DATE 31/08/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
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SCALE 1:70,000 at A3	DATUM GDA2020 MGA Zone 55
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FILE CEH IAS - FIG 12 STUDY AREA - IFI B	FIG 12
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3.4 Project components, developments, activities and infrastructure that constitute the project to be declared coordinated

The project the subject of this application includes two primary components, being the PHES and transmission.

The PHES components are:

- a) PHES reservoirs, comprising an upper reservoir with a valley in-fill wall, an instream lower reservoir within the Broken River and structures for operations and/or maintenance support;
- b) Spillway facilities at both reservoirs for flood and dam safety management;
- c) Powerhouse building (housing the generating/pumping units and control room);
- d) Switchyard;
- e) Structures connecting the reservoirs and powerhouse for water conveyance, including associated inlet and outlet structures;
- f) Spoil material use or disposal locations;
- g) Operations, maintenance and administration facilities;
- h) Various roads and tracks to access reservoirs and ancillary infrastructure; and
- i) Communications facilities.

The transmission components are:

- a) High voltage transmission line from the powerhouse and switchyard to the existing 275kV Strathmore to Nebo transmission line and a substation at the connection location; and
- b) Various roads and tracks to access the transmission line and substation.

The construction phase of the project will require the conduct of various activities and the development of temporary infrastructure and facilities, which may include:

- a) Land clearing and vegetation management;
- b) Earthworks and haulage;
- c) Drilling and blasting;
- d) Concrete batching and sourcing/supply of materials to batching plants;
- e) Stand alone power generation;
- f) Temporary water supply;
- g) Construction/assembly of the project components;
- h) Riverine management during reservoir construction; and
- i) Construction, operation and decommissioning/rehabilitation of temporary infrastructure and facilities including:
 - i. Access tracks and roads;

- ii. Sediment, stormwater and other environmental control systems;
- iii. Laydown areas;
- iv. Staging areas;
- v. Workshops;
- vi. An in-reservoir quarry (upper reservoir) to provide material for the construction of the reservoir walls for the PHES;
- vii. Construction camp accommodation, including necessary support facilities such as wastewater treatment and disposal, power generation, communications and water supply; and
- viii. Quality control and testing facilities.

Table 1 provides an indicative estimate of area required for components of the project based on current designs that are subject to further iteration and refinement.

Table 1: Indicative Area Required for Project Components¹¹

Project Component	Area (Ha)	Comments
Upper Reservoir	117	Inc walls and inundation area
Lower Reservoir	111	Inc walls and inundation area
Powerhouse and Switchyard	1	
PHES Access Tracks	18	
Reservoir walls construction envelope	22	Allowance for temporary work areas upper and lower reservoir walls
Allowance for ancillary Infrastructure (camps, laydowns, storage, workshops, crushing and batching plants and areas, stockpile and waste areas, administration and communications facilities) (several options) ¹²	66	Mostly temporary work areas with administrative buildings, communications facilities and workshops to remain post commissioning.
Allowance for existing road widening, upgrades and extensions in project area (several options)	37	

¹¹ Area estimates do not necessarily equal land clearing. Estimates are prior to mitigation measures being applied, co-location of facilities and may occur in previously disturbed or cleared areas.

¹² Allowances for disturbance areas are made where definitive locations have yet to be determined or where more than one option is available consistent with EPBC referrals. The final area required for the component will likely be lower than stated as design progresses, final options are chosen and mitigation measures applied.

Project Component	Area (Ha)	Comments
Transmission line (longest of two options)	182	
Allowance for transmission line access tracks (greatest of two options)	19	
Substation	15	

The total footprint of the PHES and its associated infrastructure is approximately 370 hectares, of which about 43 hectares is non remnant / regrowth vegetation.

The total footprint of the transmission option with the greatest area of disturbance is approximately 215 hectares, of which about 94 hectares is non-remnant / regrowth vegetation.

3.5 External infrastructure requirements

The project will utilise existing road networks from the north through Bowen, Collinsville, Turrawulla Road and Mount Barker Road, and from the south through Mackay, Peak Downs Highway, Suttor Development Road, Turrawulla Road and Lizzie Creek Road. Light vehicle access will also utilise Eungella Dam Road.

The road network around the project area is shown in Figure 13.

The energy generated by the project will require connection to the existing Powerlink 275kV Strathmore to Nebo transmission line. This is being pursued according to established connection processes with Powerlink. The transmission network is shown in Figure 14.

Once construction of the project is complete, there will not be a significant demand on external infrastructure, with only operations and maintenance activities requiring access on existing public roads.



LEGEND

-  Capricornia PHES and Transmission (the project)
-  State controlled road
-  Local road
-  Watercourse / waterbody
-  Protected areas

Sources:
State controlled roads - Queensland,
22/08/2022

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PROJECT **Capricornia PHES and Transmission**

TITLE **ROAD NETWORK IN THE REGION OF THE PROJECT**

DATE 31/08/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
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SCALE 1:900,000 at A3	DATUM GDA 1994 MGA Zone 55
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FILE CEH IAS - FIG 13 TRANSPORT - IFI B	FIG 13
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Source:
Electricity Transmission Lines ©
Commonwealth of Australia (Geoscience
Australia) 2021

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LEGEND

-  Capricornia PHES (the project)
- Existing transmission powerline Capacity
 -  275kV
 -  132kV
-  Roads
-  Watercourse / waterbody
-  Protected areas

PROJECT Capricornia PHES and Transmission

TITLE
EXISTING TRANSMISSION NETWORK

DATE	STATUS	PRODUCED
1/09/2023	ISSUED FOR INFORMATION	AC

SCALE	DATUM
1:2,500,000 at A3	GDA2020 MGA Zone 55

FILE	FIG
CEH IAS - FIG 14 TX NETWORK - IFI B	14

3.6 Timeframes for the project

Key milestones and the anticipated date of completion are detailed in Table 2.

Table 2: Key milestones and timeframes for project development and operations¹³

Stage	Commencement	Completion	Status
Concept	June 2019	December 2019	Complete
Prefeasibility	January 2020	March 2021	Complete
Feasibility and reference design (including EPBC referrals and EIS lodgement)	April 2021	December 2024	In Progress
Design and construct	January 2025	December 2028	Not started
Commissioning (6 months)	January 2029	June 2029	Not started
Operation (at least 75 years)	2029	2104	Not started
Decommissioning (2 years)	As required		

3.7 Construction and operational processes

A construction program and schedule have been developed for the project and anticipates a four year construction period. The construction program anticipates a construction order as follows:

- a) Detailed design, procurement and site early works (camp construction, laydowns etc);
- b) Access road construction;
- c) Quarry preparation (quarry material will be sourced from the area to be inundated by the upper reservoir) and crusher establishment;
- d) Where underground connection between the reservoirs and powerhouse is the preferred option, vertical shaft development followed by the tunnels;
- e) Powerhouse site preparation;
- f) Upper and lower reservoir construction including land clearing of the inundation area; and
- g) Powerhouse construction.

Transmission line and substation construction would occur concurrently with the PHES construction.

¹³ Timeframes and milestones are subject to periodic review.

Options for water supply during construction are being considered, however import of water from Eungella Dam is a possible option. Waste management during construction and operations is discussed in section 5.5.

External road networks will be utilised to deliver the main equipment for the construction phase which will predominantly be earthmoving equipment and deliveries of the powerhouse components, head and tail race manifolds and transmission and switching / substation equipment. As discussed in section 5.2.2 (Traffic and Transport), the existing road network is sufficient to handle the construction equipment with possible minor upgrades required.

There will be a high demand for water for the initial filling of the reservoirs to prepare the PHES for commissioning. Water sources are being investigated, although the Eungella Dam is again a possible source should allocations be available or traded. Once the initial fill is completed, seepage and evaporation losses will require make-up throughout the life of the project if demand cannot be met by river flow.

Once construction is complete, disturbed areas not required for operations will be rehabilitated to facilitate continuation of the pre-disturbance land use (i.e., grazing).

The project is expected to be operational for a minimum of 75 years.

3.8 Workforce requirements during construction and operation

A workforce of up to 600 workers is estimated to be required to construct the project. This construction workforce would be sourced from the region, state and interstate as required to meet role requirements.

Due to the remote location of the construction site, it is planned that onsite accommodation would be provided for a significant proportion of the construction workforce, who would mostly be made up of fly-in-fly-out and drive in-drive-out workers. The onsite accommodation would be comprised of prefabricated and transportable buildings and amenities and is designed to be temporary for the construction and commissioning phase of the project.

The operational workforce is expected to comprise of up to 65 personnel and include an onsite caretaker, with support staff (electrical and mechanical) housed locally or in the region to facilitate drive-in-drive-out routine operations maintenance.

3.9 Economic indicators

3.9.1 Capital cost estimate

Capital cost estimates have been prepared for the project as part of the feasibility study. The cost estimate is considered to be high Class 4 (+50%/-30%) in accordance with AACE International Recommended Practice No. 18R-97.

In order to reflect varying degrees of uncertainty in the estimates of both quantities and rates, individual contingency amounts have been applied against each line item for quantities and rates.

The total estimated capital cost for the project, including contingency, is summarised in Table 3.

Table 3: PHES capital cost estimate (2023) for development of the project (\$AUD)

	Item	\$M
Construction		
Contractor Direct Costs	Engineering and design, site development, construction of reservoirs, waterways (tunnels), powerhouse.	1,362.26
Contractor Indirect Costs	Mobilisation / demobilisation, project management, support services, fees and insurances.	478.38
Principal's costs	Materials, construction services, other	141.12
Principal		
Principal's Costs	Development expenses, project management, administration, insurance, fees and levies, property expenses	304.16
Risk and Contingency		389.75
Escalation		197.05
Project Cost		2,872.74

3.9.2 Revenue

The operator of the project will generate revenue by selling power generated and ancillary services into the National Electricity Market, as well as providing portfolio benefits particular to the operator such as operation flexibility for portfolio assets.

3.9.3 Contribution and impacts to economy

The project is located in the Bowen Basin in Queensland which has significant existing industrial activity, meaning that a significant portion of the construction works can be carried out with local experience by leveraging off the local mining industry.

Early economic impact analysis shows Type 1 (supply chain) multipliers of over 2 times (on direct expenditure), and type 2 multipliers (economic impact) of over 3 times (on direct expenditure). This economic analysis of the project will be revised during the feasibility study.

3.10 Financing requirements and implications

The development and construction of the project will be funded by CIP who have the demonstrated technical and financial capability to develop, construct and operate a project of this nature. The MoU contemplates a potential opportunity for CS Energy to consider possible participation in the development and operation of the project.

Table 4 details the estimated expenditure required to deliver each phase of the project.

Table 4: Estimated expenditure required to deliver each stage of the project.

Stage	Expenditure	Status
Concept	\$1m	Complete
Prefeasibility	\$9m	Complete
Feasibility and reference design (including OEM engagement and Early Contractor Involvement)	\$40m	In progress
Construction	\$2,576m	Not started

4 LOCATION OF KEY PROJECT ELEMENTS

4.1 Location

The project is situated in the locality of Eungella Dam about 70km south-east of Collinsville and about 80km west of Mackay. Locally, the project is west of Eungella (10km), Finch Hatton (26km) and east south-east of Newlands (58km).

Access to the project area is by public roads from the east (Mackay and Eungella), the north and west (Bowen and Collinsville) and the south (Nebo).

The project area occurs within four land parcels (see Figure 16):

- a) Lot 2 on SP104779 (Turrawulla Station);
- b) Lot 100 on SP239828 (Eungella Station);
- c) Lot 110 on SP334138 (Eungella Station); and
- d) Lot 112 on SP334138 (Eungella Station).

The project area is within the Mackay and Isaac Local Government Areas.

The nearest protected areas are the Crediton Forest Reserve (2.5 km), Crediton State Forest (5.8 km) and the Eungella National Park (8.7 km).

Topography within the project area is variable. The project area is characterised by steep terrain with prominent ridges and escarpments down to the Broken River. The transmission study area traverses steep ridges and gullies in the east and foothills and plainlands in the west.

4.2 Tenure and land use

The land on which the project is proposed is sparsely populated and characterised by large rural properties primarily used for cattle grazing. It is proposed to be located on two large rural holdings (comprising 4 land parcels), being Eungella Station (PHES, transmission, access and ancillary infrastructure) and Turrawulla Station (transmission and access). Table 5 details the land use, tenure and regional planning designations of the project area.

Table 5: Tenure, land use and planning designation of land parcels in project area

Real Property Description	Tenure	Local Government Area	Planning Scheme Zoning	Regional Plan Designation	Current Use	Proposed Project Use
Lot 2 on SP104779	Leasehold	Isaac (part)	Rural	Regional Landscape and Rural	Grazing	Transmission and access

Real Property Description	Tenure	Local Government Area	Planning Scheme Zoning	Regional Plan Designation	Current Use	Proposed Project Use
				Production Area		
Lot 2 on SP104779	Leasehold	Mackay (part)	Open Space	Regional Landscape and Rural Production Area	Grazing	Transmission and access
Lot 110 on SP334138	Leasehold	Mackay	Open Space	Regional Landscape and Rural Production Area	Grazing	PHES, powerhouse, transmission, access and ancillary infrastructure.
Lot 112 on SP334138	Leasehold	Mackay	Open Space	Regional Landscape and Rural Production Area	Grazing	Transmission, access, ancillary infrastructure.
Lot 100 on SP239828	Freehold	Mackay	Open Space	Regional Landscape and Rural Production Area	Grazing	Transmission, access, ancillary infrastructure.

