BIG-T PUMPED HYDROPOWER ENERGY STORAGE

INITIAL ADVICE STATEMENT

JULY 2022

powering a sustainable world

GE Renewable Energy

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This initial advice statement has been prepared and compiled by Entura with inputs from BE Power, on behalf of BE Power Projects Pty Ltd for the Big-T Pumped Storage Project, for the purpose of seeking declaration as a 'Coordinated Project' under the Queensland *State Development and Public Works Organisation Act 1971*.

Revision history

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EXECUTIVE SUMMARY

BE Power and GE Energy Llc are jointly proposing to develop the Big-T pumped hydropower energy storage (**PHES**) project in the locality of Biarra, situated 45 km northeast of Toowoomba, Queensland. The Project will also include a battery energy storage system (**BESS**). Collectively the project is referred to as the 'Big-T PHES'.

The Big-T PHES Project is one of the projects shortlisted by the federal government's Underwriting New Generation Investment (**UNGI**) scheme. The Project is strategically located in one of three renewable energy zones identified by the State of Queensland as well as one of eight renewable energy zones identified by the Australian Energy Market Operator (**AEMO**). Furthermore, the Project will positively contribute to the Queensland Government's target of 50% energy generation by renewable resources by 2030 (**RET**) by supporting renewable energy developments through provision of medium to long-term duration energy storage.

The PHES component of the Project has a planned generating capacity of 400 megawatts (**MW**) and the ability to provide 10 hours of continuous generation within a 24-hour timeframe. The BESS has an anticipated capacity of 200 megawatt hours (**MWh**). Connection to the National Electricity Market (**NEM**) will be by a new approximately 15 km underground high-voltage transmission line along Sebastapool Road and Three Mile Road 'right of ways'. A new upper reservoir will be constructed on privately-owned land, while Lake Cressbrook, owned by the Toowoomba Regional Council (**TRC**), is proposed as the lower reservoir.

Much of the project site meets the definition of core koala habitat (as defined in the *South East Queensland Koala Strategy 2020–2025*) and supports an active koala population. The Project has sought to minimise impacts to koala habitat and other terrestrial environmental values by situating infrastructure underground where possible.

Construction of the Project is expected to take three-and-a-half years with a workforce of up to 350 personnel at peak periods. The operational workforce is estimated to average 10 personnel. The Project is anticipated to be operational for 80 years.

The Project will require a number of approvals across federal and state departments, and is estimated to require a capital investment of up to $1.3 billion. The Project is expected to bring significant local, regional, and state economic opportunities, predominantly during construction. Once operational, the Project will become an 'enabler' for new wind and solar NEM grid-connected projects with an anticipated positive impact on electricity prices for Queensland electricity consumers.

It is considered that the Project meets the requirements for declaration as a 'Coordinated Project' under the Queensland *State Development and Public Works Organisation Act 1971* (**SDPWO Act**). It is proposed that the Project be assessed by the Office of the Coordinator-General (OCG). This initial advice statement has been prepared to support the proponent's application to have the Project declared a 'Coordinated Project' under the SDPWO Act.

Contents

Appendices

List of figures

List of tables

1 INTRODUCTION

The proposed Big-T Project (**the 'Project'**) is a pumped hydropower energy storage (**PHES**) project with a battery energy storage system (**BESS**), located in Biarra, adjacent to Lake Cressbrook, 45-kilometre (**km**) northeast of Toowoomba, in Queensland. The Project is being co-developed by BE Power Projects Pty Ltd as Trustee for the Big-T Unit Trust and GE Energy Llc, collectively referred to as BE Power.

It is proposed that the Project will be assessed by the Office of Coordinator-General (**OCG**) under the Environmental Impact Statement (**EIS**) process defined under the Queensland *State Development and Public Works Organisation Act 1971* (**SDPWO Act**). It is also proposed that the assessment bilateral agreement between the State of Queensland and the Commonwealth will be utilised for assessment of Matters of National Environmental Significance (**MNES**) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**). A referral under the EPBC Act has been lodged with the Commonwealth Department of Agriculture, Water and the Environment (**DoAWE**) (reference 2021/9140) and was determined to be a controlled action on 23 March 2022.

1.1 BACKGROUND

A PHES requires upper and lower water reservoirs located at a considerable difference in elevation. The Project includes the construction of a new upper reservoir on private land whilst Lake Cressbrook, owned and operated by the Toowoomba Regional Council (**TRC**), is proposed as a lower reservoir. The two reservoirs will be linked by water conveyances and a 400 MW underground power station housing reversible turbines, capable of pumping and electricity generation. Water will be pumped from Lake Cressbrook and stored in the upper reservoir from where it will be released back through the power station to Lake Cressbrook. The electricity generated will be exported to the National Electricity Market (**NEM**) via an approximately 15 km underground high voltage (**HV**) transmission line within public road reserves. The Project is described in further detail in Section 3.

BE Power is seeking to have the Project declared a 'Coordinated Project' under the SDPWO Act.

Given the long-term regional and State-based benefits anticipated to be derived from the Project, it is considered the Project meets the requirements for declaration under the SDPWO Act. With reference to the criteria provided under section 27(2)(b) of the SDPWO Act, BE Power proposes that the Project meets all of the defined characteristics, as outlined below:

- Complex approval requirements:
    - The Project will require engagement with and approval from Commonwealth, state and local governments and agencies, including, but not limited to:
        - Commonwealth Department of Agriculture, Water and Environment (**DoAWE**)

  - Queensland Department of Regional Development, Manufacturing and Water (**DRDMW**)
  - Queensland Department of Resources (**DR**)
  - Queensland Department of Environment and Science (**DES**)
  - Queensland Department of Aboriginal and Torres Strait Islander Partnerships (**DATSIP**)
  - Queensland Department of Transport and Main Roads (**DTMR**)
  - Somerset Regional Council (**SRC**)
  - Toowoomba Regional Council (**TRC**).
- The Coordinated Project pathway allows for the implementation of the bilateral assessment pathway for Commonwealth assessment.

- Strategic significance locally, regionally and to Queensland:
  - The Project contributes to the Queensland Government's renewable energy target of 50% energy generation from renewable sources by 2030.
  - The Project is located within the Southern Queensland Renewable Energy Zone (**Southern QREZ)**.
  - The Project is located within the Darling Downs Queensland Renewable Energy Zone (**REZ 8**) as identified in the Australian Energy Market Operator's (**AEMO**) draft 2022 Integrated System Plan (**ISP**), released in 2022. The construction and operation of the Project will positively contribute to renewable energy generation in the region, and more broadly assist in the transition away from non-renewable energy generation (closure of coal and gas generation plants).
  - The Project will see a capital investment of approximately $1.3 billion into state and regional economies.
  - The Project has been shortlisted under the federal government Underwriting New Generation Investment (**UNGI**) scheme.
- Potential environmental effects:
  - Studies across the Project site and vicinity highlight the presence of Matters of National Environmental Significance (**MNES**) and Matters of State Environmental Significance (**MSES**), including verified koala habitat and sightings of the koala, brush-tailed rock wallaby, as well as evidence of the greater glider within the broader project area.
  - The Project site is located within the Southeast Queensland Koala Conservation Strategy area. Ecological studies undertaken to date have verified the presence of an active koala population within the project site, and the vegetation on site satisfies Commonwealth guidance as habitat that is critical to the survival of the koala.
  - The project will require the permanent disturbance of up to 122 ha of koala habitat which is considered a significant impact under Commonwealth guidelines.
- Significant infrastructure requirements:
  - The Project will require significant new infrastructure to support its operation, including a new upper reservoir, power station and connecting water conveyances.

- A new underground transmission line will be constructed to connect the PHES scheme to the electricity grid along an existing public road right of way on BE Power privately owned land.
- The project requires access to Lake Cressbrook to recirculate approximately up to 7 gigalitres (**GL**) of water between the lake and the upper reservoir.

1.2 PURPOSE AND SCOPE

This initial advice statement (**IAS**) has been prepared to provide the information required under section 27AB of the SDPWO Act to enable the Coordinator-General (**CG**) to decide whether to declare the Project as a 'Coordinated Project'. The CG's assessment requirements are summarised in Table 1.1.

To the best of the proponent's and its consultants' knowledge, this IAS provides the most up-to-date information regarding the Project, including the physical context in which it will be located, as well as the impacts that may arise from the Project.

Table 1.1: Coordinator-General's assessment requirements

Information required (s.27, SDPWO Act)	Section reference
Detail information about the Project by the proponent in an IAS	This document
Relevant planning schemes or policy frameworks of a local government, the State or the Commonwealth	Section 4.2.1
Relevant State policies and government priorities	Section 4.2.2
A pre-feasibility assessment of the Project, including how it satisfies an identified need or demand	Provided with the application
The capacity of the proponent to undertake and complete the IAR or EIS for the Project	Provided with the application

2 THE PROPONENT

2.1 PROJECT PROPONENT

The proponent for the Project is BE Power Projects Pty Ltd as trustee for the Big-T Unit Trust (**BEP**). BEP has entered into a Co-development Agreement with GE Energy Llc (**GE**) for the development and operation of the Project (collectively, '**BE Power**').

The contact details for the Project proponent are:

BE Power Group
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383-397 Flinders Lane
Melbourne, Victoria, Australia 3000
enquiries@bepower.com.au

BE Power is a multi-faceted electricity company that develops and operates power plants. It also undertakes electricity trading, and is the controlling owner of the NEM electricity retailer, Elysian Energy. BE Power has a pipeline of projects of over 1,200 MW.

BE Power has undertaken numerous technical and environmental assessments for its existing operations and has the necessary technical and financial capacity to deliver the environmental studies required for the Project.

GE is a global leader in hydropower with more than 30% of installed capacity worldwide. GE has been a significant player in the Australian energy sector for over 100 years, with an installed base across wind, hydro, gas, battery, steam and transmission equipment of close to 20 GW. In addition, GE Hydro's turbines and generators power 3.9 GW of capacity, roughly half of Australia's hydro fleet.

Globally, GE is a major global player in both conventional and pumped hydro, with an installed base exceeding 320 GW in total and 45 GW in pumped hydro specifically. GE's portfolio for hydropower covers assets from 4 MW to 400 MW units at head heights ranging from 25 m to 1112 m. Projects in GE's current portfolio which are similar to that proposed for this Project include Revin in France, and Qiongzhong in China.

BEP was established in 2015 with the principal objective of developing dispatchable electricity projects within Australia. Its senior management team consist of individuals who hold in excess of 25 years of experience in power project development, feasibility, engineering and design, construction, finance, knowledge of the NEM and trading, as well as operations.

BEP and GE have entered into a Co-development Agreement for the Project, which includes GE supplying the reversible turbines, providing technical support for the high-voltage (**HV**) component of the Project, including the NEM grid connection, and providing support from GE Finance for the debt funding component of the Project.

The environmental and social studies for this Project will be delivered with the assistance of highly capable technical consultants who hold extensive experience across state and Commonwealth jurisdictions for

water and energy Projects. This will ensure that the required reporting meets best practice environmental standards, and addresses all of the required supporting information.

For the development of the Big-T PHES Project, BE Power and GE are supported by the following project consultants:

- **Entura** – engineering advisor, completion of the Bankable Feasibility Study, and Project permits and approvals
- **Egis** – water access and regulatory advisor
- **Yurika** – grid connection engineering advisor
- **Ernst & Young** – financial and commercial advisor
- **DLA Piper** – legal advisor.

The Project team will also draw upon the services and experience of technical specialists particularly to undertake assessments for the preparation of the environmental impact statement (**EIS**). Currently, the following local consultancies are engaged to provide services and assistance to the Project:

- **DPM Envirosciences** – terrestrial and aquatic ecology, water quality monitoring
- **Landskape** – Aboriginal and cultural heritage studies
- **Rowland** – stakeholder communications and social impact assessment
- **Water Modelling Solutions** – hydrodynamic modelling
- **WSP** – geology and geotechnical engineering.

2.2 ROLE OF TOOWOOMBA REGIONAL COUNCIL

Toowoomba Regional Council (**TRC**) released the New Energy Generation Project expression of interest in August 2020. The New Energy Generation Project aims to provide the successful tenderer the opportunity to develop a project that generates energy through existing TRC land and water assets. Subsequent excess energy generated through the project would either be used by Council facilities or fed back to the grid for community use. The successful tenderer will develop the project, including construction and operation of the infrastructure.

The lower reservoir for the Project is Lake Cressbrook which is owned and operated by the TRC. BE Power (and the Project) are currently participating in a staged TRC Invitation to Tender for New Energy Generation (**ITT**) for the purpose of the award by TRC of land and access rights to Lake Cressbrook required for the Project. In this regard, the TRC have provided the OCG a 'Letter of Support' for BE Power to engage directly with the OCG.

In October 2021, TRC endorsed BE Power as the successful tenderer for the Council's New Energy Generation Project. Further information is available on the TRC website under 'Media Releases'. The ITT process is still underway and BE Power must successfully complete the process before it obtains legal access to the land for the purposes of developing the Project.

3 NATURE OF THE PROPOSAL

3.1 SCOPE OF THE PROJECT

3.1.1 Overview of PHES

PHES schemes store energy as gravitational potential in water that has been pumped uphill to an elevated reservoir when electricity is abundant such as when renewable generation is high, but demand is low. When electricity demand rises and renewable generation is unable to meet demand, the water is released to power a turbine to generate electricity (Figure 3.1). PHES schemes, such as this Project, recirculate water between the lower and upper reservoirs.

PHES is a proven technology and has a long-standing global track record of providing long duration storage at grid scale. It complements intermittent and seasonal variable renewables by providing medium to long duration storage. Unlike other storage technologies such as batteries, PHES operate as synchronous generators, providing critical ancillary services to the grid.

There is currently only one example of a pumped storage system in Queensland, at Wivenhoe Power Station. Operated by CleanCo with a generating capacity of 570 MW, the power station uses electricity from the grid to pump water uphill from Wivenhoe Dam into Splityard Creek Dam. The water is stored at Splityard Creek Dam until it is required for electricity generation, at which time the water is released back down into Wivenhoe Dam via two 285 MW turbines to generate electricity. The Splityard Creek Dam of Wivenhoe PHES is not a turkey's nest dam (refer Figure 3.2), however it is a 76m high, which is higher than the dam wall proposed for the Project's upper reservoir.

In addition to the Wivenhoe PHES, there are several known PHES in development in Queensland, such as the Kidston, Borumba and Urannah PHES projects. Further details as to why PHES projects are important for the Australian energy landscape are outlined in Section 3.3.