In relation to existing land use, the project:

- a) Intersects 3 mining tenures and 0 petroleum tenures (see Figure 15):
 - i. Exploration Permit (Minerals) application 28203;
 - ii. Exploration Permit (Minerals) granted 27635;
 - iii. Mining Lease (Minerals) granted ML100294.
- b) Is not within a key resource area (KRA);
- c) Intersects Agricultural Land Class B on some sections of the transmission routes;
- d) Does not intersect any existing rail infrastructure;
- e) Does not intersect any power transmission infrastructure (other than at the connection point);
- f) The lower PHES reservoir will intersect the dedicated (but unmade) Bee Creek Road; and
- g) Depending on the final route selected, the transmission line may intersect various local roads, watercourses or water easements. Once the transmission line route is refined, consultation with easement holders will be undertaken.

The project is proximate to one known stock route (stock route 409ISAA previously listed as U409NEBO01). This stock route is located approximately 18km west of the PHES reservoirs and is located within Lot 2 SP104779 (rolling term lease). The status of this stock route is listed as opened however, the classification is minor and unused. The stock route follows Turrawulla Road to the west of the substation. The project footprint does not overlap with the stock route, however the route may be affected by project traffic. The impact of traffic utilising Turrawulla Road will be assessed in a traffic impact assessment as part of the EIS.

Granted mining lease 100294 is located within the project area but is not located within the current project footprint of areas to be developed as part of the project. The mining lease holder will be consulted as the project progresses.

The project is not considered to adversely impact on the intended use of rural land for rural purposes. In accordance with local government planning scheme provisions, the project is considered compatible with existing and future land uses in the rural zone. The project is consistent with, and contributes to, the desired regional outcomes of the *Mackay, Isaac and Whitsunday Regional Plan 2012*. The importance of renewable energy is expressed throughout the plan and improving availability of and access to renewable energy is also a prominent theme.

The current land use is shown in Figure 6 and land tenure in Figure 16.

To secure tenure for the project, the strategy of the proponent companies is to reach agreement for the purchase, lease or granting of easement over affected land with the land or lease holder.

For freehold land, the project intends to purchase or lease land where applicable, or for transmission requirements, seek an easement over the land by agreement with the land owner and application to the Department of Resources.

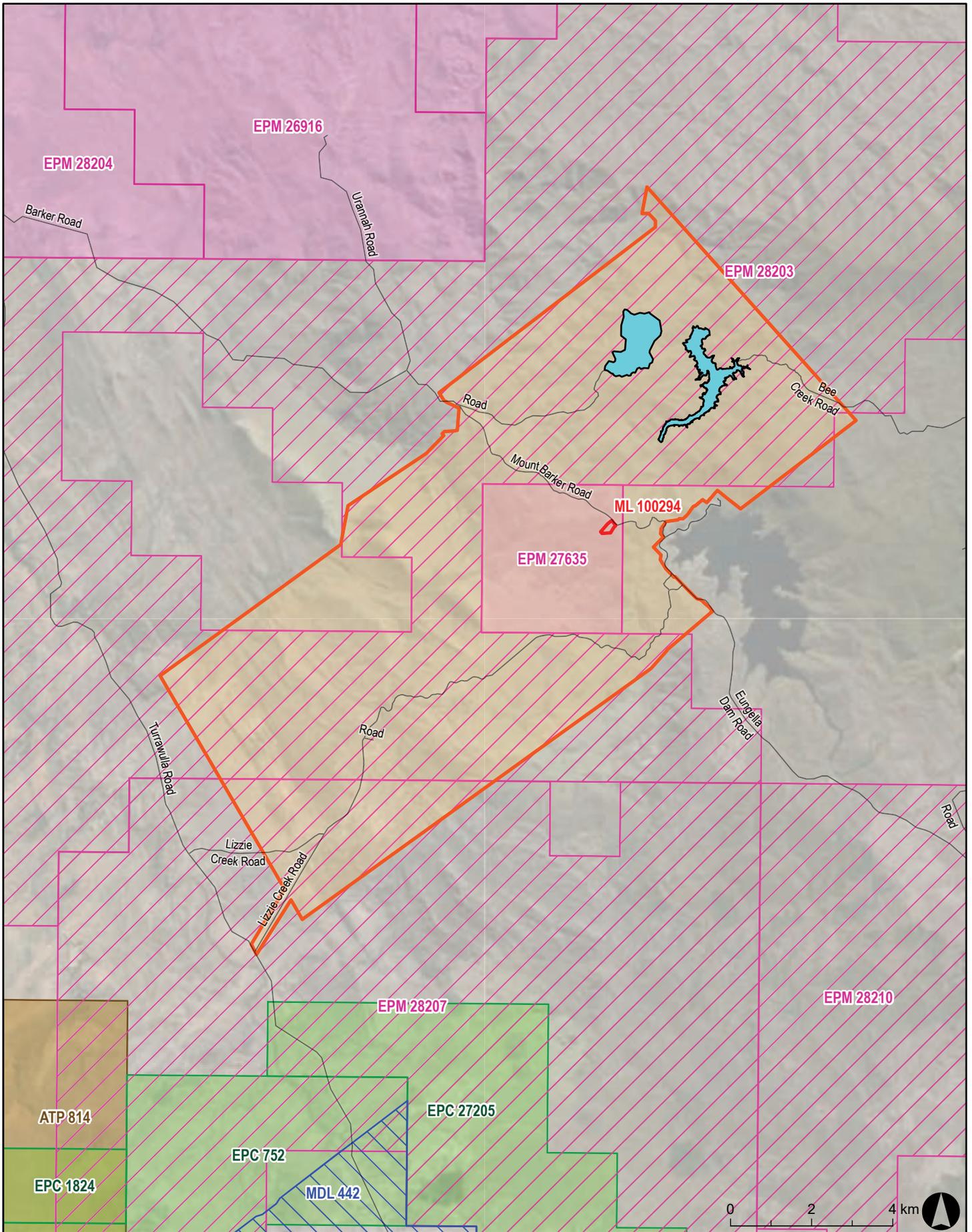
For leasehold land, the project intends to purchase the lease from the existing leaseholder and add an additional purpose (renewable energy) to the lease by application to the Department of Resources. For transmission purposes, the project will investigate seeking an easement over affected lands with agreement of the leaseholder and approval of the Department of Resources.

4.2.1 Areas of Regional Interest

The *Regional Planning Interests Act 2014* (RPI Act) identifies areas that contribute, or are likely to contribute to the economic, social and environmental prosperity of Queensland. The RPI Act identifies the following matters as "areas of regional interest":

- a) Strategic cropping area;
- b) Priority agricultural area;
- c) Priority living area; or
- d) Strategic environmental area.

None of the areas of interest occur within the project area.



Sources:
Mines Permits Current © State of Queensland
(Department of Resources) 2022. Download
08/02/2023.

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LEGEND

- Capricornia PHES (the project)
- Proposed pumped hydro reservoirs
- EPC Permit Granted
- EPM Permit Application
- EPM Permit Granted
- ATP Permit Granted
- MDL Permit Granted
- ML Permit Granted

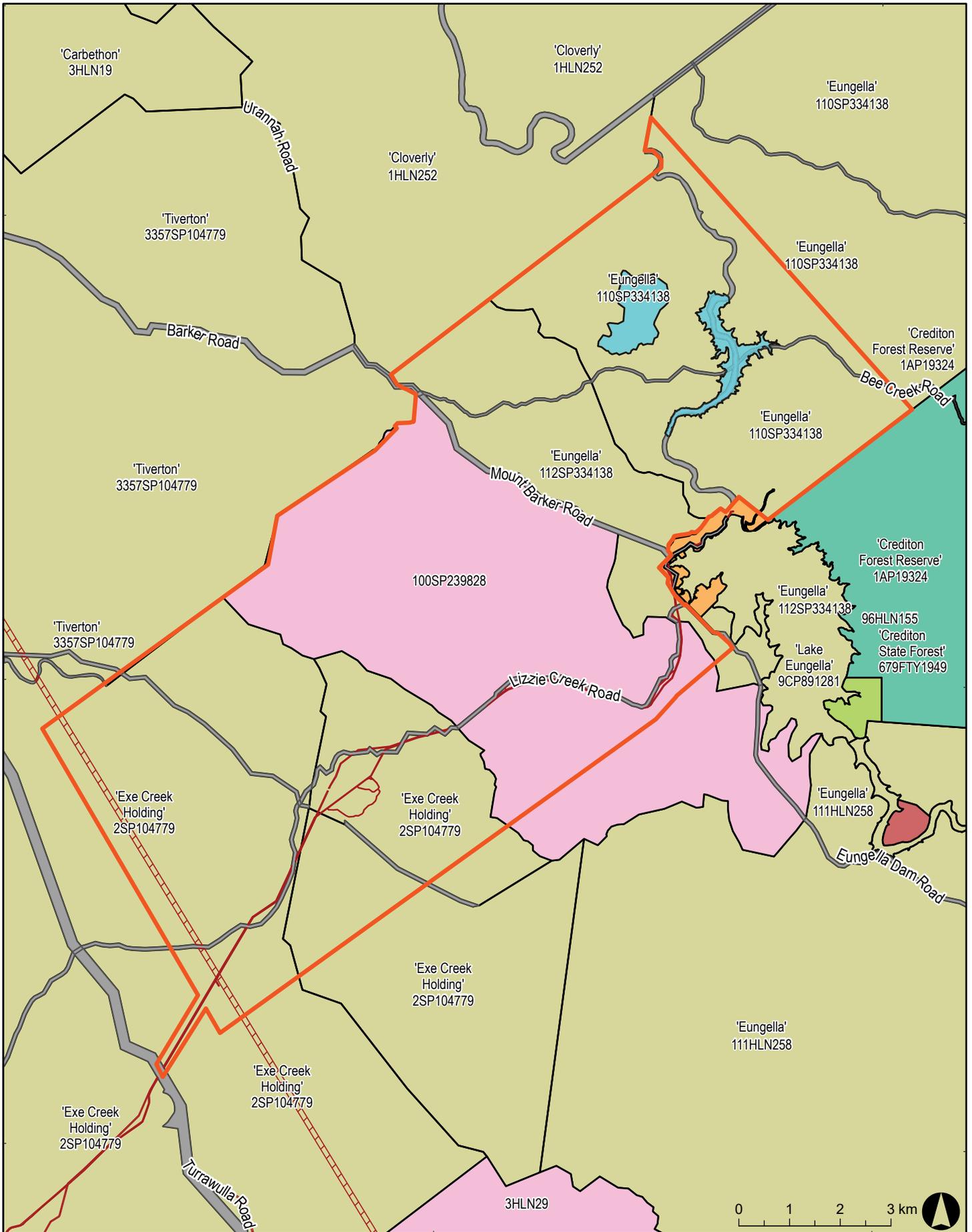
PROJECT **Capricornia PHES and Transmission**

TITLE
**MINING AND PETROLEUM
TENURE**

DATE 7/12/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
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SCALE 1:125,000 at A3	DATUM GDA 1994 MGA Zone 55
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FILE CEH IAS - FIG 15 MINING PETROLEUM - IFI C	FIG 15
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Sources:
Land parcel boundaries - Queensland,
08/2022

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LEGEND

-  Project area
-  Proposed pumped hydro reservoirs
- Land tenure**
-  Easement
-  Forest Reserve
-  Freehold
-  Lands Lease
-  Reserve
-  Road Reserve
-  State Forest
-  State Land

PROJECT Capricornia PHES and Transmission		
TITLE LAND TENURE		
DATE 7/12/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
SCALE 1:100,000 at A3	DATUM GDA 1994 MGA Zone 55	
FILE CEH IAS - FIG 16 LAND TENURE - IFI C	FIG 16	

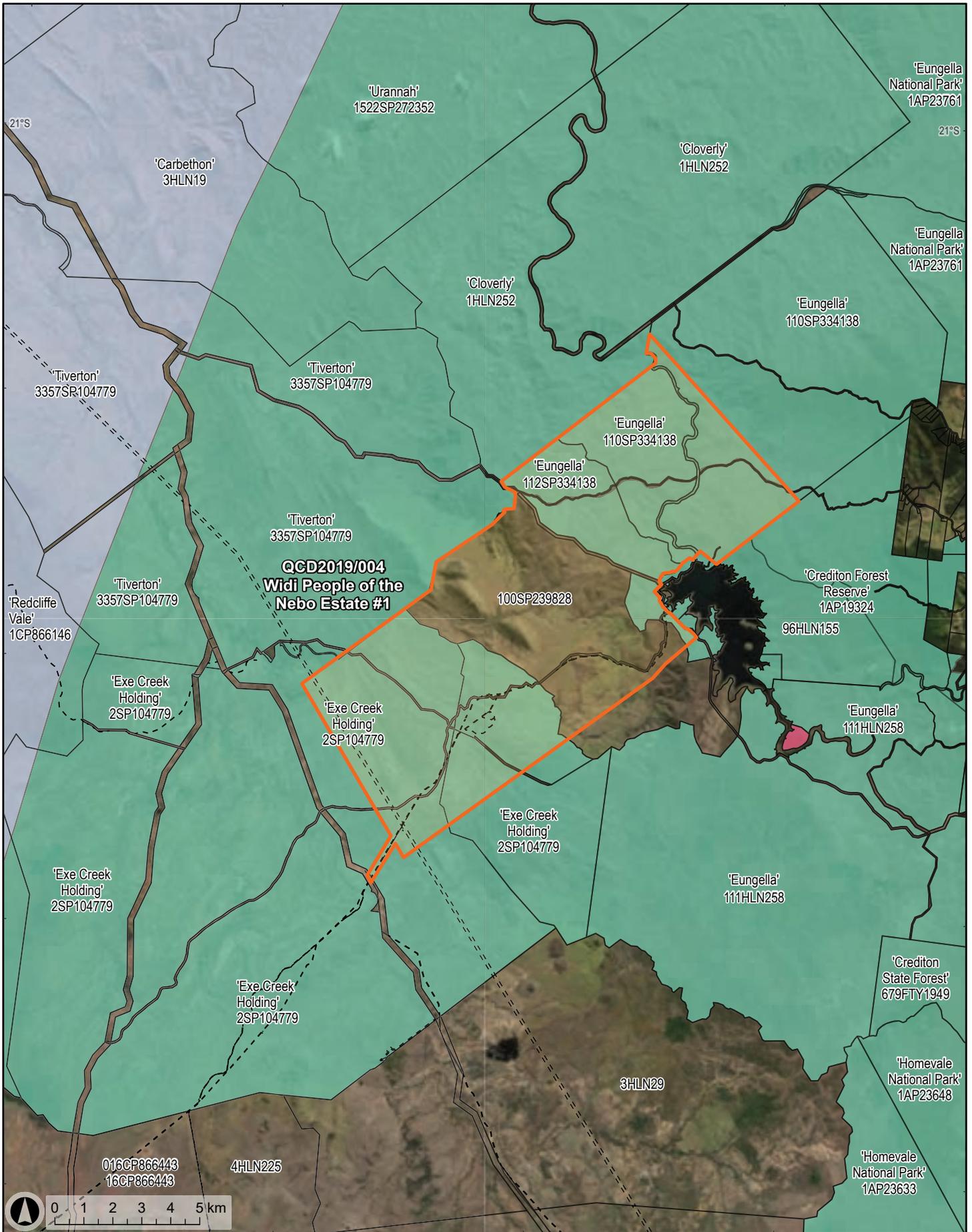
4.3 Native Title

The Widi People of the Nebo Estate #1 are the Registered Native Title Body of all the project footprint, the project area and most of the area of the host properties (see Figure 17). For a small part of Lot 2 on SP104779, the registered native title claimant is Birriah Aboriginal Corporation. This area does not occur within the project footprint or the project area.