There are two other operating PHES schemes in Australia; these are Shoalhaven and Tumut 3 in New South Wales.

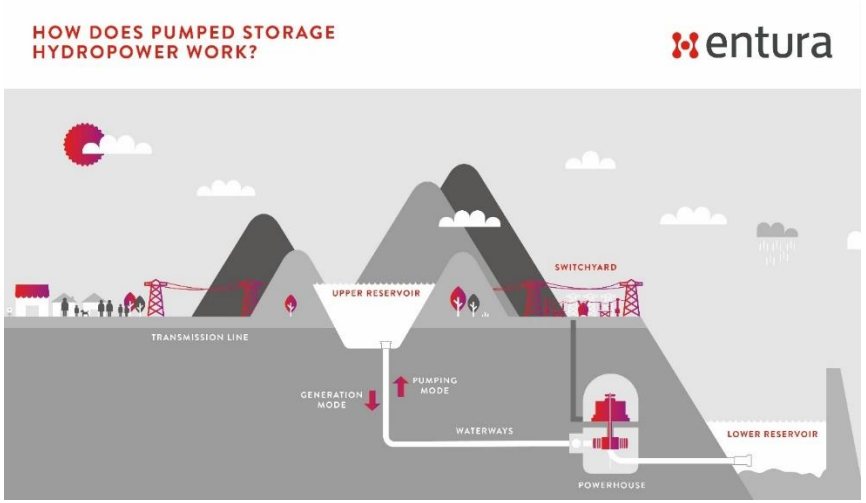

Figure 3.1: General schematic of the operation of a PHES scheme

Figure 3.2: Splityard Creek Dam and Wivenhoe Power Station
(source: Queensland State Archives)

In terms of similar styles of reservoirs to that proposed for the Project, examples can be found worldwide, such as the upper reservoir of the Lamtakong Jolabha Vadhana pumped storage located in Thailand (refer to Figure 3.3). The upper reservoir is formed by a rockfill dam that is 50 m high and 2,170 m long. (Electrical generating Authority of Thailand, 2013).

Figure 3.3: Upper reservoir of the Lamtakong Jolabha Vadhana pumped storage

Other examples also include the upper reservoir of the Tianhuanping pumped storage located in China, which is located in a natural high depression, and is impounded by one main dam and four saddle subsidiary dams. The main dam is an earth-rockfill embankment lined with asphalt concrete on the upstream side. The maximum height of the main dam is 72 m with a crest length is 503 m (Wang & Liu, 2004). Similarly, the upper reservoir of the Ludington Pumped Storage Plant in Michigan is an embankment style turkey's nest dam that sits on the banks of Lake Michigan. The dam is a 31 m high asphalt-faced embankment dam that is 9.70 km long.

3.1.2 Project description

The Project is a PHES scheme with a planned generating capacity of 400 MW and connection to the NEM via a new approximately 15 km underground transmission line along public road 'right of way'. The PHES scheme is anticipated to be complemented with a BESS, the BESS is to be located at the site of the proposed switching station at Crows Nest.

Lake Cressbrook is proposed as the lower reservoir for the Project, with a new off stream 'turkey's nest'-style dam constructed on nearby Mount Sevastopol as the upper reservoir. Lake Cressbrook is owned and operated by the TRC whilst BE Power will purchase the land proposed for the upper reservoir (the land is subject to a Call Option to acquire between BEP and the landowner).

An underground power station will house two reversible turbines able to generate electricity and to pump water from Lake Cressbrook via underground headrace and tailrace tunnels. The power station has a proposed capacity of 400 MW and the PHES will have the ability to provide 10 hours of continuous generation within a 24-hour timeframe.

The new underground transmission line will link the Project to the NEM via a switching station (to be constructed) on BEP-owned land to the existing 275 kilovolt (**kV**) overhead Tarong to Middle Ridge transmission line connection (**Feeder 831**) that runs between H18 Tarong and H14 Middle Range substations.

The Project comprises the following main permanent components:

- new upper reservoir in the form of a turkey's nest dam of up to 60 ha and a maximum dam height of 47 m, to provide an upper storage with an active storage volume 6.4 GL
- Lake Cressbrook, forming the lower reservoir
- underground water conveyances, including:
  - pressure shaft of up to 7.5 m wide and 275 m long
  - headrace tunnel of up to 7.5 m wide and 900 m long to connect the upper reservoir to the power station
  - tailrace tunnel of up to 7.5 m wide and 1.2 km long to connect the power station to the lower reservoir
- intake and outlet infrastructure connecting the water conveyances to the upper and lower reservoirs. Intake and outlet infrastructure will be located within the upper reservoir, and on the shoreline of Lake Cressbrook
- underground power station cavern housing two 200 MW reversible turbines (400 MW generation capacity) with a switchyard located in a transformer cavern next to the power station cavern
- access tunnel to the power station cavern of up to 7.5m wide and 3 km long
- power, evacuation and ventilation tunnel of up to 6 m wide and 1.2 km long
- upgrade in the form of realignment and reconstruction of Sebastapool Road for approximately 15 km
- new access road to tunnel portals and lower intake of up to 8 m wide and 3 km long
- underground 275 kV double circuit transmission line of up to 15 km long to connect from the transformers to the existing 275 kV Feeder 831 transmission line, via a new switching station to be located on BEP-owned land on Lot 10, nominally referred to as the Cressbrook Substation

- permanent spoil storage for excess material excavated for the power station cavern and tunnels and not utilised for construction
- a BESS with an anticipated capacity of 200 MWh utilising lithium-ion technology or similar. The BESS will be housed in a single storey structure(s) with a combined size of approximately 140 m long and 30 m wide, located directly adjoining the switching station on Lot 10.

Other temporary works to support the construction of the Project may include:

- construction management area including site office and construction facilities
- site plants, including batching, crushing and screening
- construction laydown areas, quarries and borrow areas
- stockpile areas
- access roads for investigation and/or construction
- widening of road reserves for trenching and laying of transmission line.

The Project will have a permanent disturbance footprint of up to 156 ha (**permanent disturbance area**) with an additional temporary disturbance footprint of up to 24 ha (**temporary disturbance area**).

Temporary disturbance areas will be progressively rehabilitated during construction. Construction of the Project is further detailed in Section 3.7.

An indicative Project layout is provided in Figure 3.4. Further, Figure 3.5 depicts the aboveground infrastructure on Lot 2 and 58, and Figure 3.6 for Lot 10, while Figure 3.7 shows the underground infrastructure. The switching station and BESS will be located within the footprint identified as 'construction management area' in Figure 3.6.

A schematic diagram for the proposed Project is also included in Figure 3.8. Note that the design is subject to change as the Project is developed.

3.2 LAND USE

The Project site is currently used for grazing where there is a land use. A residential dwelling is located on the land parcel that will host the switching station (owned by BEP). Lake Cressbrook is used as an open space and recreational facility.

Areas that will be disturbed for permanent infrastructure will require a permanent land use change to infrastructure and electricity generation, however areas that are not affected by the construction and operation of the Project will not require land use change.