An ILUA was signed with the Widi People on 12 November 2022. The ILUA has been registered with the National Native Title Tribunal.

The project is currently in discussion with the Birriah People to reach an ILUA.

Land dealings within the project area are not expected to result in the extinguishment of native title.



Sources:
Native Title Determination Outcomes -
National Native Title Tribunal, ©
Commonwealth of Australia. Correct as at
7/12/2023.

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in relation to any use of the data in this map.

LEGEND

- Project area
- Easement
- Lot

Native Title Determination Outcomes

- Native title exists (exclusive) - Widi Aboriginal Corporation
- Native title exists (non-exclusive) - Birriah Aboriginal Corporation RNTBC
- Native title exists (non-exclusive) - Widi Aboriginal Corporation

PROJECT Capricornia PHES and Transmission			
TITLE NATIVE TITLE BOUNDARIES			
DATE 7/12/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC	
SCALE 1:175,000 at A3	DATUM GDA 1994 MGA Zone 55		
FILE CEH IAS - FIG 17 NATIVE TITLE - IFI C	FIG 17		

5 DESCRIPTION OF THE EXISTING ENVIRONMENT, IMPACTS AND MITIGATION MEASURES

5.1 Natural environment

The landscape of the project area is comprised of steep rocky and rolling hills of open ironbark woodland ranging from 400m to 820m Australian Height Datum (m AHD). Scattered patches of dry rainforest are present amongst the rocky gorges. Historically, the land has been subject to low intensity cattle grazing (both improved and unimproved).

The average yearly rainfall at Eungella Dam is about 1,300mm, with a range of about 1,000mm to 1,700mm.

5.1.1 Land

5.1.1.1 Land use

Land use in the vicinity of the project is predominantly rural zoned land for grazing, and open space and recreation. Land use is not considered to be adversely affected by the project and is consistent with planning schemes. See section 4.2.

5.1.1.2 Topography

The project is located in areas with high variability of elevation due to the mountainous nature of the region, ranging in elevation from approximately 400m AHD to 820m AHD.

The upper reservoir is located on the high country west of the Broken River and sits within a wide undulating valley. Slopes comprise grassy undulating terrain with small gullies, a flattish valley floor and sparse trees. Slopes are around 15°. The lower reservoir is located within the Broken River. The riverbed is approximately 30m wide and founded on massive rock slabs.

Contours of the project area are shown in Figure 2.

5.1.1.3 Geology

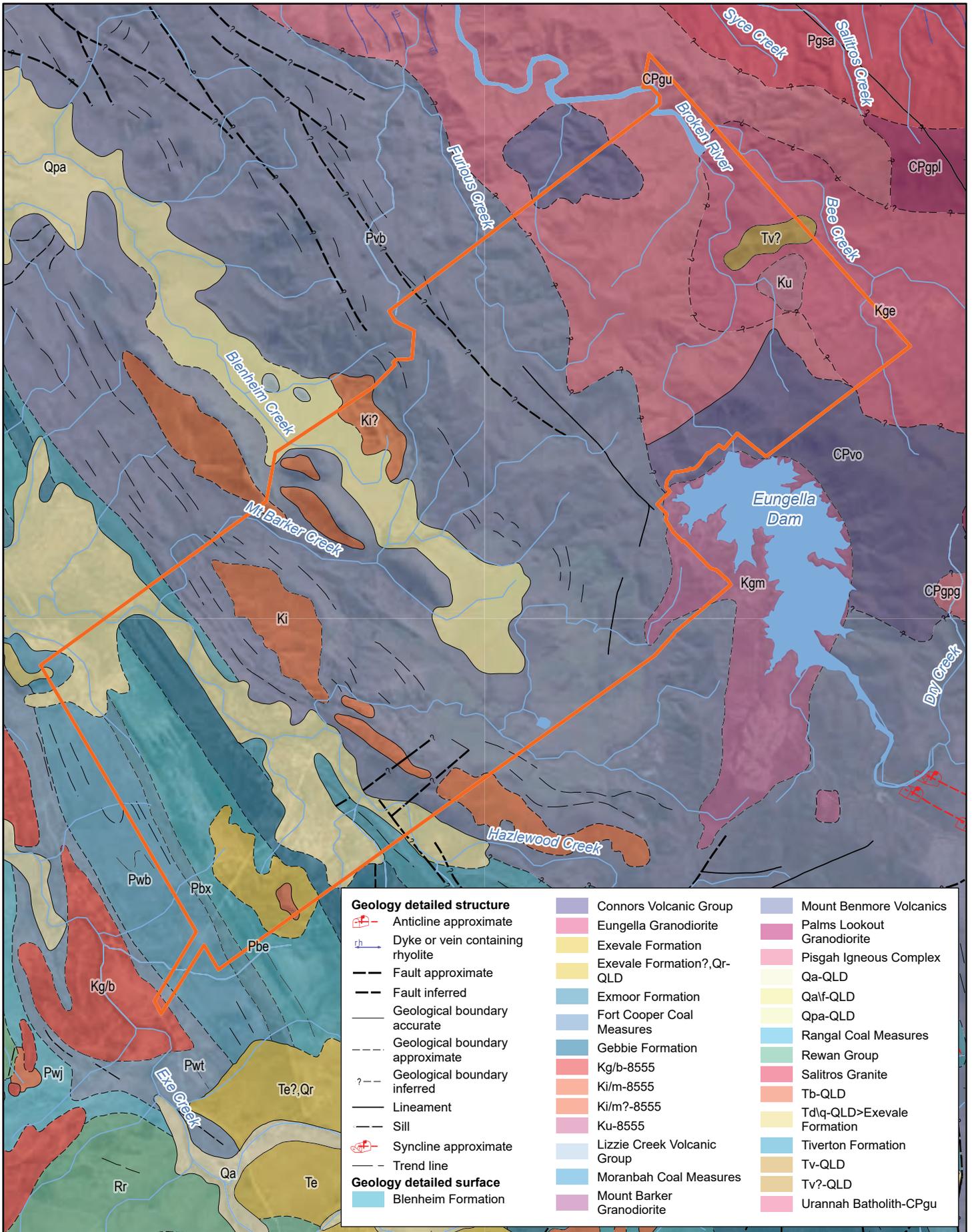
The project is located within the eastern section of the Tasman Orogenic Zone, known as the New England Orogen. In Queensland, the New England Orogen is subdivided into several geological provinces with the project located within the Connors–Auburn Province; a linear belt of predominantly subaerial, terrestrial felsic volcanics and granitoids of the Auburn sub-province in the south and the Connors sub-province in the north.

On a finer regional scale, the Brigalow Belt bioregion is characterised by resistant basement rocks, comprising of granite and a mix of volcanic rocks including tuff and 'welded' air-fall pyroclastic types as well as lavas. To the south-east of Charters Towers, alluvial and colluvial plains associated with large river systems are dominant.

The project is underlain by the Eungella Granodiorite of the Early Cretaceous (~145 to 65 million years ago) and numerous formations of Early Permian aged (~270 to 299 million

years ago) Granitoids thought to be part of the Urannah Complex of the Early Permian to Carboniferous age. The geology represents a complicated history of intrusive events throughout the wider area.

Major geology of the project area is shown in Figure 18.



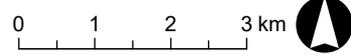
Geology detailed structure		Geology detailed surface	
	Anticline approximate		Blenheim Formation
	Dyke or vein containing rhyolite		
	Fault approximate		
	Fault inferred		
	Geological boundary accurate		
	Geological boundary approximate		
	Geological boundary inferred		
	Lineament		
	Sill		
	Syncline approximate		
	Trend line		
			Connors Volcanic Group
			Eungella Granodiorite
			Exeveale Formation
			Exeveale Formation?, Qr-QLD
			Exmoor Formation
			Fort Cooper Coal Measures
			Gebbie Formation
			Kg/b-8555
			Ki/m-8555
			Ki/m?-8555
			Ku-8555
			Lizzie Creek Volcanic Group
			Moranbah Coal Measures
			Mount Barker Granodiorite
			Mount Benmore Volcanics
			Palms Lookout Granodiorite
			Pisgah Igneous Complex
			Qa-QLD
			Qa/f-QLD
			Qpa-QLD
			Rangal Coal Measures
			Rewan Group
			Salitros Granite
			Tb-QLD
			Td\q-QLD>Exeveale Formation
			Tiverton Formation
			Tv-QLD
			Tv?-QLD
			Urannah Batholith-CPgu



Sources:
 Detailed surface geology - Queensland, Aug 2022
 Detailed structure - Queensland, Aug 2022

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LEGEND
 Project area
 Watercourse / waterbody



PROJECT Capricornia PHES & Transmission		
TITLE MAJOR GEOLOGY OF THE PROJECT AREA		
DATE 7/12/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
SCALE 1:100,000 at A3	DATUM GDA 1994 MGA Zone 55	
FILE CEH IAS - FIG 18 GEOLOGY - IFI C	FIG 18	

5.1.1.4 Soils

Large scale soil mapping in the project area indicates that sodosols are the dominant soil type. This soil type generally has high sodicity leading to high erodibility, poor structure and low permeability. Acid sulfate soils are considered unlikely due to the elevation of the project area.

Soil erosion can result in a loss of soil resources which can affect the ability of disturbed areas to be rehabilitated. Releases of sediment to surface waters can also affect water quality and aquatic ecosystems. Construction activities that have the potential to cause erosion and land instability include:

- a) Vegetation clearing to accommodate the establishment of construction facilities (storage and laydown areas, batching plants and stockpiles etc);
- b) Vegetation clearing to accommodate site access and required road upgrades to facilitate construction access;
- c) Vegetation clearing associated with construction activities at river crossings;
- d) Excavation and construction of earthworks, dams and embankments; and
- e) Establishment of stockpiles and movement of spoil material.

Erosion and sediment control measures employed during construction will be consistent with the practices described in the IECA Best Practice Erosion and Sediment Control Guideline (IECA 2008). A site-specific Construction Environmental Management Plan (CEMP), including an erosion and sediment control management plan will be developed and implemented.

During the operational phase of the project, potential impacts will be largely associated with changed flow regimes and increased erosion and sedimentation potential. These impacts will be managed through an Operational Environmental Management Plan (OEMP). The potential for salinisation will also be investigated in an EIS for the project.

5.1.1.5 Visual amenity

The study area is characterised by being sparsely populated with large rural properties and minimal built environment characteristics. The area has a mix of landscape features including valleys and escarpments, grasslands and woodlands. Prominent existing built features include Eungella Dam, roads and the Strathmore to Nebo transmission line.

The presence of the Eungella Dam and pipelines in the existing landscape allows capacity for the type of infrastructure proposed such as the upper and lower reservoirs and associated ancillary infrastructure within the existing landscape. However, infrastructure including transmission towers, construction activities, quarrying, earthworks and the presence of construction traffic and personnel are uncommon features in the existing environment along the Broken River and the agricultural surrounds.

Measures to mitigate visual amenity impacts may include:

- a) Minimising impacts through design and consultation with relevant stakeholders;
- b) Targeted rehabilitation and revegetation of temporary disturbance areas to integrate into the surrounding landscape; and

- c) Avoiding and minimising landscape and visual impacts during construction. As far as reasonably practicable, locate construction equipment, stockpiles, and other visible elements away from key sensitive receptor views.

5.1.1.6 Nature conservation reserves

The project does not intersect any reserve areas but is located approximately 2.5km north-west of the Crediton Forest Reserve and approximately 8.7km west of the Eungella National Park, both protected under the *Nature Conservation Act 1992* (see Figure 1).

5.1.2 Water

5.1.2.1 Existing environment

The project area is located within the Burdekin Basin in Central Queensland. The Burdekin Basin is the second-largest river basin in Australia covering an area of ~134,000km². The waterways¹⁴ in the basin vary from largely sandy, dry ephemeral creek systems to permanently flowing clear-water rivers and creeks originating in mountain rainforest.