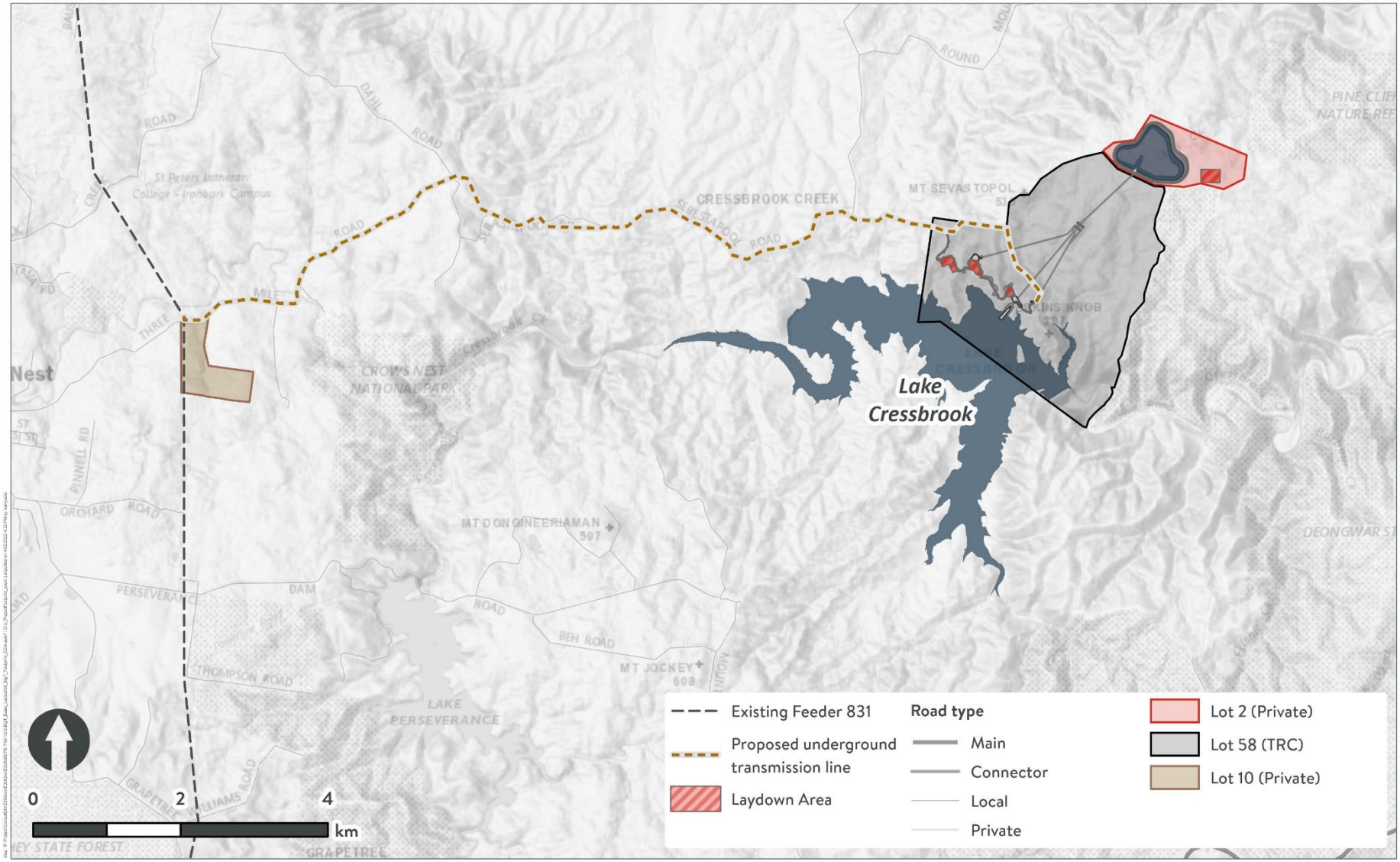

Figure 3.4: Indicative project layout

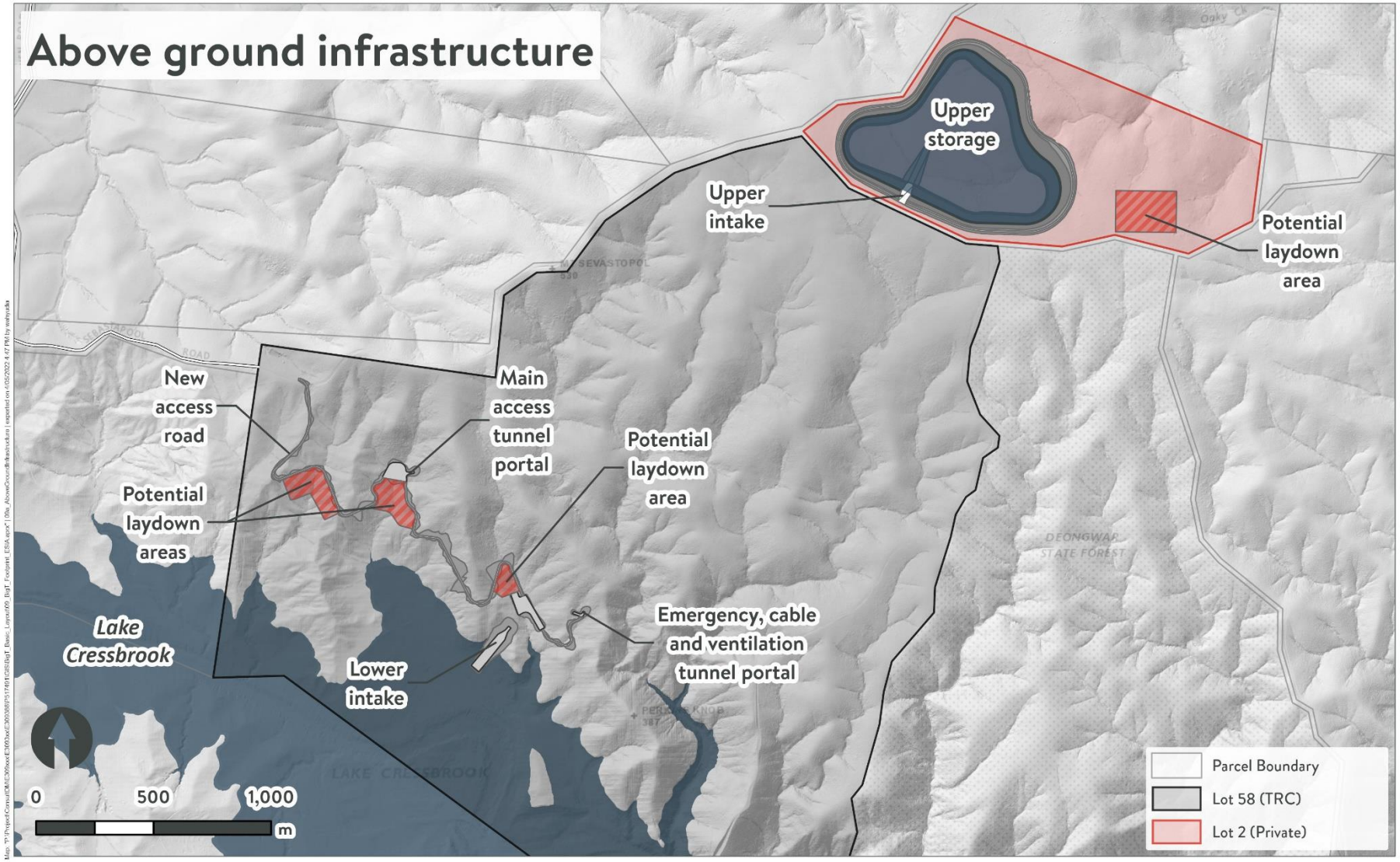

Figure 3.5: Aboveground infrastructure on Lot 2 and 58 of the Project

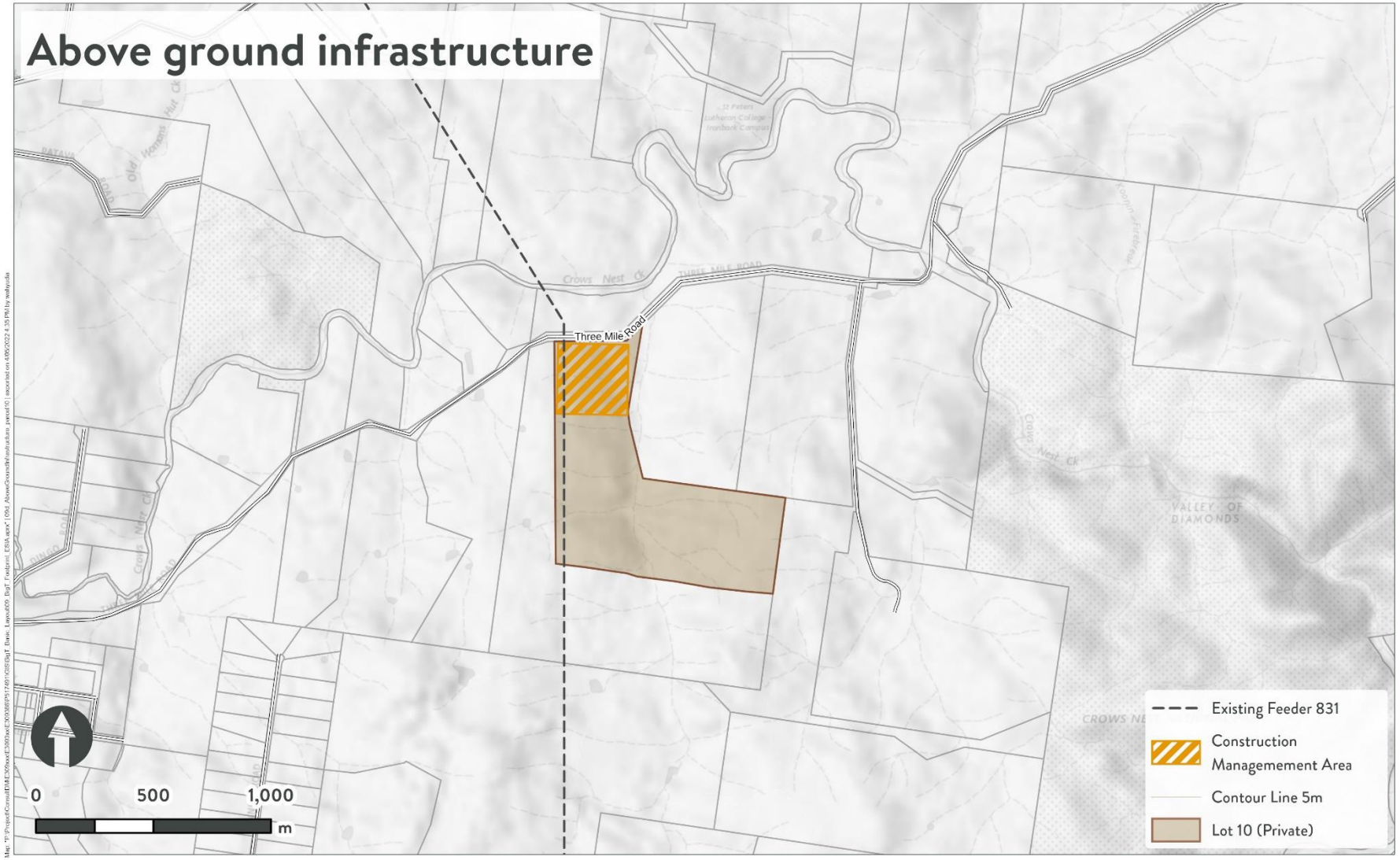

Figure 3.6: Aboveground infrastructure on Lot 10 of the Project

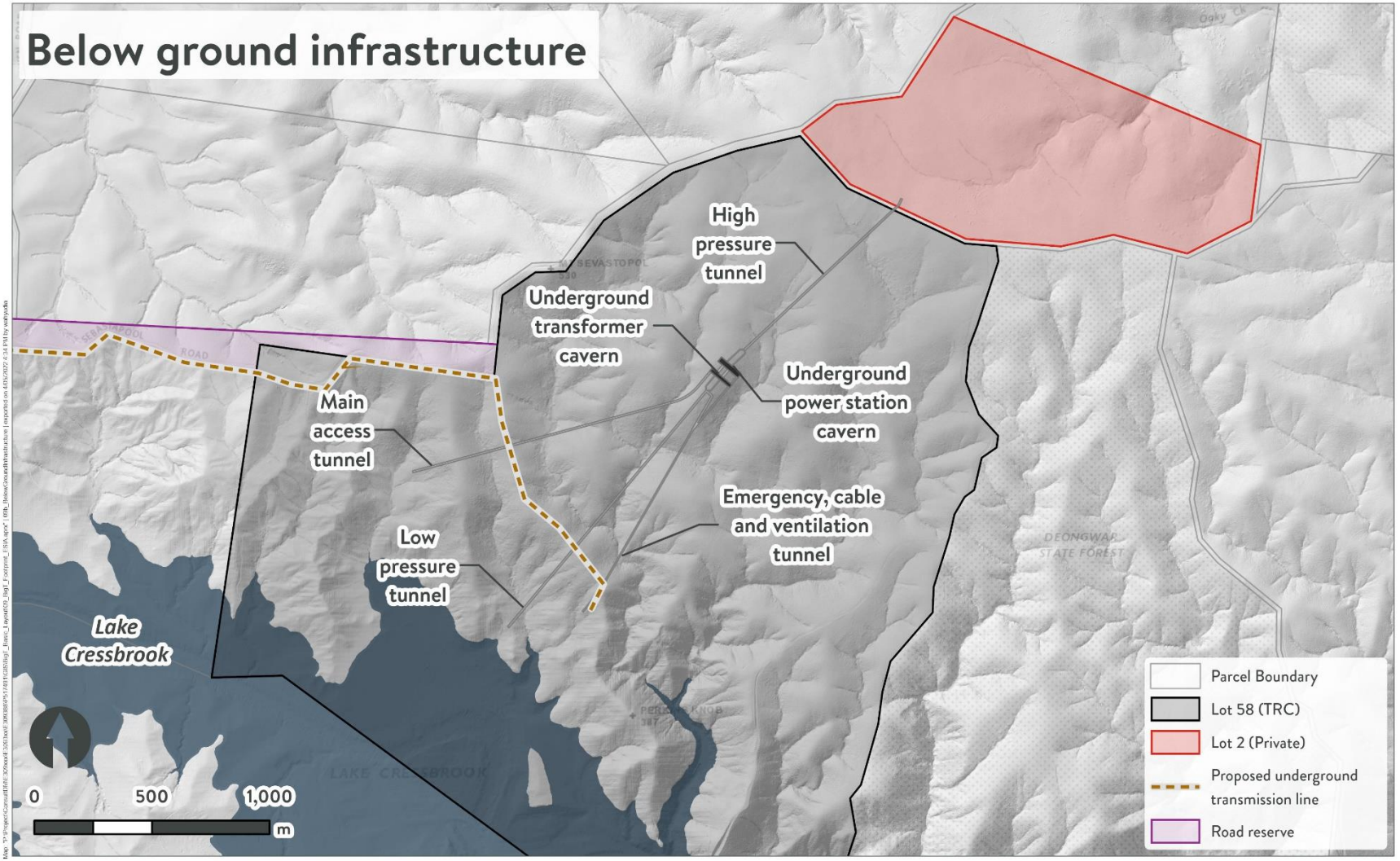

Figure 3.7: Underground infrastructure of the Project

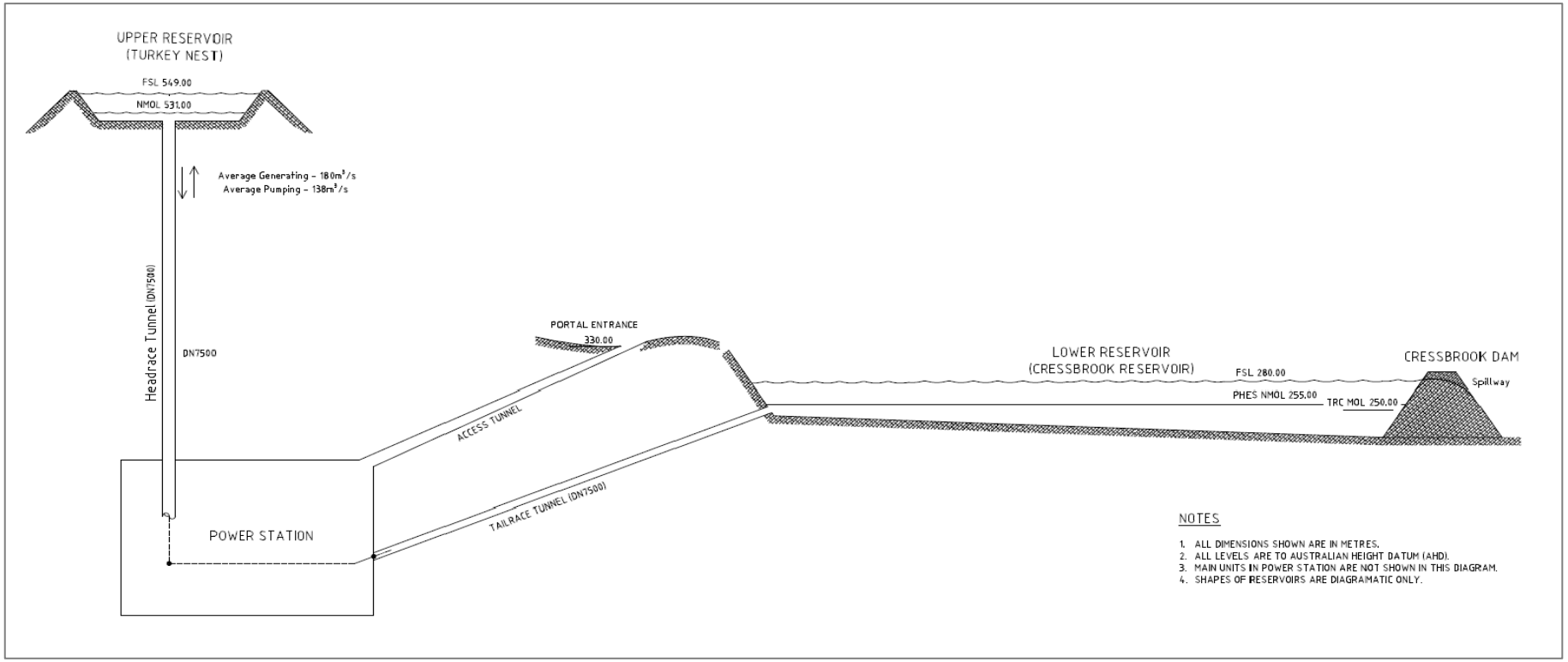

Figure 3.8: Schematic diagram showing connection between two reservoirs for the Project

3.3 PROJECT OBJECTIVE, JUSTIFICATION AND ALTERNATIVES CONSIDERED

3.3.1 Project objectives

The Project has objectives which will benefit the NEM, Queensland, the TRC and BE Power. These include to:

- support the Queensland Government's 50% Renewable Energy Target
- underpin the Darling Downs Renewable Energy Zone (**REZ 8**) through the provision of medium to long-term duration energy storage
- facilitate the buildout of additional modern renewables in the Southern Queensland Renewable Energy Zone (**QREZ**)
- improve reliability of the NEM grid in Queensland through the Project acting as a synchronous generator once operational
- underwrite the lowering of carbon emissions by enabling additional wind and solar generation in Queensland
- benefit the local and regional community through employment opportunities during construction and life span operation, as well as other economic opportunities (such as tourism) afforded by the presence of a PHES scheme in the region
- replace system inertia in the NEM grid that will be left by retiring coal-fired thermal generation
- 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 justification and key strategic benefits

Strategically, the Project is aligned with the Queensland Government's policy for renewable energy transition. The Government committed to establishing three renewable energy zones to support and coordinate new renewable energy projects to contribute to the state's 50% RET by 2030. The Project is located within Australian Energy Market Operator (**AEMO**)'s REZ 8, which is encompassed within the Southern QREZ.

As identified by AEMO, 550 MW to 1,100 MW of medium depth storage (4 to 12 hours) is recommended to facilitate renewable energy projects in REZ8.

The Project also directly addresses the need for dispatchable energy projects. According to the latest reports from the NEM regulator, the AEMO, Australia is undergoing the fastest transition of any energy system in the world. The rapid growth of renewable energy generation is driven by the concurrent factors of falling levelised cost of energy produced by wind and solar, collectively referred to as variable renewable energy developments (**VRE**), as well as the retirement of a number of coal-fired power stations. The recognition for dispatchable energy projects is stated in the AEMO's draft 2022 Integrated System Plan (**ISP**):

> *"45 GW / 620 GWh of storage, in all its forms. The most pressing need in the next decade (beyond what is already committed) is for batteries, hydro or viable alternative storage up to eight hours' depth to manage daily variations in the fast-growing solar and wind output. " (p 10)*

The Project, being situated in the Southern QREZ, is well placed to support the buildout of VRE in that region to assist in achieving the Government's 50% RET (Figure 3.9).

PHES projects are a natural fit in an energy market with high penetration of renewable energy, as they help maximise the use of renewable generation that is subject to variable weather conditions or daylight hours. PHES increases the reliability and availability of renewable energy. During periods of the day when wind power and solar power plants are producing energy, the PHES 'absorbs' excess energy available in the grid and by storing it as water in the upper storage. During periods when these renewable generators are offline or cannot meet demand, the stored energy can be released to the grid. This mechanism provides a reliable and immediate source of energy as a firm and dispatchable source.

The proposed Project, in combination with its energy capture and release capability, also provides significant physical network support in comparison to other dispatchable generation technologies (Figure 3.10). Specifically, once operational the Project will act as an enabler to the construction of additional VRE power generation projects to replace the NEM's fleet of ageing baseload coal power plants. In doing so, the Project will also assist the Queensland Government in achieving its target of 50% electricity generated by renewable energy sources.

Table 3.1: Assessment of Project against AEMO's REZ 8 Scorecard

Zone requirement	Specifics	Big-T Project
Medium depth storage recommended	500 MW – 1,100 MW	✓
Fault level	Up to 200 MVA	✓
System strength augmentation	$180 - $230 million investment required	✓

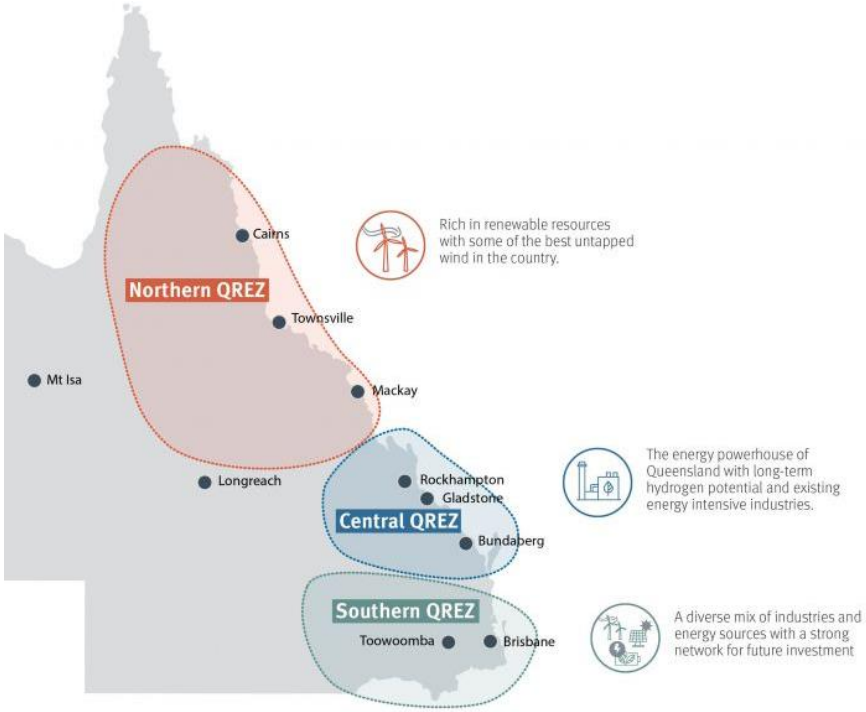

Figure 3.9: Queensland Government Renewable Energy Zone delineation

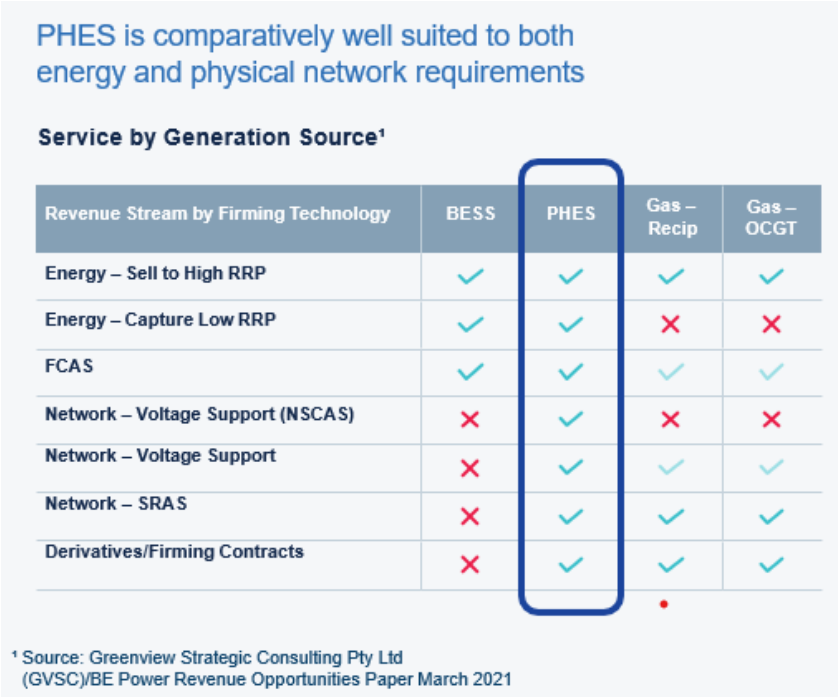

Figure 3.10: Comparison of PHES with other energy capture technologies

The Project will require a construction workforce of up to 350 personnel at its peak. The workforce is expected to come from across the region, providing significant regional benefits, such as direct cashflow to the local economy, accommodation, local tourism and housing.

In terms of blackstart capability, hydropower stations are well known worldwide for their capability to restart other generators (including coal and gas plants) within seconds in the event of a network shutdown due to any events such as station outages, cyclones, or bushfires. Given the Project layout is predominantly underground (being the first PHES in Australia with an underground transmission line), the Project can add significant security to the SEQ network.

3.3.3 Project alternatives considered

3.3.3.1 Alternative activities

As discussed in Section 1, there is a need for more dispatchable energy sources to improve the security of the grid. Other renewable energy generating methods such as wind and solar are not only season-dependent and intermittent, but also do not provide storage ability and are therefore unable to address fluctuations in energy demand throughout the day.

While battery storage has an important role as an effective storage option in the NEM, it cannot provide the medium and deep storage that will be needed as thermal generation exits the market and variable renewables proliferate. PHES schemes are therefore the only currently viable 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.

3.3.3.2 Alternative projects, site, and layout

The project design has undergone a number of iterations which have considered key selection criteria, including:

- interference with the existing TRC Lake Cressbrook operations
- impact on the Lake Cressbrook water catchment (including water security, water quality)

- impact on Lake Cressbrook recreational activities
- TRC commercial considerations
- visual impact
- constructability
- cost implications for construction and operation
- implications on the Cressbrook Dam from PHES operations
- preferred route for the grid connection
- potential impact on private and public landowners
- market soundings
- economic considerations
- preliminary environmental, geotechnical, and social impact studies.

From an environmental perspective, the current iteration of the project layout emphasises underground design arrangements to minimise impacts on terrestrial environmental values. Subject to geotechnical investigation this will include locating the water conveyances (tunnels and shafts connecting both reservoirs to each other), power station, main transformers and switchgear, and transmission line elements underground. While this will result in a significant increase in capital expenditure (**CAPEX**) and additional engineering risk, it is considered that the minimisation of impact on terrestrial environmental values is critical for this Project.

Prior to the proposed design, the Project underwent several design iterations, which are summarised below.

PHES component

The first concept design by Entura (2018), commissioned for BE Power, investigated connecting two existing reservoirs, formed by Cressbrook Dam and Perseverance Dam, to develop a PHES. This was, however, found not feasible for a number of reasons, including:

- the requirement for a long waterway and the technical and financial implications that this design would incur including dam stability reduced efficiency of the scheme and increased start-up and response time.
- the active volume that could be considered for the storage is being limited by the rapid drawdown constraint of Perseverance Dam.
- potential water quality and ecological impacts of pumping water back to Perseverance Dam, as Perseverance Dam is not located in the same catchment as Cressbrook Dam.

Due to these challenges, alternative sites within the region were assessed by applying a matrix that considered key parameters including geological and geotechnical conditions, grid connection and network capacity, existing infrastructure and environmental values. This resulted in the identification of the current Project area as having strong potential for a PHES scheme, due to the high ground northwest of Lake Cressbrook and proximity to the existing waterbody. The relatively flat topography was considered suitable for an upper reservoir in a ‘turkey’s nest’ style requiring minimal cut and fill.

In addition, the elevation difference between the proposed upper reservoir and Lake Cressbrook allows for favourable conditions to operate a PHES. Further, the site requires only a reasonably short transmission line to connect to the NEM allowing an underground connection avoiding environmental and amenity impacts.

In addition to Entura's studies, the TRC had earlier commissioned its own assessment of options using creeks and waterbodies for pumped storage. A study undertaken by GHD (2004) identified three options, two (Jockey and Little Oakey Creek) that connected to Lake Cressbrook, and the other (Peachy) to Perseverance Reservoir. The Peachy option was not preferable as it used Perseverance Reservoir. Of the GHD (2004) study, Jockey was the most preferable design due to lower capital cost despite a longer waterway.

Entura's study in 2018 furthered the advantages of the Jockey option, on the basis of better head with design alterations, shorter waterways and avoidance of damming a creek and the associated additional environmental impacts.

Following concept studies by GHD and Entura, the Project underwent substantial refinement, including reservoir design. An options assessment was undertaken by Entura in 2021 to determine the preferred arrangement for the Project as part of the bankable feasibility study. Various alternative arrangements have been considered including placement of waterways:

- surface configuration, where two reservoirs are connected by a surface penstock, vertical shaft to underground power station, and outlet structure at Lake Cressbrook
- underground configuration, where the two reservoirs are connected by shafts and tunnels, with the power station located underground in a cavern
- hybrid configuration, where two reservoirs are connected by infrastructure that is partly located above ground and some located underground.

Aside from the waterway arrangement, the options assessment also considered two reservoir design and location:

- Option A – upper reservoir located across both Lot 2 and Lot 58
- Option B – upper reservoir wholly located on Lot 2.

The underground waterway configuration was selected (dependent on geotechnical conditions) on the basis that it would reduce social and environmental impacts. Option B reservoir design was considered preferable as it is confined to a single land parcel with a smaller footprint, although it requires a slightly higher dam.

Transmission line component

In 2021, Yurika undertook an options assessment to identify possible transmission line routes for the Project. Five connection options were shortlisted for consideration, including both overhead and underground options, as well as single, dual and quad circuit options. All options connect to Feeder 831, which is the only connection point in the area.

All of the options presented advantages and disadvantages across a range of considerations, such as construction cost, maintenance and repair time, social and stakeholder impacts, environmental impacts, and line and transformer losses. Overhead options were cheaper, but required a larger easement (up to 60 m wide) and would result in social and environmental impacts. Underground options would have very limited environmental and social impact, but are more expensive to construct, have longer fault identification and repair time and consequent longer outage time in the event of a fault.

Ultimately, the underground double circuit transmission line was selected as the preferred option due to the avoidance of environmental risk (no additional land disturbance or bushfire risk) and a lower stakeholder risk (involvement of no private landowners, so no requirements for easement or land negotiations).

3.4 KEY PROJECT COMPONENTS/INFRASTRUCTURE FOR DECLARATION

It is proposed that the Project, as described in Section 3.1.2, will be subject to declaration under the Queensland SDPWO Act.

3.5 EXTERNAL INFRASTRUCTURE REQUIREMENTS

Further to infrastructure described in Section 3.1.2, the key external ancillary infrastructure of the Project is Wivenhoe Dam and the Wivenhoe pipeline that operates between Wivenhoe Dam and Cressbrook Dam.

As discussed further in Section 3.7.13.7.2, there are two potential water licencing solutions currently being explored for the PHES project. Both solutions anticipate that any annual water losses caused by the PHES (e.g. evaporation) will be replenished through the Wivenhoe Pipeline that is owned and operated by the TRC.

3.6 PROJECT TIMEFRAME

Error! Reference source not found. outlines the approximate p roposed timeframe for the development of the Project.

Table 3.2: Approximate Project timeframes

Project phase	Approximate timeframe
Bankable feasibility study	January 2021 – October 2022
Project approvals	December 2021 – October 2023
Reference design	February 2023 – May 2023
Financial close	December 2023
Construction	January 2024 – June 2027
Commercial operation date	July 2027

3.7 CONSTRUCTION AND OPERATION PROCESS

Construction of the Project is expected to take up to three and a half years including rehabilitation work. Construction activities include:

- site establishment and preliminary works
- connection of ancillary infrastructure to support the operation of the Project, including electricity supply, light vehicle roads and access tracks
- import of turbines, transformers and other electrical infrastructure
- construction of upper reservoir and intakes
- underground works including access tunnels, power cavern, headrace and tail race tunnels
- construction of the underground electricity transmission line from the Project power station to the connection point of the Middle Range - Tarong line.

Underground works, including excavating shafts, tunnels and caverns, are expected to be completed using a combination of raised bore drilling and conventional drill and blast methods. Shafts and tunnels will be lined where required. It is expected that spoil from the underground works will be used to form tunnel portals and in the upper reservoir. Excess spoil will be permanently disposed of within the project site as shown in Figure 3.11.

Some explosives may be required during tunnel and cavern excavation, stripping the dam's foundation, and quarrying aggregate for concrete and road paving.

Construction of the intake/outlet may require a cofferdam to be built between Lake Cressbrook and lower intake/outlet location to control water entering the construction area. The cofferdam will be removed after construction and commissioning of the intake/outlet structure.

Notwithstanding other matters that may result in the temporary closure of Lake Cressbrook for recreational use such as high cyanobacteria levels as is frequently the case, Lake Cressbrook is proposed to remain open for recreational use during the construction and operation of the Project. Appropriate exclusion zones in Lake Cressbrook will be established to maintain public safety.

Based on preliminary engineering design and studies, up to 2,080,000 m^3 of spoil will be excavated from the upper reservoir site, all of which will be reused for the construction of the reservoir. Additionally, there will be spoil volumes of approximately 930,000 m^3 excavated for the construction of other project components, including tunnels, power station, and intake structures. At present, it is assumed that 450,000 m^3 of that will be used in the upper reservoir. The remaining will be placed in various spoil areas proposed for the project, shown in Figure 3.11. It must be noted however, that these volumes are deduced from preliminary design work and further refinement is expected as the engineering design work progresses, and better understanding of the sub-ground composition is obtained following completion of the geotechnical investigation program that is currently underway.

Subject to consultation with the engineering, procurement, and construction (**EPC**) contractor and TRC, construction will generally occur between 7am – 7pm Monday to Friday. When operational the Project will operate 24 hours a day, seven days a week, with an anticipated lifespan of 80 years.

3.7.1 Access to Project site

Access to the primary Project site will be via Sebastapool Road from Crows Nest, as shown in Figure 3.12. Oaky Mill Road/Owens Road provides an alternative access from Eskdale to the northeast. Existing tracks are present across both Lot 2 and Lot 58. Access on Lot 10 is afforded by existing farm tracks and easement tracks.