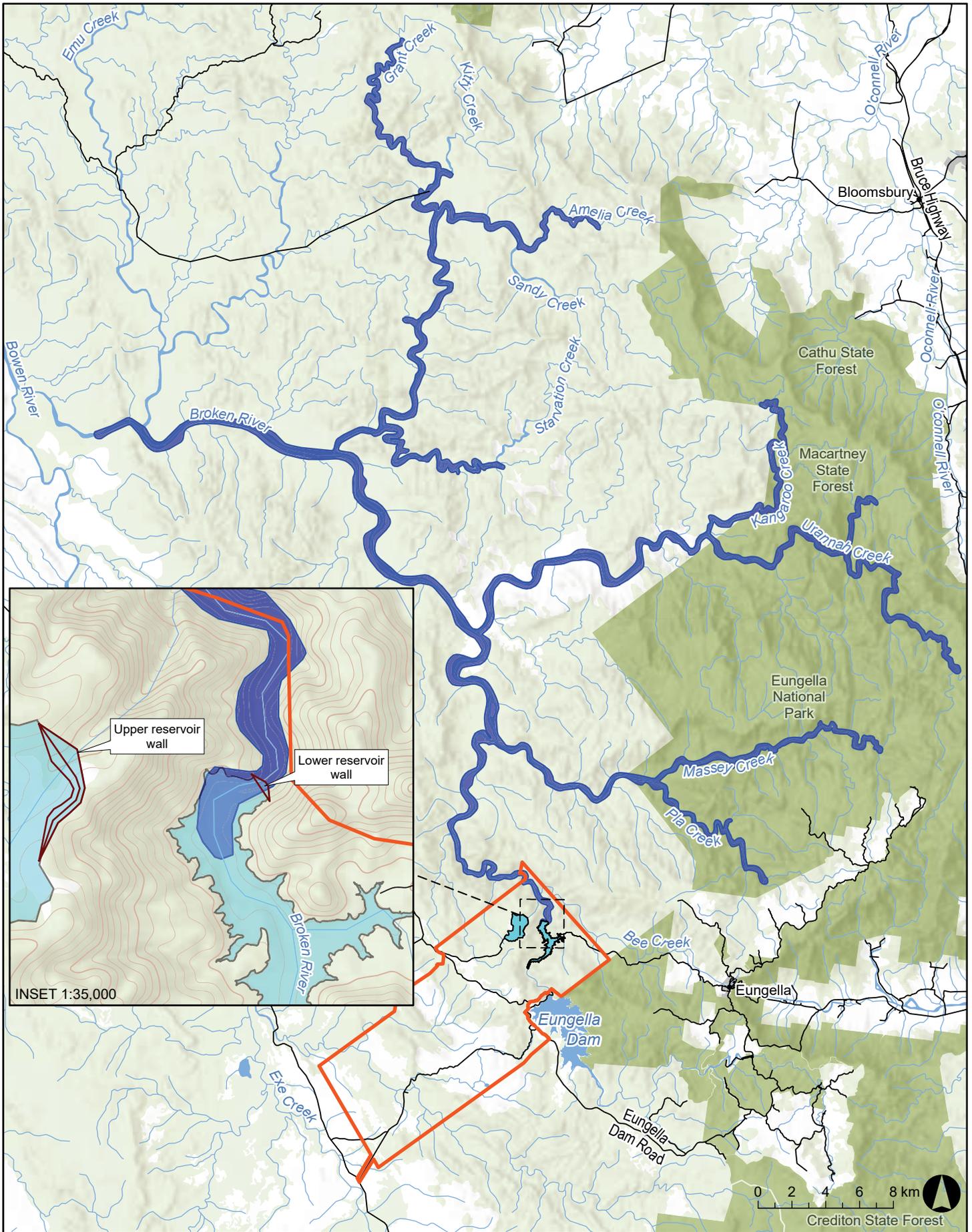
The Burdekin Basin contains a range of environmental values including groundwater dependent ecosystems, surface water, freshwater rivers, creeks and streams, wetlands, estuaries, coastal and marine systems (NQ Dry Tropics 2016).

The project area occurs within the Bowen River sub-catchment. This sub-catchment covers approximately nine percent of the Burdekin Basin and includes Bogie River, Bowen River, Broken River, Glenmore Creek, Little Bowen River, Pelican Creek and Rosella Creek (NQ Dry Tropics 2016). Named waterways are shown in Figure 2 and waterways displayed according to the spatial data layer '*Queensland waterways for waterway barrier works*' in Figure 20.

One Wetland of National Significance listed in the Directory of Important Wetlands of Australia is located marginally within and downstream of the PHES lower reservoir, namely the Broken River, Urannah Creek and Massey Creek Aggregation (QLD199).

Another nationally significant wetland, the Eungella Dam, occurs 2km upstream of the limits of inundation of the PHES area. These wetlands are displayed in Figure 19.

¹⁴ The definition of a waterway under the *Fisheries Act 1994* includes a river, creek, stream, watercourse, drainage feature or inlet of the sea. This definition includes freshwater and tidal waters, both permanent and ephemeral waterways. It also includes channels along which fish are expected to move if they connect isolated water bodies to defined waterways during times of flow.



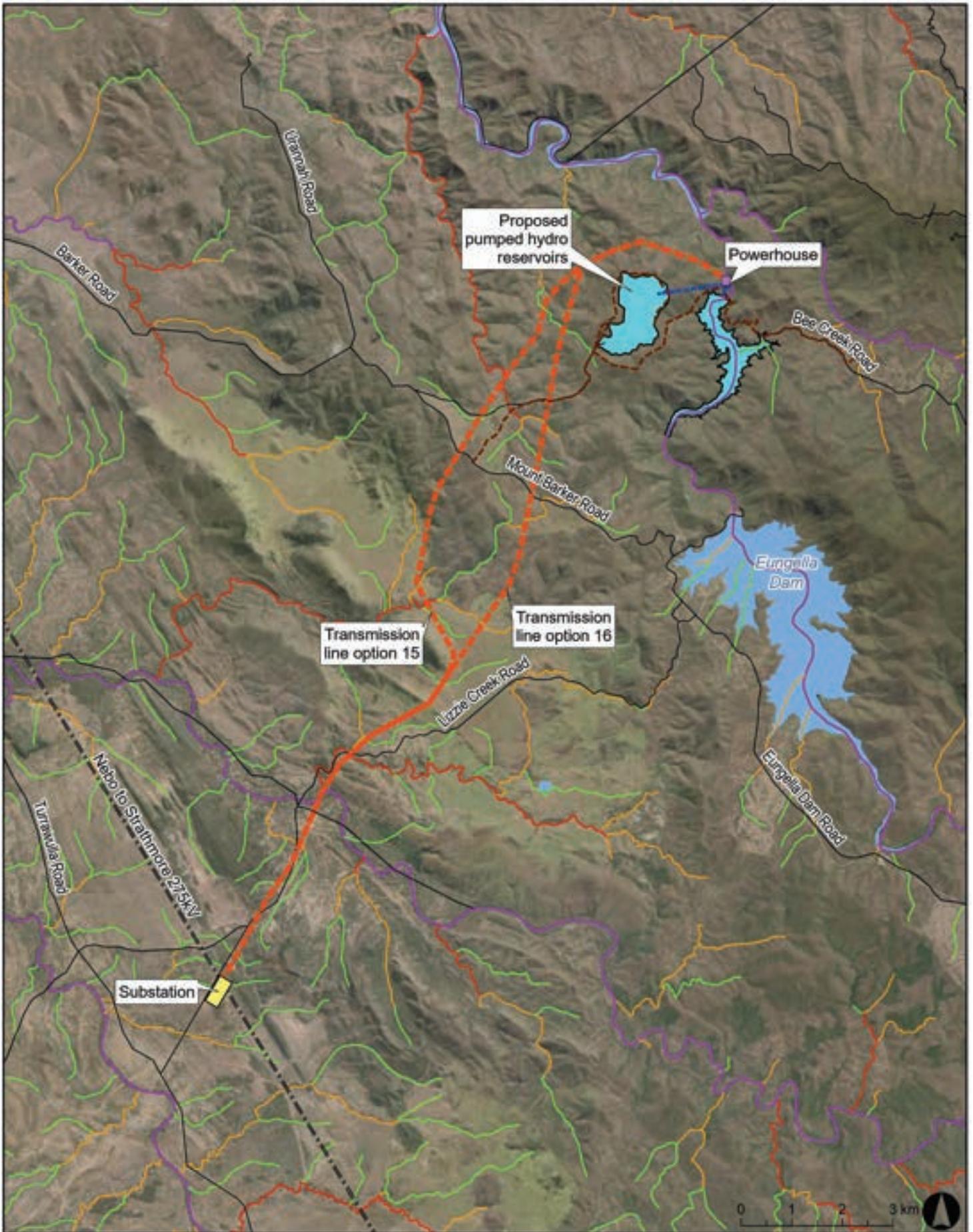
Source: Directory of Important Wetlands in Australia (DIWA) Spatial Database, 23/03/2010 (ANZCW0501003820)

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LEGEND

- Project area
- Proposed Pumped Hydro Reservoirs
- Proposed reservoir wall
- Existing road
- Watercourse / waterbody
- Protected areas
- Broken River, Urannah Creek and Massey Creek Aggregation DIWA nationally important wetland

PROJECT Capricornia PHES and Transmission		
TITLE LOCALITY OF WETLANDS LISTED IN THE DIRECTORY OF IMPORTANT WETLANDS		
DATE 7/12/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
SCALE 1:300,000 at A3	DATUM GDA 1994 MGA Zone 55	
FILE CEH IAS - FIG 19 DIWA - IFI C		FIG 19



Sources:
Queensland waterways for waterway barrier works, 2016

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LEGEND

- - - Proposed transmission line options
- Proposed Pumped Hydro Reservoirs
- Proposed substation
- Proposed powerhouse
- - - Proposed reservoir linkages
- - - Proposed access track
- - - Existing transmission powerline
- Existing road
- Waterways for waterway barrier works**
- 1 - Low
- 2 - Moderate
- 3 - High
- 4 - Major

PROJECT Capricornia PHES and Transmission

TITLE
WATERWAYS FOR BARRIER PROTECTION WORKS

DATE 1/09/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
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SCALE 1:100,000 at A3	DATUM GDA 1994 MGA Zone 55
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FILE CEH IAS - FIG 20 WATERWAYS - IFI B	FIG 20
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A flood hydrology and hydraulic assessment has been carried out that included a review of flooding in the region. This review has informed the project on baseline conditions that have been input into various models to predict impacts of the project on stream hydrology and flooding.

Areas upstream of the reservoirs do not have any built environment structures present (extending to Eungella Dam in the case of the lower reservoir) and the Broken River in the project area only flows intermittently due to the absence of environmental flow releases from Eungella Dam and the presence of natural barriers such as pools and waterfalls.

Water quality sampling has been undertaken in the project area and the results indicate parameters within established guidelines under base flow conditions.

A groundwater monitoring program is currently being established in the proposed PHES reservoirs to determine baseline conditions.

No groundwater dependent ecosystems have been identified in the project area.

5.1.2.2 Potential impacts and mitigation

Hydrology

In-stream PHES projects have the potential to affect stream hydrology by:

1. Changing environmental flows downstream of the reservoir; and
2. Increasing flooding potential within the system.

Development of the reservoirs that form the project, particularly the lower reservoir, will result in modifications to the hydrologic regime of the system and these changes are the subject of various models to determine the extent of flooding and alteration of the flow regime.

Reservoir inundation during normal and flood conditions are not predicted to affect any adjoining properties or any buildings or infrastructure.

During construction, activities will be scheduled, and mitigation measures incorporated into the construction methodology, so that flood damage is avoided or minimised. Drainage structures for access roads and crossings will be designed to appropriate standards and incorporate flood resilience measures and mitigation of potential velocity and scour impacts. Mitigation measures will be included in the CEMP.

For the operations phase of the project, flooding controls will be addressed during initial design and include matters such as spillway design and procedural controls through the OEMP.

Water quality

The project has the potential to affect the quality of surface waters during construction by:

- a) Erosion and sediment mobilisation (due to activities such as earthworks, vegetation removal, blasting, dust deposition);
- b) Wastewater discharges (from on-site wastewater treatments facilities); and
- c) Runoff from potentially contaminated sources such as fuel, oils, chemicals, concrete batching plant wastes and sodic or dispersive soils (and their potential effects on salinity).

Mitigation measures have been developed and these will form part of a CEMP. Measures include, but are not limited to:

- a) Waste rock characterisation and management plans;
- b) Erosion and sediment control plans;
- c) Footprint minimisation; and
- d) Dust suppression.

The project has the potential to affect the water quality of surface waters during operations by:

- a) Cyclical raising and lowering of the water level in both reservoirs which has the potential to re-suspend solids potentially leading to increases in turbidity and suspended solids;
- b) Modifying temperatures depending on water cycling and/or retention times;
- c) Controlled discharges from the reservoirs for environmental flows and uncontrolled releases through spillways during flood events; and
- d) Runoff from potentially contaminated sources such as sewage wastewater disposal areas and fuel/chemical leakage during their use and storage.

Due to the frequent exchange of water between the upper and lower reservoirs, the mechanisms driving water quality changes will be different to water supply dams. Stratification is less likely to occur and this will reduce the likelihood of a range of subsequent water quality issues such as low dissolved oxygen concentrations, nutrient concentration in the hypolimnion (deeper cool layers) and potential for algal blooms.