3.7.2 Water supply

The Project requires access to Lake Cressbrook to recirculate up to 6.4 GL of water between Lake Cressbrook and the upper reservoir in every charging-discharging cycle. A number of options have been investigated to date between BEP, TRC, and the Department of Regional Development, Manufacturing and Water (**DRDMW**). One of the options that addresses the water security requirements of TRC is called the "Capacity Share Water Management and Accounting System" model.

This model requires DRDMW to agree to establish a Capacity Sharing Water Management and Accounting System within the Cressbrook Water Supply Scheme.

The establishment of a Capacity Share Water Management and Accounting System is intended to:

- provide for the physical use of the upper reservoir as part of the storage volume for TRC water within TRC's Capacity Share Account; and
- enable the recirculation of the water between Lake Cressbrook and the upper reservoir for the Project, without impacting on TRC's ability to access water.

It may be that DRDMW will also require BEP, as the owner of the upper reservoir, to hold a statutory authorisation under the Queensland *Water Act 2000* for the recirculation of the water and/or the use of the upper reservoir as part of the physical storage for TRC water under the Capacity Share Water Management and Accounting System.

Additionally, it is anticipated that the following commercial agreements would be put in place between TRC and BEP:

- Operational Agreement – to allow BEP to recirculate water held in the TRC Capacity Share Account for the Project and to set out the operational parameters under which this will occur
- Water Supply Agreements – to cover the following:
    - dead storage of the upper reservoir
    - any likely annual losses
    - water for construction.

Meeting TRC's water security requirements is an important part of the TRC ITT process.

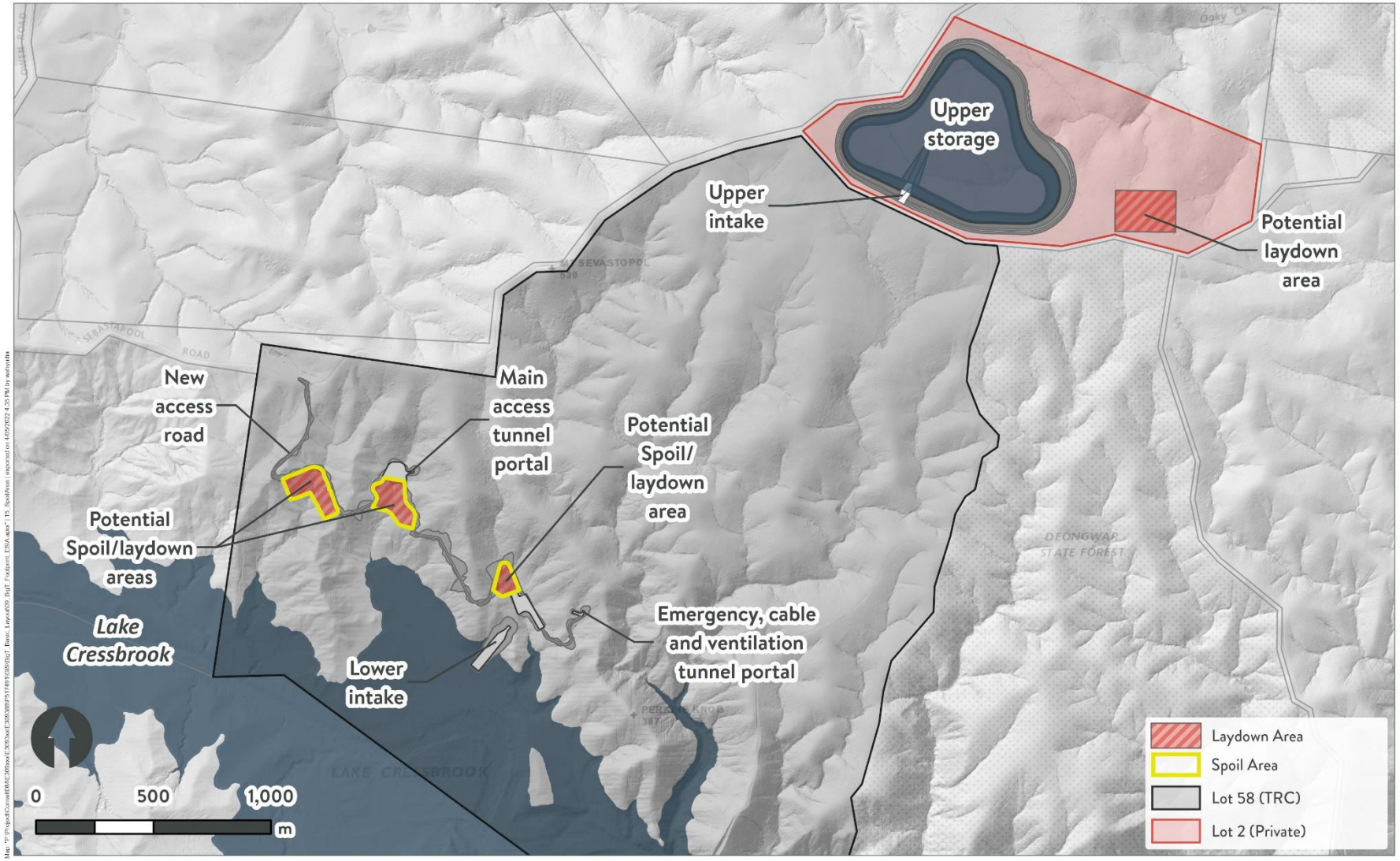

Figure 3.11: Potential spoil areas within Project site

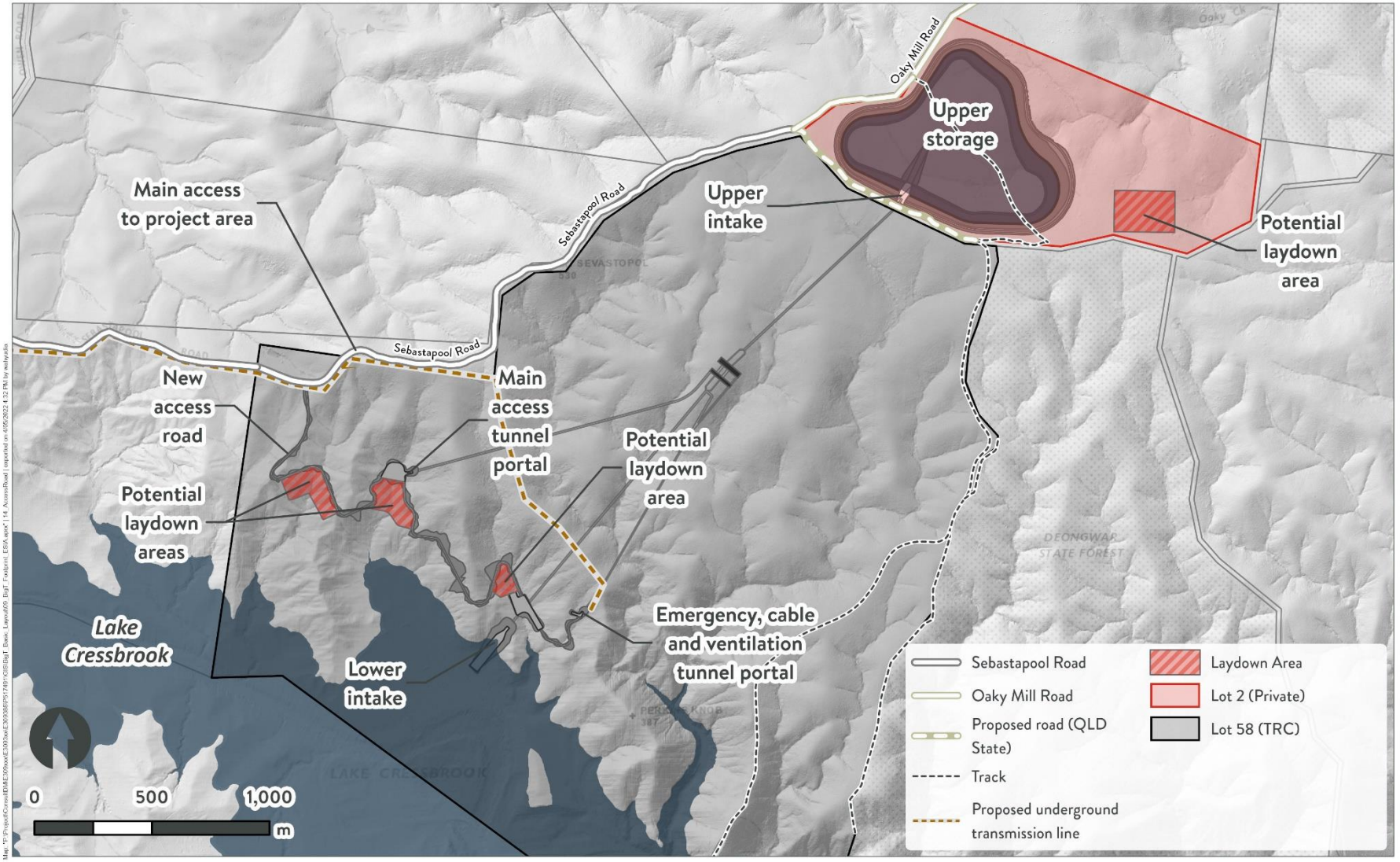

Figure 3.12: Access to Project site

3.8 WORKFORCE REQUIREMENTS DURING CONSTRUCTION AND OPERATION

Based on the Project as described in Section 3.1.2, and the geotechnical evaluations to date which assumes that the excavated rock material is suitable for use for concrete production and for placement as structural fill material, the Project will require a construction workforce of up to 350 personnel at its peak. The average workforce throughout the life of the construction of the Project will be approximately 250 personnel.

The operational workforce is expected to be approximately 10 full-time employees (excluding sub-contracted maintenance workforce).

Direct and indirect employment opportunities, including suppliers and manufacturers will be afforded through the construction phase.

Subject to the contractor responsible for construction, it is anticipated that a majority of the construction workforce will come from the broader Toowoomba and Brisbane region, and accommodation will be accounted for by the existing housing capacity in nearby towns such as Crows Nest, Esk and Hampton. Further commentary on the source of the labour is discussed further in Section 5.2.

A construction management area is proposed for Lot 10 however this is purely for administrative facilities and is not expected to be used for accommodation purposes. The area will include site office and parking space for worker light vehicles.

3.9 ECONOMIC INDICATORS

The estimated total capital cost for the development of the Project is $1.3 billion. Of the $1.3 billion, it is expected that approximately $500 million will be invested into the local economy.

The Project, as a PHES, is an enabler of the renewable energy transition. The Project is situated in REZ8 where the AEMO 2022 draft ISP determines the renewable energy potential to be 13,600 MW of solar and wind generation. To facilitate this level of renewable energy projects in REZ8, AEMO recommends that 550 MW – 1,100 MW of medium-depth storage is required. Therefore, the Project will be a significant enabler of future renewable energy project development in REZ8 over the long term with the consequent economic, social and environmental benefits.

A Commercial Proposal to the TRC is being developed by BEP as a component of the ITT process Stage 3. BEP's objective is to provide immediate and ongoing benefits to the TRC and the community.

3.10 FINANCING REQUIREMENTS AND IMPLICATIONS

The Project proponents are very experienced power project developers and financiers with significant capacity and capability. Further, BE Power has engaged Ernst & Young (**EY**) as the financial advisor to the Project.

As previously outlined, the Project is shortlisted in the federal government's UNGI scheme.

EY has completed pre-feasibility financial modelling including market modelling of the Project. Based on the current Project assumptions, the Project is considered bankable.

BE Power has undertaken market soundings for the Project debt and equity requirements utilising the Project pre-feasibility financial assessment. Significant interest from debt and equity providers has been garnered. BEP continues to work with potential financial parties as the Project approaches completion of the Bankable Feasibility Report.

4 LOCATION OF KEY PROJECT ELEMENTS

This section provides an overview of the regional and local context in which the Big-T PHES Project will be located, including a description of the features within the broader Project area, as well as the land use and tenure of areas immediately adjacent to the Project parcels. It is considered that the Project is broadly consistent with the regional and local context of the area.

4.1 LOCATION

4.1.1 Project location

The Project is located northeast of Lake Cressbrook in a mixed rural grazing setting with isolated residential properties. The Project site consists of the following parcels (collectively referred as **Project area**):

- 58/CSH2241 (**Lot 58**) – freehold parcel owned by the TRC including Lake Cressbrook
- 2/SP300942 (**Lot 2**) – freehold parcel owned privately, and which BE Power has an Option Agreement to purchase[1]
- RP223812 (**Lot 10**) – freehold parcel owned by BEP
- Road 'right of way' of Sebastapool and Three Mile roads.

The Option Agreement for Lot 2 does not prevent access during the assessment phase of the Project. BEP is expected to purchase Lot 2 in 2023. Access to Lot 58 is granted through participation in TRC's ITT process.

A conceptual design for the underground transmission line has been developed that primarily uses Sebastopol Road and Three Mile Road right of ways both of which are owned by the TRC. Impacts to private landowners from either purchase of land or the creation of easements for the transmission line are expected to be minimal.

4.1.2 Local context

The Project is located across the rural localities of Biarra, for the hydropower component, and Crows Nest for the transmission infrastructure. The Project area is bound by the New England Highway to the west, Crows Nest Road to the north and east, and Esk Hampton Road to the south. Access to the Project area is via Three Mile Road and Sebastapool Road.

[1] BE Power has an option agreement for Lot 2 to April 2023 following which BEP intend to purchase Lot 2. The only condition following purchase of Lot 2 by BEP is that 'all weather access' is provided to the adjoining lot (1/SP9300942) at all times.

The most prominent features of the local area are Lake Cressbrook and Lake Perseverance. Both are artificial lakes, owned by the TRC and used for water supply as well as recreational activities. Lake Cressbrook will act as the lower reservoir for the proposed PHES scheme. Public access to Lake Cressbrook is via a boat ramp (located opposite of the proposed intake), which is accessed via a turn off at the junction of Perseverance Dam Road and Mount Jockey Road. After completion of the project, Lake Cressbrook will continue to be a recreational asset and be available for public use. An intake exclusion zone is likely to be required near the lower intake for safety purposes.

The other Project components of the upper reservoir and power station are located on land owned by the TRC and BEP (Lot 2), are within a locked-gate area and have restricted public access.

4.1.3 Regional context

The Project is located within Southeast Queensland on the eastern edge of the Darling Downs, west of the Great Dividing Range. The eastern side of the Downs is defined by the Bunya Mountains, with the Dividing Range continuing in a south-easterly direction through Crows Nest.

Crows Nest is the nearest township to the Project and is located 15 km to the west. The town is set among hilly country, situated 543 m above sea level atop the Dividing Range. There are four National Parks and three lakes within the region. The vicinity is known for its tall eucalypt forests which is home to a diverse range of wildlife.

Toowoomba, located approximately 45 km northeast of the Project site, is the largest city and commercial centre of the Darling Downs. Other nearby towns to the Project include Esk (20 km east) and Toogoolawah (25 km northeast).

There are a number of significant natural and recreational areas within the region, including Crows Nest National Park located 8 km west of Lake Cressbrook, as well as the Deongwar State Forest. Neither are located within the Project footprint. Within the National Park, there are a number of walking tracks and features including the Koonin Lookout, Kauyoo Pool, and Crows Nest Falls.

The Project site also adjoins the Deongwar State Forest to the south and east, as well as Pine Cliff Nature Refuge to the northeast, however the Project site does not include these areas. The Project upper reservoir is located on Mount Sevastopol, with its highest point at 557 m southeast of the boundary of Lot 2, along Sebastapool Road.

4.2 TENURE

The Project is located wholly on land of freehold tenure. Three parcels which share a boundary with Lot 2 are of ‘Profit à Prendre’ tenure which indicates secondary interests on these three parcels. The three parcels are 84/CA311287, and two sub-parcels of 41/CSH403. Other areas adjacent to the Project area are largely freehold parcels.

Land of ‘State Forest’ tenure, belonging to the Deongwar State Forest (parcel reference 528/FTY1889), adjoins the project parcels to the south (Lot 2) and east (Lot 58). While it does not directly adjoin the Project area, the Crows Nest National Park is situated on tenure identified as ‘National Park’.

Further details about the local and regional land tenure is outlined in Section 5.6.2.

4.2.1 Local government planning scheme

This section provides an overview of the strategic planning context in which the Project will be developed, including the planning schemes and instruments as well as federal and state government policies that likely to apply to the Project. Based on initial review of available databases, policies, and regulatory instruments, it is considered that the Project is broadly aligned with the objectives and priorities outlined within those documents.

The Project is located across the local government areas (**LGA**) of Toowoomba and Somerset. The hydropower component is located within the Somerset LGA, and the interaction transmission line is predominantly located within the Toowoomba LGA, though some parts are within the Somerset LGA. Lake Cressbrook is owned and operated by the TRC, however parts of the lake are situated within the Somerset LGA.

4.2.2 Planning instruments, government policies

There are a number of planning instruments and government policies that are relevant to the Project, including:

- Commonwealth Draft National Koala Recovery Plan (June 2021)
- Queensland's State Planning Policy
- Southeast Queensland Koala Conservation Strategy
- regional plans
    - South East Queensland Regional Plan 2017 (**Shaping SEQ**)
    - Darling Downs Regional Plan 2013 (**DDRP**)
- local government area planning schemes
    - Toowoomba Regional Planning Scheme
    - Somerset Regional Planning Scheme
- Relevant state codes under the State Development Assessment Provisions, including but not be limited to:
    - State Code 10 – Taking or interfering with water
    - State Code 16 – Native Vegetation Clearing;
    - State Code 20 – Referable Dams;
    - State Code 22 – Environmentally Relevant Activities; and
    - State Code 25 – Development in South East Queensland koala habitat areas.
- key government policies, including but not be limited to:
    - Queensland State Infrastructure Plan (2016) and the (impending) State Infrastructure Strategy and Regional Infrastructure Plans
    - South East Queensland Regional Plan 2009 – 2031
    - Queensland Climate Transition Strategy (2017)
    - Renewable Energy Target
    - Powering Queensland Plan (2017).

4.2.3 Regional plan designation

Two regional plans apply for the Project as shown in Figure 4.1:

- South East Queensland Regional Plan 2017 (**Shaping SEQ**)
- Darling Downs Regional Plan 2013 (**DDRP**).

ShapingSEQ applies for the hydropower component of the Project. The plan provides the regional framework for growth management and sets planning direction for sustainable growth and development across 12 local governments, including SRC and part of TRC. The plan acknowledges the move to affordable renewable energy as a key to the region's sustainability, and specifically calls out regional relationships with Darling Downs in sectors such as renewable energy.

Of particular relevance are designations within the ShapingSEQ plan, which determines the broader Project vicinity to have the following attributes:

- Regional Landscape and Rural Production Area
- Regional biodiversity value
- Regional biodiversity corridor.

The DDRP applies for the transmission line component of the Project. This regional plan is applicable for six local governments, including the TRC. It acknowledges the significant capacity and competitive strengths within the energy sector, including opportunities to leverage electricity infrastructure as a means to boost the economy. These developments would have a role in enabling the growth of the agricultural and farming industries which are widely prevalent across the region.

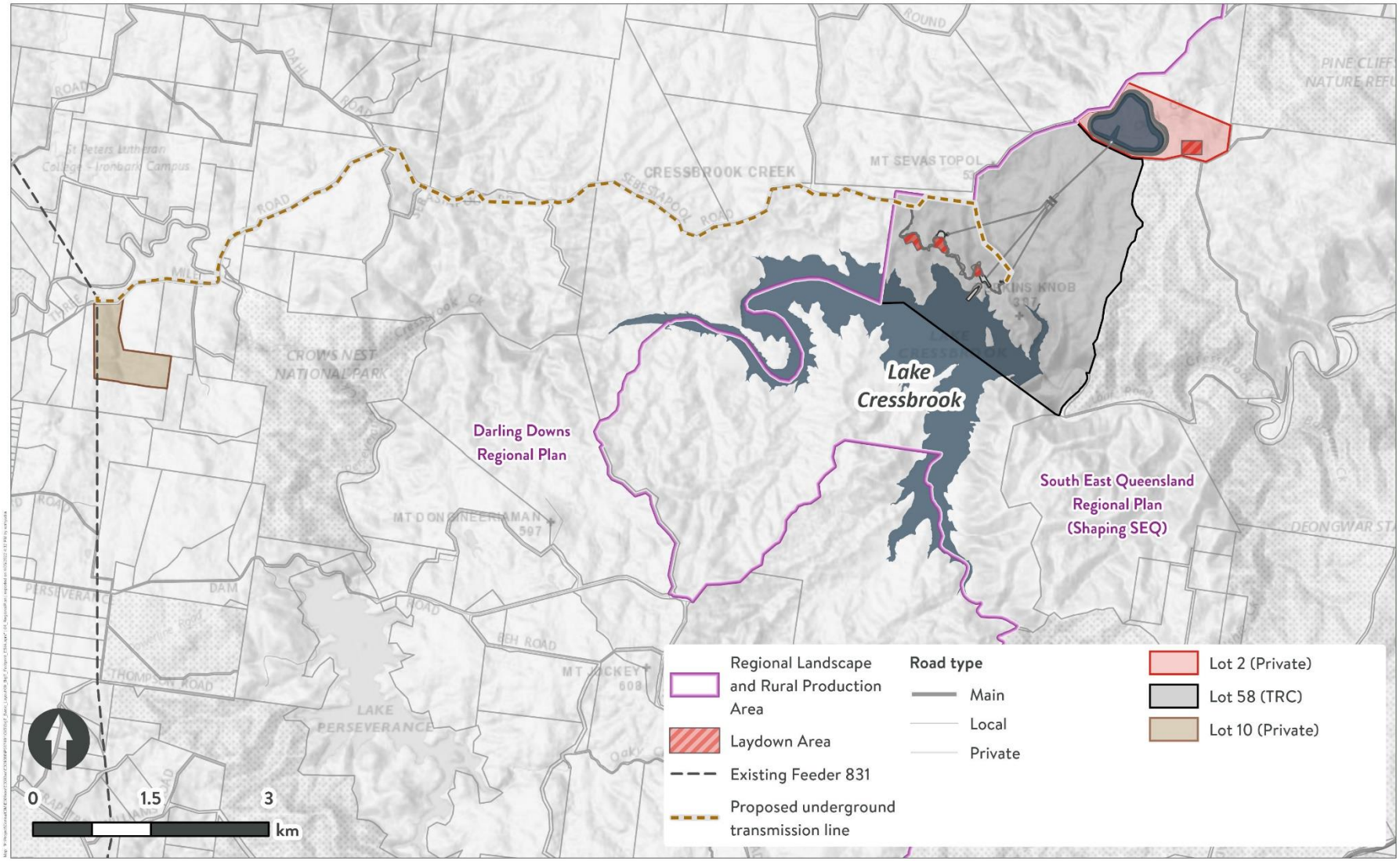

Figure 4.1: Regional plans applicable to the Project

5 DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 NATURAL ENVIRONMENT

5.1.1 Land

Topography

The Project area is located across mixed topography. The upper reservoir is located on land that is comparatively flat and sits approximately 530m above sea level. This area forms a high node, with the hill face falling steeply in a southwest direction towards Lake Cressbrook. The fall in the north is less steep. Some shore areas of Lake Cressbrook are also very steep, as is the case for the location of the outlet portal.

Notable topographic features in the area include Mount Sevastopol, as well as Perkins Knob located near the shore of Lake Cressbrook.

Cressbrook Dam lies at an elevation of approximately 270 m above sea level and rises to its highest point to the northeast at 540 m (refer Figure 5.1). The terrain in proximity to the dam and along the Sebastapool Road corridor to the west is generally flat or gently inclined. The area to the northeast rises sharply in some locations in association with Mount Sevastopol.

Broadly speaking, areas south of Sebastapool Road are generally steeper compared to areas north of the road. The steep terrain falls to Cressbrook Creek that sits within a valley and runs in an east–west direction from Lake Cressbrook through the Valley of Diamonds within the Crows Nest National Park.

Nature conservation areas

The Project is located in close proximity to the following nature areas (Figure 5.2):

- Deongwar State Forest, approximately 500 m east of the Project location
- Pine Cliffs Nature Refuge, approximately 2 km east of the upper reservoir
- Crows Nest National Park, over 5 km west of the PHES component, and 350 m south of the transmission line corridor (Three Mile Road).

Deongwar State Forest covers at area of approximately 4,900 ha and is situated mostly north of Esk Hampton Road, southwest of Lake Cressbrook. At the northern fringe of the forest, there are some views to the southernmost tip of Cressbrook Dam. The forest has several walking tracks, including the Crows Nest to Deongwar State Forest section of the Bicentennial National Trail (BNT) – the 5,330 km trek from Cooktown in Far North Queensland to Healesville in Victoria.

Crows Nest National Park covers approximately 17.9 km^2 and is known for its rugged landscape, waterfalls and a sparking gorge known as ‘Valley of Diamonds’. The national park is separated by Perseverance Dam Road, with a smaller northern section north of the road, and a larger area south of the road and to the west of Perseverance Dam.

Pine Cliffs Nature Refuge is located east of the Project site and contains an area of 517.9 ha. It is bound by Cressbrook Creek and Deongwar State Forest to the east. According to Part 45 of the *Nature Conservation (Protected Areas) Amendment Regulation (No.7) 1999*, the nature refuge supports:

- five regional ecosystems, two of which are endangered
- natural stands of bunya pine (*Araucaria bidwillii*) and homalium *(homalium alnifolium)*
- vulnerable black-breasted button-quail (*Turnix melanogaster*).

Geology

Preliminary geological field mapping for the Project was undertaken in June 2021 by WSP to provide an initial interpretation of the major geological features of the Project area.

Detailed geological studies commenced in December 2021, and are ongoing. The geological studies undertaken to date have not identified any fatal flaws in the current Project design.

Review of the Yarraman Special Geology 1:250,000 scale regional geological map indicates the Project area is located within the southern area of the Yarraman Block, specifically within Permian Age Granitoids and Late Triassic Aged post-orogenic volcanic's and related deposits. Adjacent to the Project area the Yarraman block borders the Clarence Moreton Basin to the west of the Project area, with the major contact between these units generally striking northwest. To the west of the Project area, there are multiple regional scale faults noted, associated with the inter-block Gympie Province (Cressbrook Subprovince) with orientations striking north-northeast and east-west, generally orthogonal to one another.

According to the 1:100,000 scale regional geological map last updated in 2015 by the Queensland Department of Natural Resources and Mines and as shown in Figure 5.3, the major regional geological units of the Project area include:

- Permian to Late Triassic Granodiorite, Diorite and Granite (labelled PRg?) – this geological unit is exposed at the top of Mount Sevastopol, and consists of porphyritic biotite microgranite, granite, diorite, granodiorite, and micro-granodiorite. This unit has intruded into the Sugarloaf Metamorphics, and forms an erosion resistant cap on Mount Sevastopol.
- Eskdale Igneous Complex (labelled Rges/1) – a small part of the property which will see most of the underground infrastructure contains this Late Permian to Early Triassic Granodiorite feature. It is expressed as altered coarse-grained chloritized hornblende-biotite granodiorite and granite, minor diorite and gabbro.
- Sugarloaf Metamorphics (labelled DCo) Late Devonian to Early Carboniferous: this geological unit is present across the southwestern to southeastern fringes of the private property, as well as a majority of the property that will host the underground infrastructure. It consists of slate, spotted hornfels slate, phyllite, quartzite, schist and amphibolite. Further west of this area is DCo/v (located along the transmission line corridor), which is also associated with the Sugarloaf Metamorphic unit, identified as basic meta-volcanics, amphibolite, meta-arenite, schist and slate.
- Late Permian to Early Triassic intrusives in southeast Queensland (labelled Rgr): this geological unit is present largely across transmission line corridor of the Project. It has a dominant rock type of granitoid, and consists of granite, granodiorite, tonalite, diorite and gabbro.

Further geological and geotechnical investigations as well as laboratory and in situ testing are currently underway to refine the understanding of the geotechnical conditions and geological features of the Project area. Findings and results of the investigations will ultimately inform Project design, in particular confirming the viability of an underground water conveyance arrangement.

Soils

The State Regional Ecosystem (**RE**) is a land classification framework in Queensland. Land is classified by bioregion, land zone and then vegetation and/or variations in geology/landform/soils within a land zone.

The following land zones occur within the Project area:

- Landzone 3 – which includes (for the broader State) recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes and associated wave built lunettes;
- Landzone 11 – metamorphosed rocks, forming ranges, hills and lowlands;
- Landzone 12 – Mesozoic to Proterozoic igneous rocks, forming ranges, hills and lowlands;

Soils mapping at the 1:2 million scale by CSIRO (and various other groups) (BRS 1991) identifies tenosols and sodosols as the primary soil groups for the Project area (Table 5.1).