Mitigation measures will be included in design features and operational plans to minimise to the extent practicable the impacts associated with operations. These mitigations measures may include development of an environmental release strategy, emergency action plans and erosion and sediment control plans.

5.1.3 Air

5.1.3.1 Existing environment

Assessment of the existing air quality within the study area provided an indication of the environmental values to which existing sensitive receptors are exposed. The existing air quality was characterised through:

- a) Review of air quality data as measured at Queensland Department of Environment and Science (DES) air quality monitoring stations;
- b) Review of expected regional influences on air quality; and

- c) Review of existing industrial sources reporting to the National Pollutant Inventory (NPI) to identify any facilities that may be contributing to local/regional air quality conditions.

The review indicates that historical air quality at West Mackay frequently approaches or exceeds the EPP (Air) objectives:

- a) The annual average objective ($25\mu\text{g}/\text{m}^3$) is not exceeded for any year at West Mackay; however, the measured annual average is above 65% of the objective for all years; and
- b) The 24-hour objective ($50\mu\text{g}/\text{m}^3$) is exceeded for all years at West Mackay with exception of 2020. The objective is exceeded on 15 occasions (average ~4 per year) throughout the period.

A review of monthly average PM_{10} concentrations provides further understanding of the existing air quality environment within the study area and can provide an indication of the regional sources that contribute to poor air quality at the air quality monitoring station locations. The results show that monthly averages peak during spring (September) and are at a minimum during autumn. This trend is consistent with the inverse of the soil moisture trends and suggests that wind erosion from dry surfaces is a likely contributor to local and regional air quality within the study area.

A review of the NPI database shows one facility within 10km of the project area. This facility is the Eungella landfill and is likely to generate some dust emission with the potential to impact on sensitive receptors within the study area.

5.1.3.2 Potential impacts and mitigation

Construction of the project has the potential to affect air quality by dust and particulate generation from:

- a) Land clearing activities;
- b) Quarrying, including blasting, excavation of material, crushing, sorting;
- c) Concrete batching;
- d) Wind erosion from material stockpiles and exposed areas;
- e) Exhaust emissions from vehicles and mobile generators; and
- f) Vehicle movements on internal haul roads.

The construction of the project would take about four years to complete. Due to the relatively remote location of the construction site, it is expected that construction could occur 24 hours per day, seven days per week over the construction schedule.

Most of the excavation and construction work will take place at the reservoir walls and quarry. These areas are about 6km from the nearest sensitive receptor at Eungella Dam. Due to the significant separation distance, no impacts are expected from the construction of the project at sensitive receptor locations.

Construction activities will be carried out in accordance with a CEMP. The CEMP will outline all mitigation and management measures which will be employed to prevent dust impact

in exceedance of the relevant air quality objectives at sensitive receptor locations and temporary workforce accommodation.

At a minimum, it is expected that the following mitigation and management measures would be carried out during construction activities:

- a) Watering of internal haul roads and exposed areas;
- b) Blasting only during favourable meteorological conditions, as defined in an operational blast management plan and as forecast and measured near the blast location;
- c) Water sprays at crushing and screening plant; and
- d) Minimising stockpile areas.

Project operations are not expected to adversely affect air quality values.

5.1.4 Ecosystems¹⁵

5.1.4.1 Existing Environment

Terrestrial ecology

The terrestrial ecology assessment included a desktop review of environmental databases, mapping layers, field survey reports and seasonal field assessments of the terrestrial flora and fauna ecological values within the study area.

The Brigalow Belt bioregion stretches from Townsville in the north to the NSW border in the south and separates Queensland's wet tropical rainforests from the temperate forests of southeast Queensland. The bioregion contains 56,496 km² of mixed landscapes, including undulating hills, low ridges and rises, deep valleys and flat alluvial plains.

Floristically, the bioregion is characterised by the natural overstorey dominance of *Acacia harpophylla* (silver foliage wattle brigalow), however it also supports mixed eucalypt woodlands, softwood scrubs and open *Astrebla* and *Dichanthium* grasslands. The majority of the bioregion has been cleared for cropping and agricultural purposes with current estimates that 87 percent of the bioregion's remnant vegetation has been cleared.

The Brigalow Belt bioregion is comprised of 38 subregions. The project area is contained within the Bogie Hills subregion of the Brigalow Belt bioregion.

The following wildlife corridors are mapped within or near the project area:

- a) A statewide terrestrial wildlife corridor extends through the project area in an arc from east to west incorporating Eungella Dam;
- b) A statewide riparian wildlife corridor is mapped within the lower reservoir investigation area following the Broken River; and

¹⁵ This section includes various area calculations and species references that were relevant at the time of field surveys and may not yet account for transmission line details or project footprint changes. They should be considered a guide only until final reports are released.

- c) A regional significant riparian wildlife corridor is mapped on Massey Creek, downstream and outside of the project area.

The project area is not located within an Important Bird Area (sites recognised by BirdLife International for their high bird conservation values).

Essential habitat for conservation significant species are mapped within parts the transmission study area (see Figure 22 and Figure 23).

Aquatic Ecology

The aquatic ecology assessment included a desktop review of environmental databases, mapping layers, previous field survey reports and seasonal field assessments of the aquatic flora and fauna ecological values within the study area.

The upper reservoir is located on a first order waterway and the lower reservoir is located on the Broken River. The waterways associated with the upper reservoir provide limited aquatic habitat value and are predominantly dry, low stream order waterways. The PHES lower reservoir occurs within the predicted distribution of the conservation significant *Ornithorhynchus anatinus* (platypus), *Scortum parviceps* (small headed grunter) and *Neosilurus mollespiculum* (softspine catfish).

In the absence of environmental flow releases from Eungella Dam and the presence of natural barriers in the form of rocky gorges, habitat for these species within the lower reservoir is marginal. These species may occur in the project footprint, particularly during/following flow events. The conservation significant *Crocodylus porosus* (estuarine crocodile) and *Elseya irwini* (Irwin's turtle) are unlikely to occur within the footprints of the project but both species are known to occur downstream on the lower Broken River.

5.1.4.2 Potential impacts and mitigation

The project can impact terrestrial ecosystems by:

- a) Land clearing for the components of the project;
- b) Fragmenting ecosystems and corridors; and
- c) Operation of the project affecting aquatic ecosystems.

The project can impact aquatic ecosystems by:

- a) Loss and alteration of aquatic habitat;
- b) Degradation and disturbance of aquatic habitat;
- c) Fauna injury and mortality;
- d) Alteration of flow and fauna movement; and
- e) Increased pest and weed species.

Siting of the PHES reservoirs has taken into account significant ecological values (i.e., MNES, MSES) where possible. For example, multiple sites were investigated (see Figure 10) and the current configuration has ecological advantages over the other options.

A route for the proposed transmission line has not been finalised and ecological surveys are currently being undertaken within a transmission study area (see Figure 12) to inform an optimal route.

Having avoided impacts where possible, the construction and operation of the project will still result in the removal of vegetation (and the habitat this provides) within the project footprint, and disturbance to the ecological values of the local landscape on either a temporary or permanent basis.

A detailed suite of management and mitigation measures to address (e.g., avoid, minimise, mitigate) these impacts have been identified and will be modified as the project progresses.

Assessments have been undertaken to determine the likelihood of occurrence of any conservation significant species and ecosystems that are MNES and MSES and these are included in Table 6.

Assessments were also undertaken for MSES regulated vegetation and connectivity areas.

Table 6: Likelihood of occurrence for MNES/MSES conservation significant species matters in study areas^{16 17 18}.

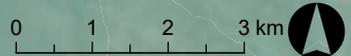
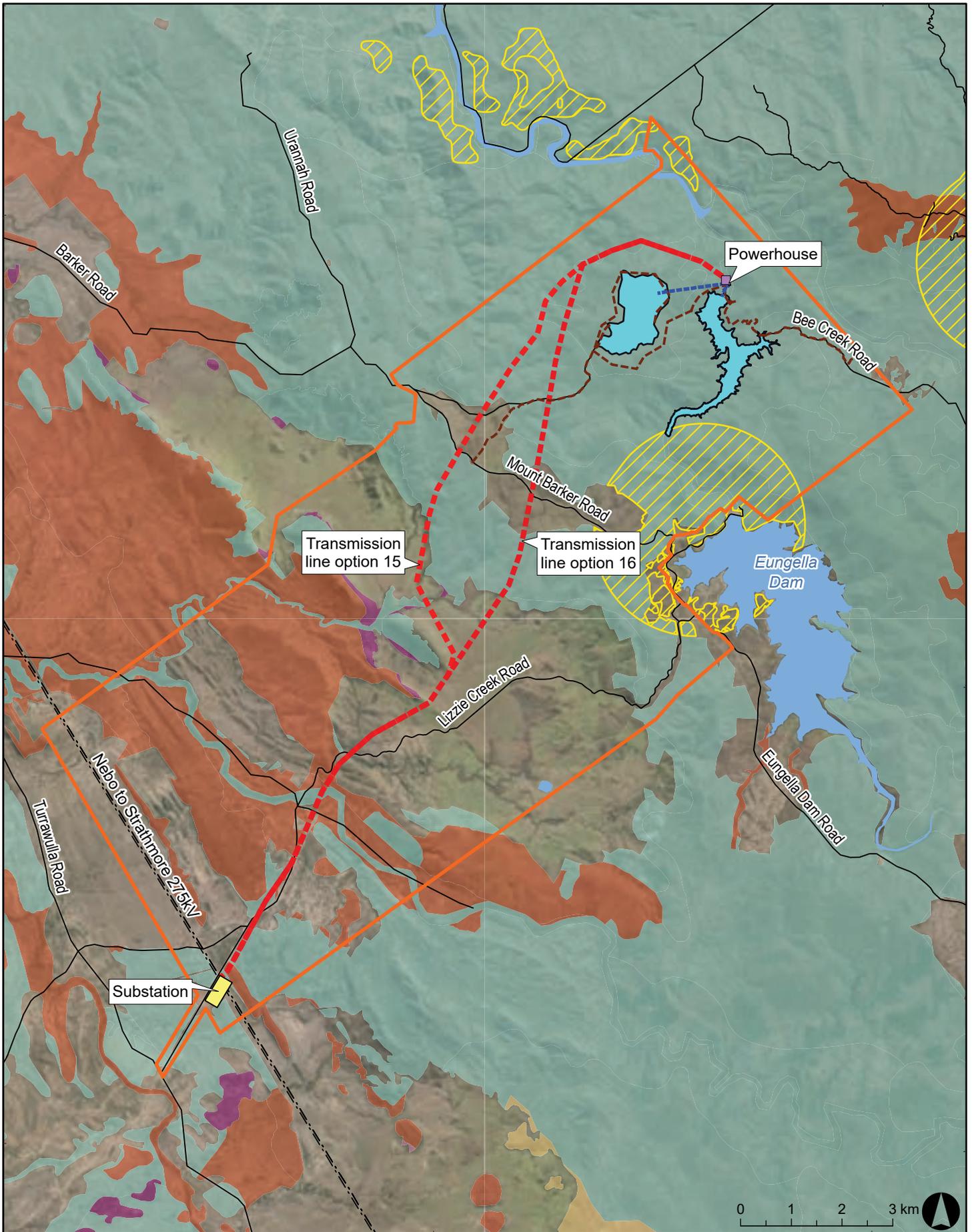
Species	NC Act Status	EPBC Act Status	Likelihood of Occurrence
Threatened ecological communities			
Poplar Box Grassy Woodland TEC	-	E	Confirmed
Threatened flora			
<i>Solanum graniticum</i>	E	E	Confirmed
<i>Eucalyptus raveretiana</i>	LC	V	Confirmed
Threatened mammals			
Koala	E	E	Confirmed
Greater glider	E	E	Confirmed
Grey-headed flying-fox	LC	V	High-moderate
Northern quoll	LC	E	High-moderate
Yellow-bellied glider (south-eastern)	V	V	High-moderate
Short-beaked echidna	SL	-	Confirmed
Platypus	SL	-	High-moderate
Threatened birds			
Squatter pigeon (southern)	V	V	Confirmed
White-throated needletail (migratory)	V	V; Mig	High-moderate
Spectacled monarch (migratory)	SL	Mig	High-moderate
Fork-tailed swift (migratory)	SL	Mig	High-moderate
Satin flycatcher (migratory)	SL	Mig	High-moderate
Rufous fantail (migratory)	SL	Mig	High-moderate

¹⁶ Where the likelihood is confirmed or assessed as high-moderate. The likelihood of occurrence may change as further ecological surveys and assessments are conducted / reported.

¹⁷ Conservation status: CE – Critically Endangered, V -Vulnerable, Mig – Migratory; LC – Least Concern, SL – Special Least Concern.

¹⁸ Refer also section 6.1 EPBC Act Referrals.