5.1.1.1 Acid sulfate soils

A search on the Queensland Globe (2021) database did not identify any acid sulfate soils in the vicinity of the Project.

5.1.1.2 Contaminated land/soils

A search on the Queensland Globe (2021) database did not identify any contaminated land or soils within the Project proximity.

Table 5.1: CSIRO soils mapping within the Project area (BRS 1991)

Soil group and unit	Soil description
Sodosol, Qd6 (Dr2.42)	Hard pedal red duplex soils. Duplex red, hard setting A horizon, A2 horizon conspic bleached, neut pedal whole col B horizon.
Tenosol, Fu3 (Um2.12)	Steep hilly to mountainous terrain on metasediments and phyllites. Uniform medium, conspic bleached A2 horizon, non calc, underlain by a carbonate pan.
Tenosol, Cd4 (Uc2.12)	Mountainous land on granite. Uniform coarse, non calc, A2 horizon conspic bleached with non calc pan below A2 horizon. Bleached sands.

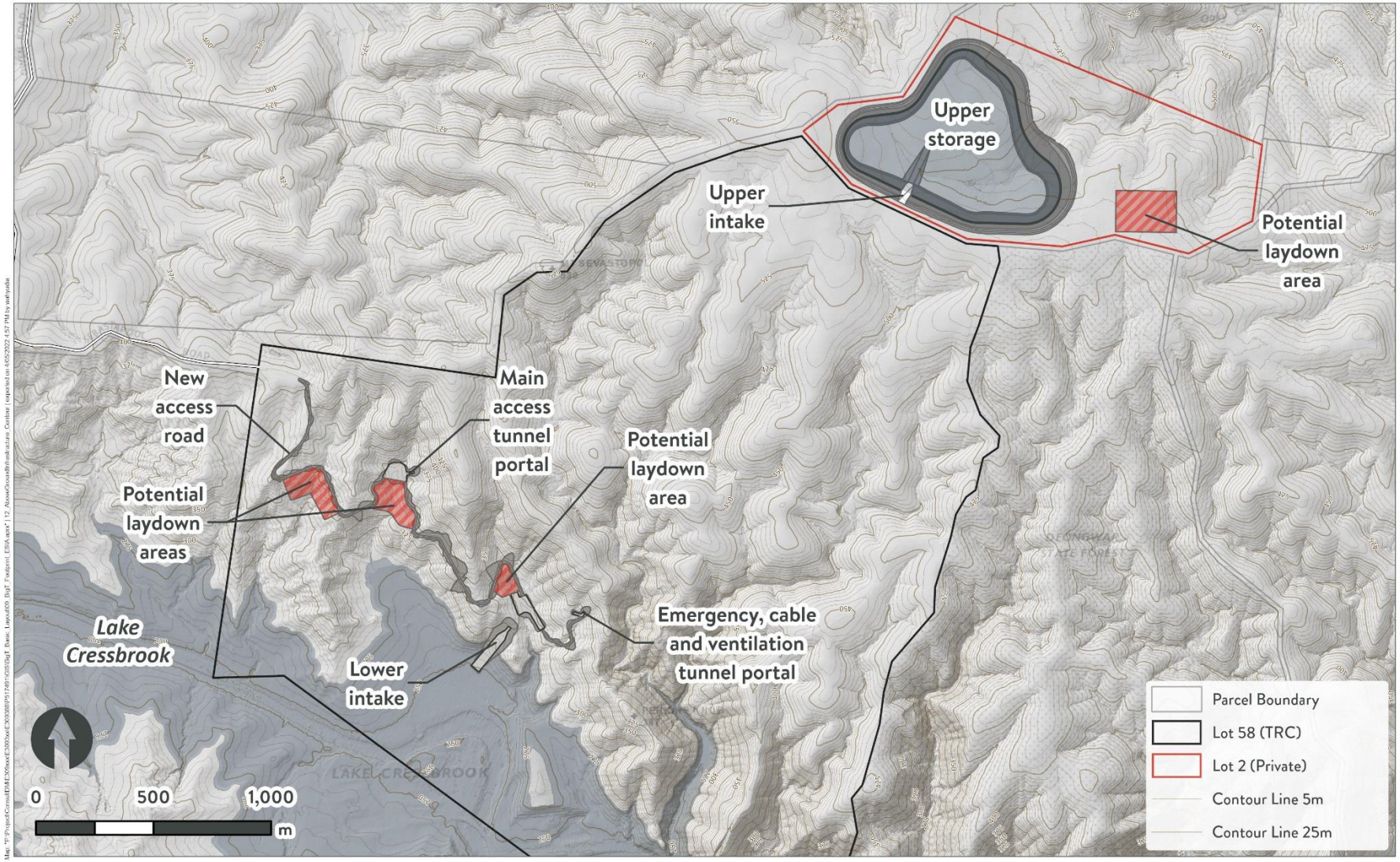

Figure 5.1: Contour map overlayed with key project infrastructure

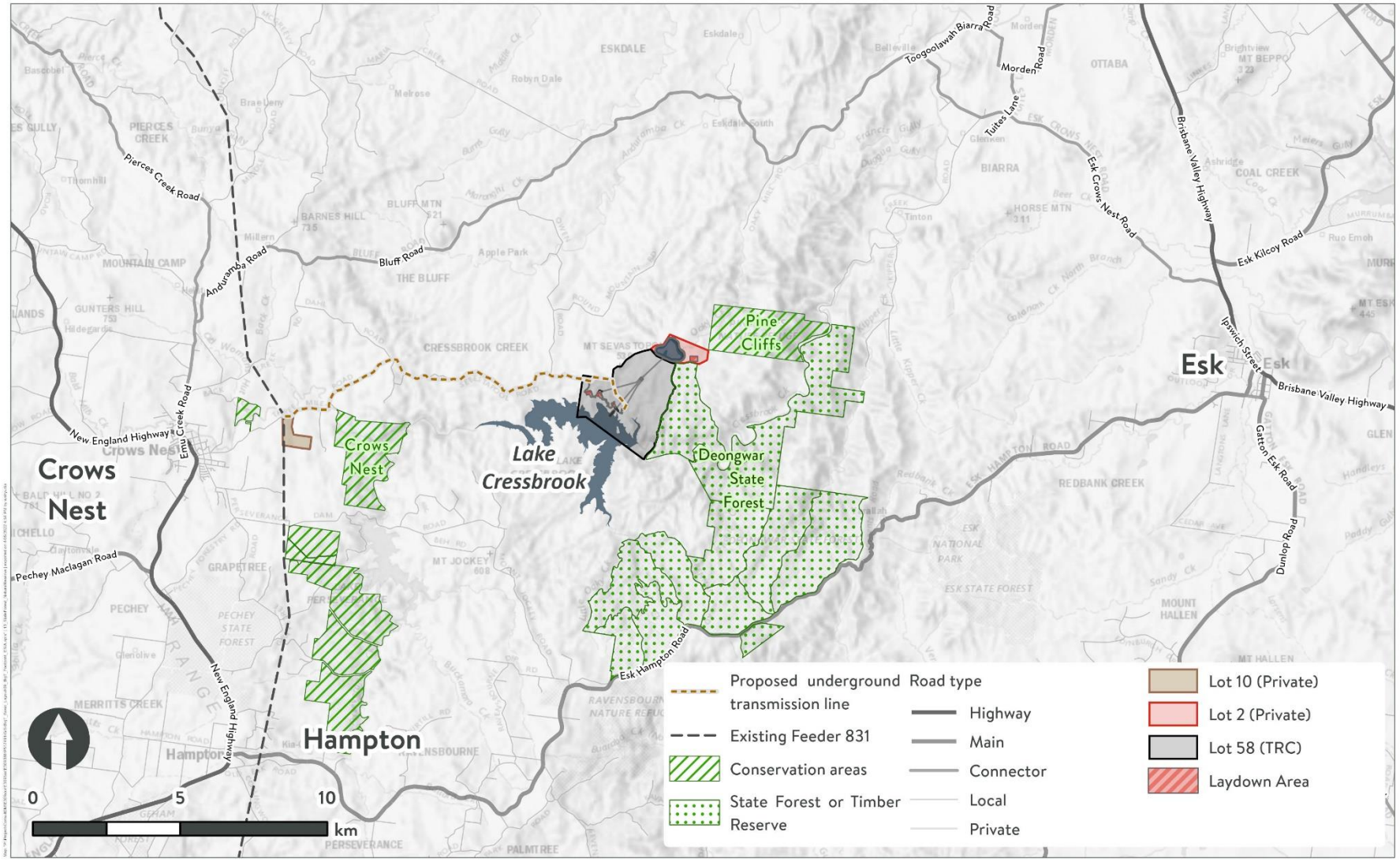

Figure 5.2: Nature conservation areas in project surrounds

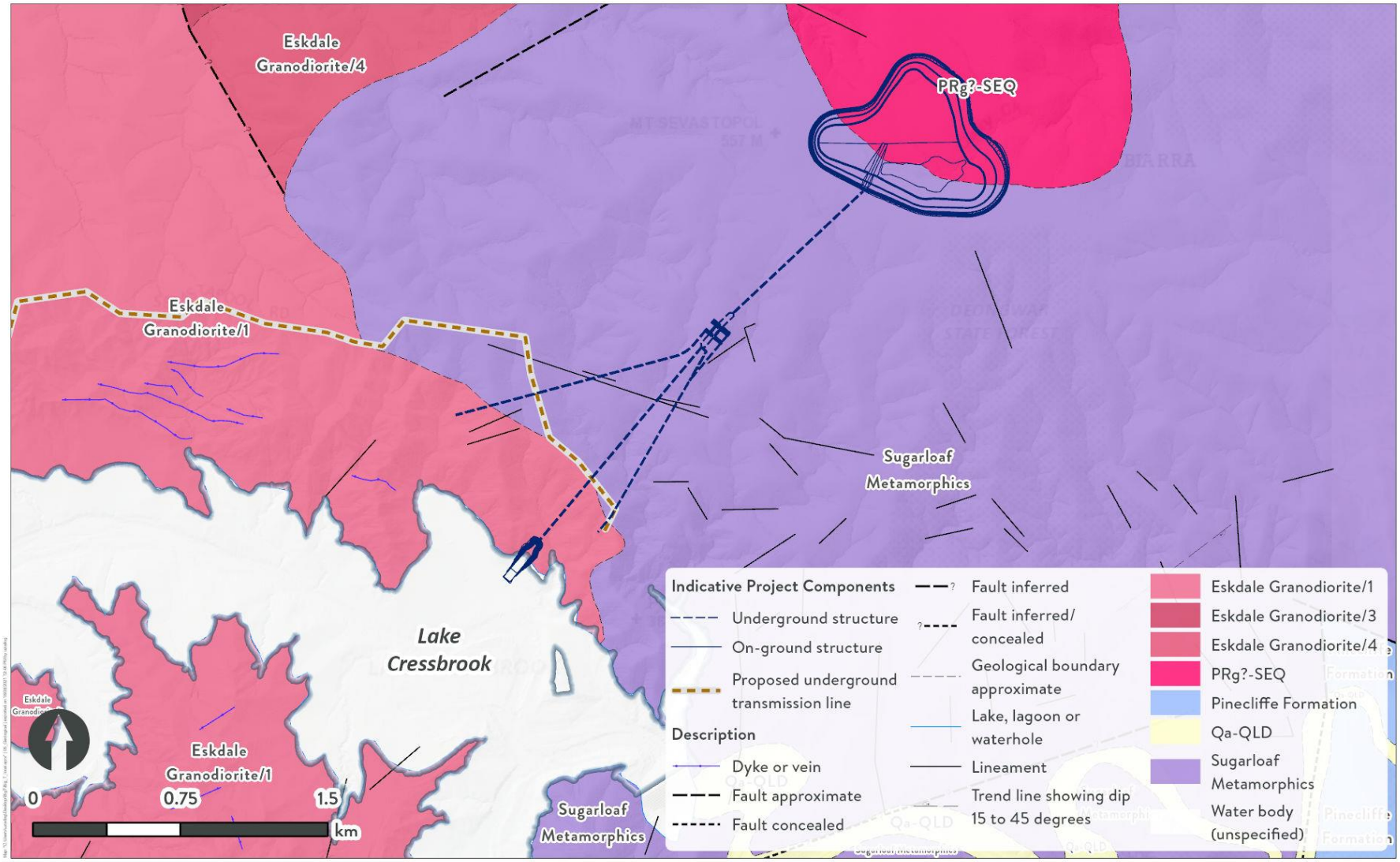

Figure 5.3: Major regional geological maps

5.1.2 Water

5.1.2.1 Surface water

The Project is located within the Lower Cressbrook Creek, Oaky Creek and Lake Cressbrook catchments, regulated by the Water Plan (Moreton) 2007.

The Queensland Wetlands Mapping Database identifies riverine systems, watercourses, waterways or drainage lines (referred to collectively as waterways). There are numerous waterways within the broad Project area owing to the steep nature of the terrain, with the majority occurring as likely intermittent (Strahler) stream order 1 and 2 waterways draining the surrounding slopes. The most notable waterways include:

- five waterways of stream order 3 (unnamed waterways)
- one waterway of stream order 4 (Little Oaky Creek)
- two waterways of stream order 5 (Cressbrook Creek and Crows Nest Creek).

The proposed upper reservoir intersects the Lake Cressbrook catchment as well as the catchments of intermittent headwaters of Oaky Creek. Mapping showing the sub-catchments within the Project area is included in Figure 5.4, while Figure 5.5 summarises the watercourses mapped by Department of Regional Development, Manufacturing and Water (**DRDMW**) watercourse identification map.

The key surface water feature within the Project area is Lake Cressbrook, a major water storage facility. Lake Cressbrook is situated on Cressbrook Creek and Crows Nest Creek.

Lake Cressbrook is impounded by Cressbrook Dam, constructed in 1983. The lake has a surface area of 517 ha at full supply, with a total capacity of 81.8 GL. The storage has a catchment of 320 km^2, though includes the Perseverance Dam which is located 10 km upstream.

The Cressbrook Dam, along with Cooby and Perseverance dams are the main water supplies for the Toowoomba region. Supplementary water is fed from Wivenhoe Dam into the Lake Cressbrook via a 38 km pipeline. The pipeline is owned by TRC and operated by SEQwater. The interconnection provides security of supply to TRC when the rainfall in the dam catchments is insufficient to maintain the region's needs.