Species	NC Act Status	EPBC Act Status	Likelihood of Occurrence
Black-faced monarch (migratory)	SL	Mig	High-moderate
Eungella Honeyeater	V	-	High-moderate
Powerful owl	V	-	High-moderate
Glossy black-cockatoo	V	-	High-moderate
MSES Waterways			
Waterways providing for fish passage			Confirmed

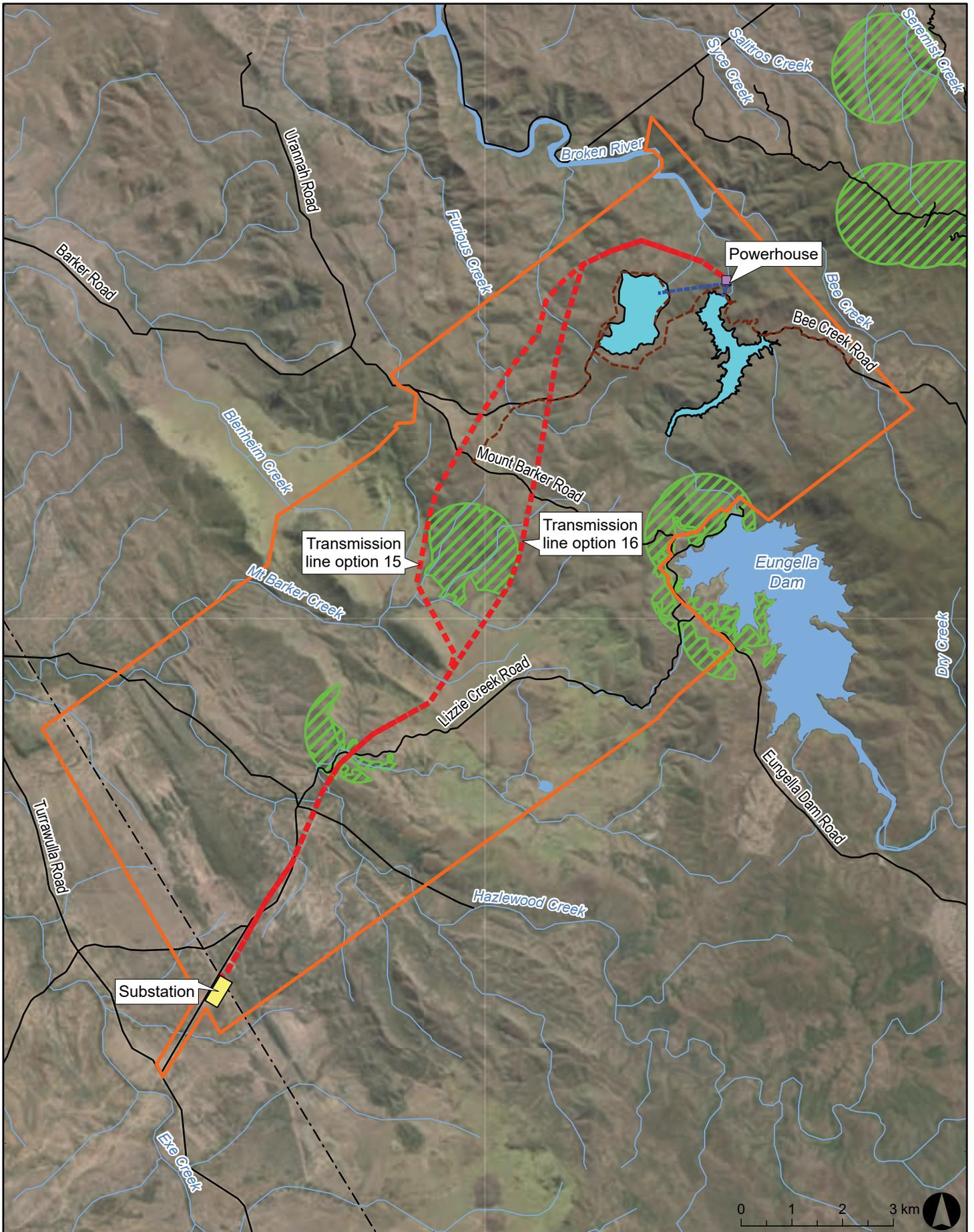



Sources:
 Biodiversity status of 2019 remnant regional ecosystems v12.2
 Flora Survey Trigger Map for Clearing Protected Plants in Queensland v8.0

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LEGEND	
	Project area
	Proposed pumped hydro reservoirs
	Proposed substation
	Proposed powerhouse
	Proposed transmission line options
	Proposed underground head/tail race
	Proposed access track
	Existing transmission powerline
	Existing road
	Flora survey trigger map
Regional ecosystem map	
	Endangered - dominant
	E-subdom
	Of concern - dominant
	O-subdom
	Least concern

PROJECT Capricornia PHES and Transmission		
TITLE REGIONAL ECOSYSTEM MAPPING FOR THE PROJECT AREA		
DATE 7/12/2023	STATUS ISSUED FOR INFORMATION	PRODUCED AC
SCALE 1:100,000 at A3	DATUM GDA 1994 MGA Zone 55	
FILE CEH IAS - FIG 21 REGIONAL ECOSYSTEMS - IFC		FIG 21



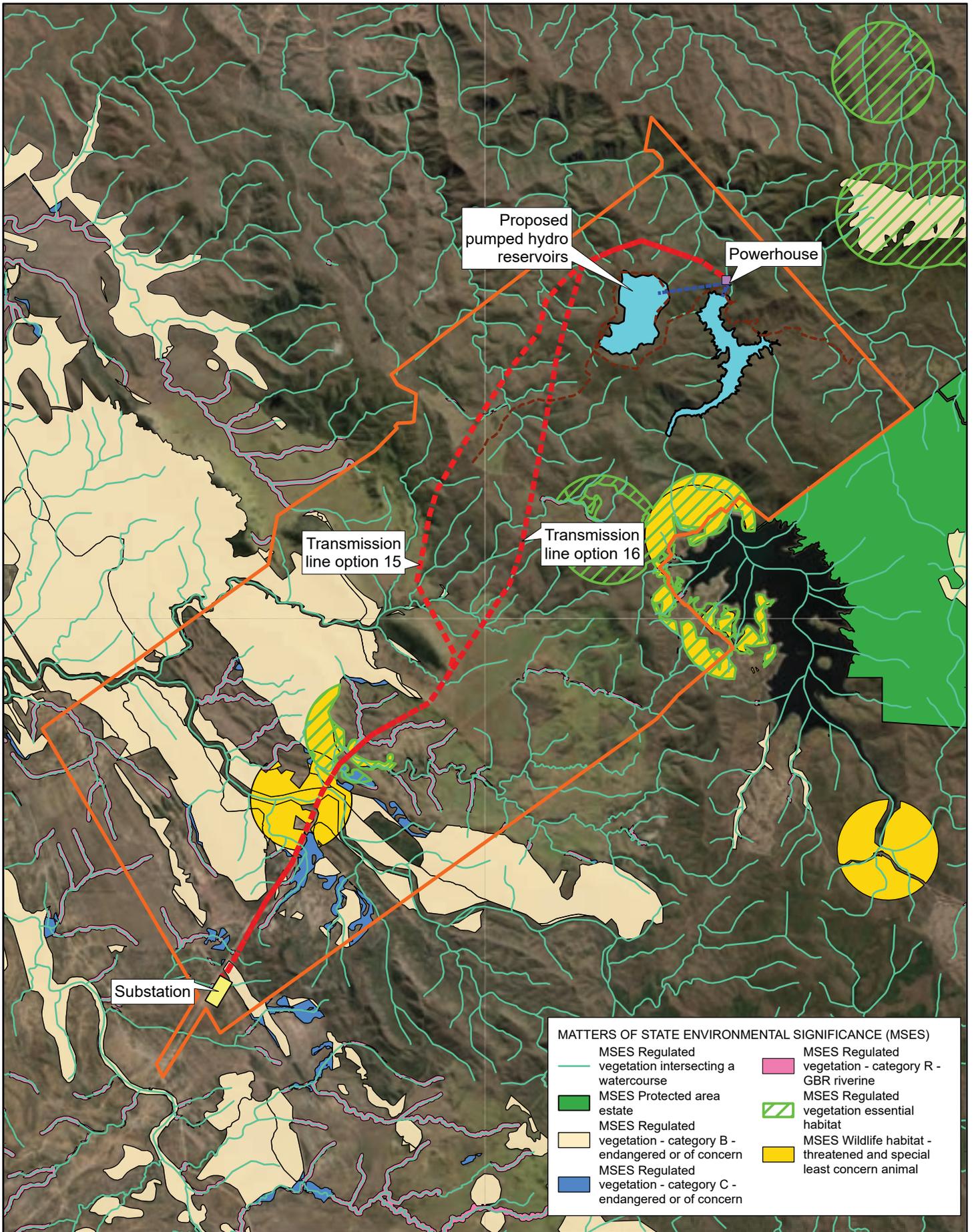
Sources:
MSES - Regulated vegetation - essential habitat, 07/09/2022

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LEGEND

- Project area
- Proposed pumped hydro reservoirs
- Proposed powerhouse
- Proposed substation
- Proposed transmission line options
- Proposed underground head/tail race
- Proposed access track
- Existing transmission powerline
- Existing road
- Watercourse / waterbody
- Essential habitat map

PROJECT Capricornia PHES and Transmission			
TITLE ESSENTIAL HABITAT			
DATE 7/12/2023	STATUS IFI	PRODUCED MVC	
SCALE 1:100,000 at A3	DATUM GDA 1994 MGA Zone 55	REV IFI	FIG 22
FILE CEH IAS - FIG 22 ESSENTIAL HABITAT - IFI C			



MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE (MSES)

MSES Regulated vegetation intersecting a watercourse	MSES Regulated vegetation - category R - GBR riverine
MSES Protected area estate	MSES Regulated vegetation essential habitat
MSES Regulated vegetation - category B - endangered or of concern	MSES Wildlife habitat - threatened and special least concern animal
MSES Regulated vegetation - category C - endangered or of concern	

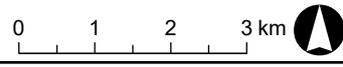


LEGEND

Project area	Proposed transmission line options
Proposed pumped hydro reservoirs	Proposed underground head/tail race
Proposed substation	Proposed access track
Proposed powerhouse	

Sources:
MSES Series, QLD DES 06/07/2022

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PROJECT Capricornia PHES and Transmission			
TITLE MATTERS OF STATE SIGNIFICANCE MAPPED IN THE PROJECT AREA			
DATE 7/12/2023	STATUS IFI	PRODUCED MVC	
SCALE 1:100,000 at A3	DATUM GDA 1994 MGA Zone 55	REV IFI	
FILE CEH IAS - FIG 23 MSES - IFI C	FIG 23		

Impacts to aquatic habitat will be avoided wherever possible within the design of the project and the proposed construction, operation and maintenance methodology.

Specifically:

- a) The upper reservoir will be located on first order ephemeral waterways to avoid impact to aquatic flora and fauna species;
- b) The lower reservoir will avoid impact to high quality habitat within the lower Broken River;
- c) Where feasible, permanent ancillary infrastructure is located within existing cleared areas and away from waterways;
- d) The proposed location of the construction access will use existing tracks and waterway crossings where possible, and crossing of majority and high risk waterways has been avoided where possible; and
- e) Resource extraction will occur within the future inundation area as much as possible.

In addition, best practice construction techniques have been specifically selected to reduce direct works within waterways and aquatic habitat wherever possible. Aquatic ecological values will be minimised where practicable through design and implementation of a CEMP and OEMP. Key management actions may include:

- a) Design and implementation of a strategy in accordance with the requirements of the *Fisheries Act 1994* and State Code 18 for management of river flow during the construction of a waterway barrier in fish habitat;
- b) Design and implementation of a habitat enhancement plan for the Broken River below the footprints of the PHES lower reservoir to restore and enhance aquatic habitat within these areas as quickly as possible and provide suitable habitat conditions for aquatic flora and fauna, including conservation significant species;
- c) Investigation into the requirement for environmental flow releases from the PHES lower reservoir in accordance with the Burdekin Basin Water Plan. Releases would occur in accordance with environmental flow objectives for ecosystem protection (if required);
- d) Design and implementation of an aquatic fauna monitoring program to assess injury and mortality of aquatic species during project operation. Aquatic fauna salvage could be undertaken in accordance with DAF Fish Salvage Guidelines where high risk of fauna injury/mortality is identified through monitoring (e.g., following spilling event from Eungella Dam); and
- e) Completion of a design process in accordance with State Code 18 for constructing or raising a waterway barrier in fish habitat.

5.1.5 Terrestrial flora and fauna¹⁹

5.1.5.1 Existing Environment

Databases searches conducted for the project area identified the following:

- a) 27 conservation significant species and 15 migratory species listed under the EPBC Act that are predicted to occur within the desktop search extent. Results of the Protected Matters Search Tool are included in Appendix A.
- b) 27 conservation significant species (listed under the EPBC Act and/or the NC Act) and 10 special least concern species that have been historically recorded within the desktop search extent using state-based searches²⁰.

Ecological field surveys across the study areas observed a total of 110 fauna species. This comprised five species of amphibians, 12 reptiles, nine mammals, and 84 birds. Also:

- a) No conservation significant amphibian species were recorded within the project area;
- b) No conservation significant reptile species were recorded in the project area, and none were assessed as likely to occur when considering field studies and the desktop assessment;
- c) Ten mammal species were confirmed within the project area during field surveys including three conservation significant mammal species – the koala, greater glider, and short-beaked echidna;
- d) A total of 84 bird species were recorded within the project area. One conservation significant bird species was confirmed within the investigation area during field surveys, namely squatter pigeon (southern). Four other conservation significant species (powerful owl, Eungella honeyeater, glossy black cockatoo and white-throated needletail), and six migratory species (black-faced monarch, spectacted monarch, forktail swift, satin flycatcher, rufous fantail and white throated needletail) are likely to occur due to historical records and the presence of suitable habitat within the project area.

Six conservation significant species were confirmed present during field studies. A further 13 conservation significant species were considered likely to occur within the project area based on the presence of suitable habitat and nearby records.

Of the remaining 44 conservation significant species identified in desktop searches, 16 have a low likelihood of occurrence (may occur). The remaining 28 species are unlikely to occur due to both the absence of suitable habitat and nearby historical records, or because their currently described range does not overlap the project area.

Of note, most of the historical records for conservation significant species were recorded within the nearby Eungella National Park, which contains different vegetation communities to those within the project area.

¹⁹ This section includes various area calculations and species references that were relevant at the time of desktop searches and field surveys and may not yet account for transmission line details or project footprint changes. They should be considered a guide only until final reports are released.

²⁰ Wildlife Online, Species Profile Search and Biomaps

Two conservation significant flora species (*Solanum graniticum* and *Eucalyptus raveretiana*) were confirmed within the project area and one threatened ecological community (Poplar Box Grassy Woodland on alluvial plains).

5.1.5.2 Potential impacts and mitigation

During the construction phase, the project is expected to result in the loss of vegetation and habitat, due to clearing for:

- a) Upper and lower reservoir footprints;
- b) Transmission lines and substation; and
- c) Ancillary infrastructure such as access tracks, laydown areas and others as detailed in section 3.4.

Without appropriate mitigation, vegetation clearing may result in direct mortality and injury of wildlife, and indirect ecological impacts such as:

- a) Temporary disturbance of wildlife through construction light, noise, vibration and increased vehicle movements;
- b) Restricted fauna movement and barrier effects; and
- c) Degradation of adjacent habitats through erosion, sedimentation, and weed/pest species invasion.

Permanent habitat loss will occur where new infrastructure is required to remain *in-situ* post-construction (e.g., reservoirs, transmission lines, access tracks etc. required for project operations). The ecological integrity of the local landscape may be altered due to a reduction in the availability of habitat, and changes to the key indices of landscape pattern (connectivity, heterogeneity).

The operation and maintenance phases may result in a small number of additional, ongoing impacts to terrestrial biodiversity (i.e. above and beyond the impacts caused by construction): for example relatively low-level risks of disturbance and injury/mortality of wildlife (e.g. vehicle strike), localised noise impacts, and spread of weeds and pests due to movement of maintenance vehicles.

Where practicable, mitigation measures may include, but not be limited to:

- a) Implementation of design strategies to avoid, minimise or mitigate effects of the project on flora and fauna and prioritise options for avoidance of significant species;
- b) Minimise clearing footprint;
- c) Maximise use of already cleared/disturbed areas;
- d) Develop a Biodiversity Offset Strategy where avoidance cannot be achieved; and
- e) Development of a CEMP which would include typical fauna and flora protection/mitigation measures for land clearing and development work such as:
 - i. fauna spotting and relocation;
 - ii. revegetation of areas required temporarily;
 - iii. utilise fauna escape methods; and

- iv. prepare a Pest and Weed Management Plan (including liaison with local authorities regarding implementation of regional biosecurity management plans).

5.1.6 Aquatic flora and fauna²¹

5.1.6.1 Existing environment

Databases searches conducted for the project area identified the following:

- a) No conservation significant species listed under the EPBC Act that are predicted to occur within the desktop search extent. Results of the Protected Matters Search Tool are included in Appendix A.
- b) Eight conservation significant species that have been historically recorded or are likely to occur within the desktop search extent using state-based searches²².

There were 22 species of aquatic macrophytes recorded within the Broken River study area during field surveys. Of these species, there were 19 native and three exotic species present.

All fish species captured during surveys were least concern natives, with the exception of the exotic species, Mozambique tilapia (*Oreochromis mossambicus*). Mozambique tilapia are a restricted species under the *Biosecurity Act 2014*.

The platypus, Irwin turtle and estuarine crocodile were not recorded within the study area.

5.1.6.2 Potential impacts and mitigation

During the construction period it is anticipated that the following activities may have localised, short-term impacts upon aquatic ecological values:

- a) Loss of vegetation and excavation within the riverbed and banks;
- b) Alteration to flows;
- c) Barrier to aquatic fauna movement;
- d) Vehicle and plant movement to, from and around the construction site;
- e) Inadvertent spillage of potentially hazardous materials;
- f) Construction (excavation, dewatering, establishment of coffer dams) within the waterway; and
- g) Resource extraction.

The impacts associated with the impoundment may include:

- a) Loss and alteration of aquatic habitat;
- b) Degradation and disturbance of aquatic habitat;
- c) Fauna injury and mortality;

²¹ This section includes various area calculations and species references that were relevant at the time of field surveys and may not yet account for transmission line details or project footprint changes. They should be considered a guide only until final reports are released.

²² Wildlife Online, Species Profile Search and Biomaps

- d) Alteration of flow and fauna movement; and
- e) Increased pest and weed species.

Mitigation measures during construction will include development of a CEMP that will include:

- a) Drainage, erosion and sediment control;
- b) Water quality management;
- c) Waste and hazardous materials management; and
- d) Weed and pest management (including liaison with DAF regarding implementation of biosecurity measures).

Mitigation of measures relating to the impacts of the project on stream flow may include:

- a) Engineering solutions;
- b) Management measures (such as procedural measures); and/or
- c) Implementing an offsets strategy.

5.2 Built environment

The project is situated on grazing land and riverine areas that do not have any structures currently present.

The transmission study area intersects various local roads (namely Mt Barker Road, Lizzie Creek Road, Bee Creek Road and Turrawulla Road) (see Figure 13). The lower PHES reservoir intersects the unmade Bee Creek Road. Impacts of the project on traffic and road networks are discussed in section 5.2.2.

The transmission study area intersects a Sunwater water pipeline.

The transmission study area also intersects the 275kV Strathmore to Nebo transmission line. This would be the location where a sub-station would be built for connection to the grid. Connection enquiries have indicated that there is sufficient capacity in the network to accommodate the project.

There are no other coordinated projects within the area of the proposed project.

5.2.1 Accommodation and housing

5.2.1.1 Existing environment

Eungella is a small rural community with a population of 190 people in 2021. The town is situated in the Mackay Hinterland and is located approximately 10km east of the project.

The township is a popular visitor attraction and is a stepping-stone to many unique surrounding attractions, including the Eungella National Park and Crediton State Forest. According to the 2021 Census, there were 88 private dwellings in Eungella, of which 71.8 percent were occupied. The small size of the existing housing stock means the rental housing market is non-existent. The capacity of the short-term accommodation market is

relatively small with only three short-term accommodation providers in Eungella who provide a mixture of hotel and cabin accommodation.

The Mackay urban centre is the principal administration centre for the Mackay LGA with a population of 80,455 people in 2021. It is located approximately 80km east of the proposed project area.

Mackay provides a variety of specialised personal and professional services and includes major employment opportunities, high-order services and functions, including a major hospital and the Mackay, Issac, Whitsundays (MIW) region's main emergency services (DLGIP, 2012). It is also a significant centre for services supporting mining activities, agricultural industries and tourism in the MIW region.

A workforce of up to 600 workers is estimated to be required to construct the project. This construction workforce would be sourced from the region, state and interstate as required to meet role requirements and would likely be a mix of local, fly-in fly-out or drive-in drive-out workers utilising the on-site accommodation camp.

5.2.1.2 Potential impacts and mitigation

Due to the remote location of the construction site, it is planned that onsite accommodation would be provided for a significant proportion of the construction workforce. The onsite accommodation would be comprised of prefabricated and transportable buildings and amenities.

The use of an on-site accommodation camp is considered a preferable option in order to minimise impacts of the project on the rental housing market, displacement of communities and traffic impacts.

The operational workforce is expected to comprise of up to 65 personnel regionally and include an onsite caretaker, with support staff (electrical and mechanical) housed locally in the region in as close proximity to the project as feasible to facilitate drive-in-drive-out routine inspections.

5.2.2 Traffic and transport

5.2.2.1 Existing environment

Project-related traffic is expected to predominantly affect the road transport infrastructure. Sea and air networks will be utilised for imports of construction materials and equipment to the Port of Townsville and for the fly-in, fly-out (FIFO) workforce. Rail was not considered to be a viable option because of existing network congestion.

Transport activities associated with the project will mostly occur during the construction stage and will include transportation of material and equipment and construction personnel to the project sites. Traffic movements generated during the peak construction phases for the project are anticipated to be almost entirely associated with heavy vehicle

movements for the delivery of construction material, the removal of waste and the delivery of equipment. Most equipment involved with general construction will be sourced from local or regional external contractors and is likely to involve various types of earthmoving equipment, cranes, water trucks and onsite concrete batching plants.

Access to the project is proposed from the west via Mount Barker Road or Lizzie Creek Road.

5.2.2.2 Potential impacts and mitigation

Traffic associated with the construction of the project is not anticipated to impact intersection and road link capacity. The transport impact assessment found that intersection and road link delay impacts from construction traffic are negligible as the affected intersections and links have sufficient spare capacity to accommodate construction generated traffic.

5.3 Cultural heritage (Indigenous and non-Indigenous)

There are no non-indigenous cultural heritage sites listed in the project area.

A cultural heritage management agreement has been executed with Widi in relation to the project activities on Eungella station. That agreement is currently lodged for registration as a cultural heritage management plan in accordance with the *Aboriginal Cultural Heritage Act 2003*.

The project is currently in discussion with the Birriah People to reach a cultural heritage management agreement for Turrawulla Station.

5.4 Greenhouse gas management plan

A greenhouse gas emissions inventory, management plan and carbon dioxide (CO₂) abatement plan will be prepared in accordance with the *National Greenhouse Gas and Energy Reporting Act 2007* and other relevant standards.

5.5 Waste Management

5.5.1 Existing environment

A desktop search was carried out for the Mackay LGA and its existing waste management facilities and the wastes they accept. Waste management facilities within the region are generally small purpose-built facilities to manage municipal waste.

5.5.2 Potential impacts and mitigation

The project is unlikely to generate significant quantities of waste that will require off-site management. Waste generation will mostly be associated with the construction phase of the project and the waste streams will generally be:

- a) Waste rock from any tunnel and land preparation activities (if not used in reservoir wall or other infrastructure development);
- b) Vegetation removed;
- c) General construction waste (excess concrete, packaging, steel hydrocarbon waste etc);
- d) Camp wastes (sewage, food waste etc); and
- e) Administration and office waste.

The CEMP for the project will include a waste management plan. It will be guided by the overall waste management hierarchy (avoid, reduce, re-use, recycle, recover, treat and finally safe disposal) and emphasis will be placed on the segregation of waste and diversion of those waste streams that are sent to landfill. The Waste Management Plan will:

- a) Identify waste streams for the proposed activity;
- b) Detail appropriate transport, storage and disposal of waste;
- c) Outline training of site personal on procedures developed concerning the transport, storage and disposal of waste streams; and
- d) The monitoring and auditing of waste streams against the Waste Management Plan to ensure the objectives of the plan are being met.

In consultation with local government and application of industry accepted waste management practices, it is not expected that waste generated by the project would result in significant impacts on the environment.

5.6 Hazard and risk, and health and safety

A project hazard and risk assessment has been carried out and will be revised to take into account changes to the project definition. The assessment will include the following tasks:

- a) Description of the existing environment including identification of natural hazards;
- b) Identification of the hazards posed by construction and operation of the project;
- c) Appraisal of the hazards and their risks to people, property and the environment; and
- d) Definition of measures to avoid, mitigate and manage hazards and risks.

Currently identified natural hazards include bushfire, flooding, landslip and pests. Mitigation measures for these hazards include management plans, project design controls and engineering solutions.

Hazards associated with construction of the project include, but are not limited to:

- a) Reservoir wall failure during construction;
- b) Blasting;
- c) Hazardous materials;
- d) Vehicle movements; and
- e) Mosquito breeding.

Hazards associated with operation of the project include, but are not limited to:

- a) Reservoir wall failure;
- b) Unauthorised access to reservoirs;
- c) Transmission line ignition / electric magnetic fields;
- d) Vehicle movements; and
- e) Mosquito breeding.

Mitigation for these hazards include engineering controls, design and management actions (ie systems and procedures).

6 APPROVALS REQUIRED FOR THE PROJECT

The project will require many approvals for construction and operation of the asset. These approvals will be required from all levels of government. The applications and assessments may be coordinated through the SDPWO Act or be dealt with outside of that process (for example, minor permits for construction).

Table 7 details the key approvals required and whether these would be dealt with through a coordinated project assessment process or individually with the relevant assessment body outside of the Part 4 coordinated process.

Table 7: Main approvals required for project and Part 4 identification

Approval & legislation	Authority	Approval trigger & relevance to the project	Assessment under SDPWO Act
EPBC Referral EPBC Act	DCCEEW	A referral is required when a project has the potential to significantly impact on a MNES protected under the EPBC Act. Baseline ecological assessments have indicated that the project has the potential to impact on several MNES. Referrals have been submitted to the Commonwealth Environment Minister who has determined that the project is a controlled action.	Yes
Application for 'coordinated project' declaration requiring an EIS SDPWO Act	OCG (DSDILGP)	The Coordinator-General may declare a project to be a "coordinated project" including where the project has complex approval requirements, significant environmental effects, strategic significance or significant infrastructure requirements. Assessment by way of an EIS resulting in the issue of the Coordinator General's report assessing the project.	Yes

Approval & legislation	Authority	Approval trigger & relevance to the project	Assessment under SDPWO Act
<p>Development permit for a material change of use for a renewable energy facility</p> <p><i>Planning Act 2016</i> <i>Planning Regulation 2017</i></p>	<p>Mackay and Isaac Regional Councils</p>	<p>The project will be a 'Renewable energy facility' for the purposes of the Mackay Region Planning Scheme 2017.</p> <p>The proposed development will likely be the start of a new use of the site, which is a material change of use under the <i>Planning Act 2016</i>.</p>	<p>Yes</p>
<p>Development permit for operational works for taking or interfering with water in a watercourse</p> <p>Water allocation</p> <p><i>Planning Act 2016</i> <i>Planning Regulation 2017</i> <i>Water Act 2000</i> <i>Water Regulation 2016</i> <i>Water Plan (Burdekin Basin) 2007</i> <i>Water Amendment Plan (Burdekin Basin) 2019</i> <i>Burdekin Basin Water Management Protocol 2016 (Amended June 2019)</i></p>	<p>SARA & DRDMW</p>	<p>This may apply to operational works associated with construction of the lower reservoir within the Broken River and potentially operation of the project.</p>	<p>Yes</p>
<p>Development permit for operational works for constructing waterway barrier works.</p> <p><i>Planning Act 2016</i> <i>Planning Regulation 2017</i> <i>Fisheries Act 1994</i></p>	<p>SARA & DAF as technical agency</p>	<p>This will apply to permanent and temporary waterway barrier works located within the bed and banks of the Broken River and along transmission line</p>	<p>Yes</p>
<p>Development permit for operational work clearing native vegetation</p> <p><i>Planning Act 2016</i> <i>Planning Regulation 2017</i> <i>Vegetation Management Act 1999</i></p>	<p>SARA & DoR as technical agency</p>	<p>This will apply to the loss of any remnant vegetation from construction of the project.</p> <p>The extensive terrestrial ecological assessments revealed that the project study area supports least concern regional ecosystems dominated by open woodlands and existing cleared grazing lands.</p>	<p>Yes</p>
<p>Development Permit and environmental authority for a MCU involving Environmentally Relevant Activities (ERAs)</p> <p><i>Planning Act 2016</i> <i>Planning Regulation 2017</i> <i>Environmental Protection Act 1994 (EP Act)</i> <i>Environmental</i></p>	<p>SARA & DES as technical agency</p>	<p>The project has the potential to trigger the requirement for a number of ERA's including:</p> <ol style="list-style-type: none"> 1. Chemical storage 2. Extractive and screening activities 3. Cement manufacturing 4. Sewage treatment 	<p>Yes</p>

Approval & legislation	Authority	Approval trigger & relevance to the project	Assessment under SDPWO Act
<i>Protection Regulation 2019</i>		Given that these activities are likely to be dependent of the construction methodology adopted by the construction contractor, details are unlikely to be known prior to the 'coordinated project' process.	
Generation and/or Transmission Authority <i>Electricity Act 1994 (Qld)</i>	DEPW	A generation authority is required to authorise generating plant to connect to the transmission grid or supply network. A transmission authority may also be required.	No
Quarry material sales permit <i>Forestry Act 1959</i>	DAF	The proposed quarry potentially extracts state owned quarry materials and may trigger the need for a sales permit.	No
Development permit for constructing a referable dam <i>Water Supply (Safety and Reliability) Act 2008</i>	SARA & DRDMW	If a failure impact assessment determines that 2 or more people are at risk from a dam failure, a development permit would be required.	Yes
Species management plan (SMP) <i>NC Act Nature Conservation (Wildlife Management) Regulation 2006</i>	DES	This applies when undertaking activities which impact on breeding places for species listed under the NC Act.	No

6.1 EPBC Act Referrals

The project has been referred to the Commonwealth Minister of Environment for assessment under the EPBC Act. Two referrals have been made for the project:

- a) The PHES component was referred by Eungella PHES Pty Ltd as trustee for Eungella PHES Trust and has reference number 2023/09626; and
- b) The transmission component was referred by Eungella Infrastructure Pty Ltd and has reference number 2023/09627²³.

Both referrals have been determined to be controlled actions. The controlling provision for each referral is threatened species and ecological communities.

Comprehensive seasonal ecological field surveys have been conducted throughout the project footprint, project area and more broadly in the region since 2019.

Of the 48 MNES identified through desktop review for the PHES, field surveys determined that 33 were unlikely to occur or had a low likelihood of occurrence, 15 had a moderate to

²³ The referrals and their supporting information, including survey methodology and results can be found by searching at [www. https://epbcpublicportal.awe.gov.au/all-referrals/](https://epbcpublicportal.awe.gov.au/all-referrals/) for EPBC Ref 2023/09626 (PHES) and EPBC Ref 09627 (Transmission).

high likelihood of occurrence but were not found in surveys and six were confirmed as occurring (see Table 6).

A significance of impact assessment (SIA), conducted using the current project footprint details and current survey outputs²⁴, determined that there would likely be a significant impact on five MNES species:

- a) Greater glider;
- b) Grey-headed flying fox;
- c) Koala;
- d) Northern quoll; and
- e) Yellow-bellied glider.

Of the 46 MNES identified through desktop review for the transmission component, field surveys determined that 30 were unlikely to occur or had a low likelihood of occurrence, 10 had a moderate to high likelihood of occurrence but were not found in surveys and six were confirmed as occurring (see Table 6).

An SIA conducted using the current project footprint details and current survey outputs²⁴, determined that there would likely be a significant impact on six MNES species / communities:

- a) Greater glider;
- b) Grey-headed flying fox;
- c) Koala;
- d) Northern quoll; and
- e) Yellow-bellied glider; and
- f) Poplar Box Grasslands on Alluvial Plains threatened ecological community.

Both SIAs will be reviewed as project design elements are refined, further mitigation measures applied and results from remaining ecological field surveys become available.

7 COSTS AND BENEFITS SUMMARY

7.1 Local, State and National Economies

With 600 construction and 65 operational jobs and capital expenditure of \$AUS 2.87bn, the project will have significant direct and indirect benefits to the economy on a local, regional, state and national scale.

The project has significant benefits that will address government policy, including:

- a) Support the Queensland Government's 70% Renewable Energy Target by 2032;
- b) Underpin the Renewable Energy Zone (AEMO's REZ Q4) through the provision of medium to long-term duration energy storage;

²⁴ As the project design progresses, results from further surveys obtained and further mitigation measures applied, the SIAs for any species may result in a reclassification or reduction of impact.

- c) Facilitate the buildout of additional modern renewables in the Northern Queensland Renewable Energy Zone;
- d) Improve reliability of the NEM grid in Queensland by acting as a synchronous generator once operational;
- e) Underwrite the lowering of carbon emissions by enabling additional wind and solar generation in Queensland; and
- f) Replace system inertia in the NEM grid that will be left by retiring coal-fired thermal generation.

The EIS for the project will study the costs and benefits associated with the project. In particular, a social impact assessment will identify potential social costs associated with the project. Avoidance or mitigation strategies will also be developed for costs that may be identified.

7.2 Natural and social environments

The project will result in some impacts on the natural and social environment near the project area and on various corridors along transportation routes. These impacts will be dependent on the phase of the project, with the most significant impacts during construction.

During the development phase, impact on the environment would be limited to study activities to support the design and approvals for the project (for example, geotechnical studies, pre-feasibility activities and environmental surveys).

During the construction phase, it is anticipated that strategies will be required to manage social impacts associated with:

- a) Local and regional accommodation;
- b) Traffic and transport;
- c) Workforce;
- d) Community identity in towns such as Eungella and Finch Hatton; and
- e) Enjoyment of community facilities such as Lake Eungella.

Operations phase activity will involve lower traffic volume (relative to construction) of predominantly light vehicles, with intermittent periods of maintenance activity involving heavy vehicle movements.

Potential social impacts will be identified through a collaborative and consultative approach with landholders, traditional owners, communities, business, government and any other parties that may be either positively or negatively affected by the project.

While considerable effort has been made in this regard since project inception in 2019, a new social impact assessment will be undertaken to take into account changing project metrics and local and regional social pressures. It is intended that the OCG Social Impact Assessment Guideline will be used as the overall guidance for the assessments.

Impacts on the natural environment will require management as addressed throughout section 5.

8 COMMUNITY AND STAKEHOLDER CONSULTATION

Consultation with stakeholders about the project commenced in 2019 with a small number of interested parties. As the project has evolved, an increasing number and range of local and regional stakeholders have been engaged.

At various times, such groups have included::

- a) Landholders;
- b) Traditional owners;
- c) Local government;
- d) Eungella community;
- e) Relevant state government departments;
- f) Relevant federal government departments;
- g) Relevant state government owned corporations;
- h) Relevant ancillary infrastructure providers;
- i) Environmental interest groups;
- j) Community interest groups;
- k) Local and regional business and economic groups; and
- l) Local, state and federal representatives for the region.

The objectives of engagement was to:

- a) Meaningfully consider the interests and concerns of stakeholders who may be impacted (positively and negatively) by the project;
- b) Provide opportunities for potentially impacted stakeholders to provide input to the social baseline;
- c) Development of management strategies (including benefit enhancing opportunities); and
- d) Inform the assessment and evaluation of impacts with the knowledge and experience of local stakeholders.

Previous iterations of this project have conducted a social impact assessment that has included:

- a) A description of the existing socio-economic context of potentially affected communities relevant to the project;
- b) Identification of potential social impacts (both beneficial and adverse) of the project and an assessment of their significance; and
- c) Identification of measures that will be undertaken by the proponent to enhance potential social benefits and avoid, mitigate and/or manage negative social impacts of the project.

As the project description has been revised and the associated project footprint reduced since the previous consultation and social impact assessment development, consultation with certain stakeholder groups will be revisited as part of the next stage of development of the project.

A Stakeholder Engagement and Communications Plan has been developed for the project and will continue to be refined over the life of the project.

The project presents opportunities for positive social impacts, primarily in relation to the employment opportunities and local business procurement opportunities during construction as well as increased economic diversity and resilience from energy security and reduced dependence on fossil fuel energy during operation of the project.

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10 GLOSSARY, ACRONYMS AND ABBREVIATIONS

ABS	Australian Bureau of Statistics
AEMO	Australian Electricity Market Operator
AHD	Australian Height Datum
CEMP	Construction Environmental Management Plan
CIP	Copenhagen Infrastructure Partners
DAF	(Qld) Department of Agriculture and Fisheries
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEPW	Department of Energy and Public Works
DES	(Qld) Department of Environment and Science
DOR	Department of Resources
DRDMW	Department of Regional Development, Manufacturing and Water
EIS	Environmental Impact Statement
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
GWhr	Gigawatt Hour
HR	Hours
IAR	Impact Assessment Report
IAS	Initial Advice Statement
ISP	Integrated System Plan 2020
LGA	Local Government Area
MCU	Material Change of Use
ML	Mining lease
MNES	Matter of National Environmental Significance
MOU	Memorandum of Understanding
MSES	Matter of State Environmental Significance
MW	Megawatts
MWhr	Megawatt Hour
NEM	National Electricity Market
OCG	Office of Coordinator General
OEM	Original Equipment Manufacturer

OEMP	Operational Environmental Management Plan
PHES	Pumped Hydro-electric Power Scheme
RE	Regional Ecosystem
REZ	Renewable Energy Zone
SARA	State Assessment and Referral Agency
SDPWO Act	State Development and Public Works Organisation Act 1971
SIA	Social Impact Assessment
TEC	Threatened Ecological Community
VRE	Variable Renewable Energy

11 DEFINITIONS

Capricornia Energy Hub – The Project, and potentially other renewable energy components like wind or solar depending on the suitability of nearby areas to support such projects.

Project Area – the envelope of land targeted to investigate optimal locations for all the components of the project.

Project Footprint – that part of land (surface or underground) and waters required to be used (either temporarily or permanently) for all plant and infrastructure needed for the construction and operation of the project.

Study Area – for environmental studies, the boundaries of that study.

The Project – a proposed approximately 750MW pump/generation facility with a storage capacity of 12GWh (16hr) and transmission line located approximately 80km west of Mackay, Queensland and the subject of this Initial Advice Statement. See Figure 2.

Transmission Study Area – the envelope of land targeted to investigate the optimal route for the transmission infrastructure.

12 APPENDIX A

Protected Matters Search Tool Results



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 10-Jan-2023

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	27
Listed Migratory Species:	15

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	2
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area	In feature area
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species

[\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area	In feature area
FROG			
Taudactylus eungellensis Eungella Day Frog [1887]	Endangered	Species or species habitat likely to occur within area	In feature area
MAMMAL			
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In feature area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<u>Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</u>			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
<u>Pteropus poliocephalus</u>			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
<u>Arthraxon hispidus</u>			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<u>Dichanthium queenslandicum</u>			
King Blue-grass [5481]	Endangered	Species or species habitat may occur within area	In feature area
<u>Dichanthium setosum</u>			
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<u>Eucalyptus raveretiana</u>			
Black Ironbox [16344]	Vulnerable	Species or species habitat known to occur within area	In feature area
<u>Omphalea celata</u>			
[64586]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<u>Ozothamnus eriocephalus</u>			
[56133]	Vulnerable	Species or species habitat may occur within area	In feature area
<u>Samadera bidwillii</u>			
Quassia [29708]	Vulnerable	Species or species habitat may occur within area	In feature area
<u>Solanum graniticum</u>			
Granite Nightshade [84819]	Endangered	Species or species habitat known to occur within area	In feature area

REPTILE

Scientific Name	Threatened Category	Presence Text	Buffer Status
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
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Migratory Marine Birds

Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
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Migratory Terrestrial Species

Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area	In feature area
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Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
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Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
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Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
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Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
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Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
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Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
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Migratory Wetlands Species

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Breeding likely to occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat may occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Crediton	Forest Reserve	QLD	In buffer area only
Redcliffe Vale	NRS Addition - Gazettal in Progress	QLD	In buffer area only

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
Broken River, Urannah Creek and Massey Creek Aggregation	QLD	In feature area
Eungella Dam	QLD	In feature area

EPBC Act Referrals					[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status	
Urannah Dam and Pipelines Project	2020/8708		Assessment	In feature area	

Controlled action					
Bowen Renewable Energy Hub Pumped Hydro-electric Scheme	2020/8706	Controlled Action	Assessment Approach	In feature area	

Not controlled action					
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area	
Nebo to Strathmore 275kV Transmission Line	2006/2997	Not Controlled Action	Completed	In feature area	

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

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Please feel free to provide feedback via the [Contact us](#) page.

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