5.1.2.2 Groundwater

There are no bores classified as 'existing' within the Project area (Queensland Globe, 2021). The nearest groundwater bore is RN 143419 to the south of the junction of Sebastapool and Three Mile roads.

Groundwater monitoring data will be collected as part of the geotechnical and geological studies program, to be commenced in the latter half of 2021. Potential impacts to groundwater will be further explored during the course of environmental studies.

5.1.3 Air

The existing air quality is presumed to be good to very good due to the lack of potentially air polluting activities within the Project area. There is no available data for air quality from the Queensland Government's Department of Environment and Science's live air data monitoring, with the nearest station (Mutdapilly) located over 100 km away.

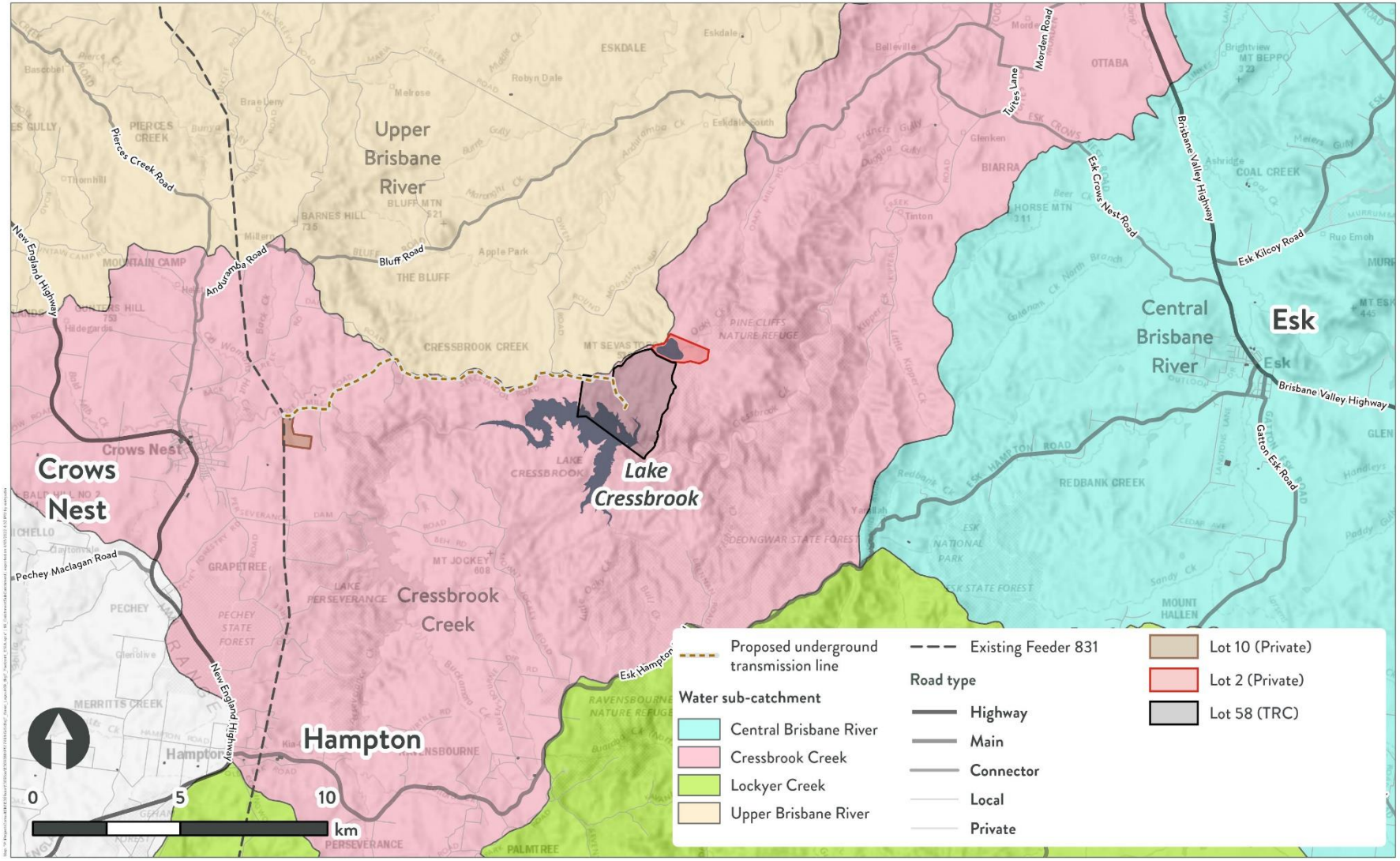

Figure 5.4: Sub-catchments within the Project area

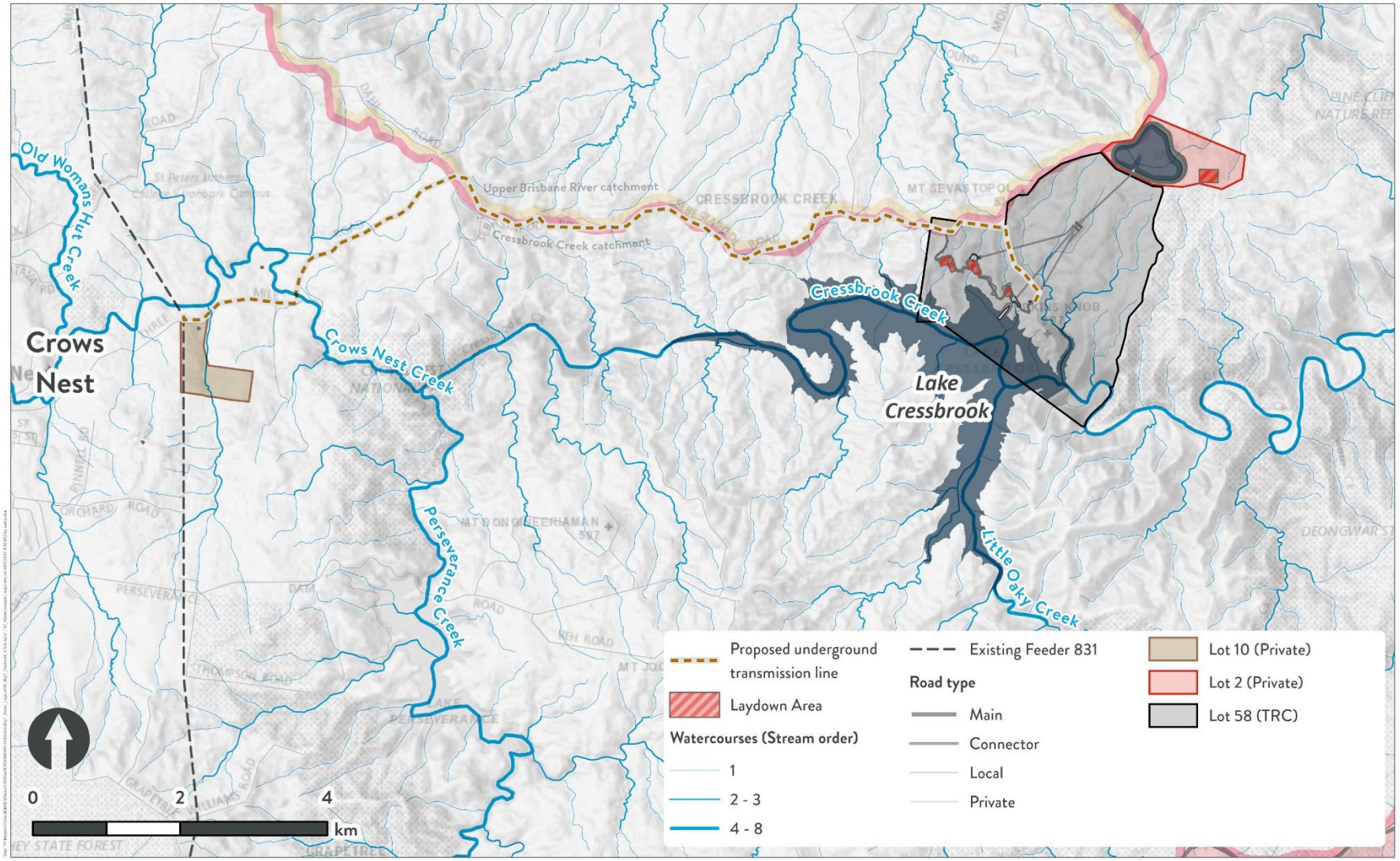

Figure 5.5: Watercourses mapped by DRDMW in Project area

5.1.4 Ecosystems

Baseline ecological surveys have been completed for the Project area. Scoping surveys were undertaken between February and April 2021, covering Lot 2, Lot 58 and the road reserves of Sebastapool and Three Mile roads. Targeted surveys for fauna were undertaken in April, November and December 2021 and targeted surveys for flora were undertaken in November and December 2021 both surveys covering Lot 2 and Lot 58. A baseline vegetation assessment was also undertaken in December 2021 for Lot 10 following purchase of the land by BEP in late 2021.

5.1.4.1 Survey methodology overview

Ecological surveys have been undertaken by Queensland based ecological consultancy, DPM Enviroscienses. Surveys have been undertaken in accordance with Commonwealth and State survey guidelines, including:

- Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et al.* 2018)
- Flora Survey Guideline – Protected Plants (Department of Environment and Science, 2020)
- Relevant Commonwealth guidelines for reptiles, birds, bats and mammals.

Flora survey sites

A total of 106 flora survey sites were assessed by DPM Enviroscienses from February to April 2021, with a further 12 meandering surveys targeting threatened flora species completed in December 2021 (refer Figure 4-2 Maps 1 and 2 of Appendix A). A further six flora survey sites were assessed in December 2021 on Lot 10.

Fauna survey sites

Both generic (comprehensive/detailed) and targeted survey methods were employed for fauna surveys. Survey methods aligned with anticipated stakeholder expectations, the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland, and relevant Commonwealth survey guidelines.

The generic fauna survey effort was undertaken across twelve sites representing primary fauna habitat types of the Project area. Site selection based on consideration of likely disturbance, broad vegetation group (based on ground-truthed REs), land zone, topography and site knowledge gained during previous surveys of the Project area.

A detailed breakdown of the assessment units adopted for the fauna survey sites is presented in Table 4-3 of Appendix A. Furthermore, a comprehensive list of fauna survey sites, including the methodology adopted at each site, is summarised in Table 4-4 and Figure 4-2 Map 2 of Appendix A.

Details of the survey method, sites and timing is included in the baseline ecology report prepared by DPM Enviroscienses, included in Appendix A.

5.1.4.2 Aquatic

Aquatic environments are commonly described with reference to their Environmental Values (**EVs**) and a comparison of water quality monitoring results with relevant water quality guidelines. EVs are the

qualities of waterways to be protected from activities in the catchment and have been established for the Upper Brisbane River (DERM 2010). Relevant sub-catchments and their EVs are included in Table 5.2.

According to the Department of Agriculture and Fisheries (**DAF**) (2021), Lake Cressbrook is stocked by the Toowoomba and District Fish Stocking Association with Australia with golden perch, Mary River cod, saratoga and silver perch. Mary River cod (*Maccullochella mariensis*) and silver perch (*Bidyanus bidyanus*) are listed as critically endangered and endangered respectively under the Commonwealth EPBC Act, though stocking refers to populations outside of their natural distributions.

5.1.4.3 Vegetation

Field verification of the State Regional Ecosystem (**RE**) identifies that the Project area is predominantly remnant vegetation and high value regrowth (refer Figure 5.6). This includes 453 ha of regrowth vegetation (**HVR**), and 976 ha of remnant vegetation, of which 480 ha is 'of concern' remnant vegetation and 496 ha is 'least concern' remanent vegetation as classified under the *Vegetation Management Act 1999* (**VM Act**), as shown in Figure 5.6.

The Project area constitutes a range of vegetation communities which vary with position in the landscape and, to a lesser degree, soils, previous management, and fire. Due to broadscale clearing, fire history or heavy logging (in the more timbered country at higher elevations), all vegetation within the Project area originates from regrowth and there are few trees that could be considered old growth. Recent fires (November 2019) have caused significant damage to many areas within the Project area, with some locations having experienced a complete loss of canopy.

At lower elevations, on both granite and metamorphic derived soils, the dominant vegetation is Queensland blue-gum (*Eucalyptus tereticornis*) and narrow-leaved ironbark (*E. crebra*) dominated woodland corresponding to Regional Ecosystem (**RE**) 12.12.12 and 12.11.14. These ecosystems persist to the bottoms of gullies, with brush box (*Lophostemon confertus*) dominating some areas. The communities range from sparse regrowth open woodland to sparse remnant woodland.

A riparian community dominated by Queensland blue-gum and river oak (*Casuarina cunninghamiana*) occurs on the minor alluvial creeks that have not been submerged by Cressbrook Dam. These areas are in poor condition due to weed infestation and recent fire damage with the area on Cressbrook Creek immediately below the dam wall having lost most of the remaining canopy species in the fire.

While desktop assessment identified potential for the Lowland Rainforest of Subtropical Australia Threatened Ecological Community (**TEC**) listed as critically endangered in the EPBC Act, field verification found it to be RE 12.3.7 and RE 12.11.8, neither of which are TECs. As such the field surveys determined that no TECs occurred in the Project area.

5.1.4.4 Groundwater dependent ecosystems

There are three broad types of groundwater dependent ecosystems (**GDEs**):

- subterranean GDEs
- terrestrial GDEs
- surface expression GDEs.

Anticipated impacts of the Project on potential GDEs are minimal and relate to minor alteration of local recharge catchments up on the hill, and minor clearing of potential terrestrial GDEs.

Subterranean GDEs

State-wide mapping of potential subterranean GDEs is currently limited to cave GDEs, none of which are likely to occur within the Project area.

A review of the Registered Water Bores layer on Queensland Globe indicates that there are no registered bores within the Project area, with the nearest registered bore being about 3 km from the Project area.

Terrestrial GDEs

The Queensland Government has mapped a number of potential terrestrial GDEs within or adjoining the Project impact area (available on Queensland Globe), including:

- derived (from modelling and expert opinion, as opposed to being 'known') terrestrial GDEs of low confidence associated with fractured metamorphic rocks
- derived terrestrial GDEs of low confidence associated with fractured igneous rocks with intermittent flow
- derived terrestrial GDEs of moderate confidence associated with alluvial aquifers with intermittent flow.

Surface expression GDEs

The Queensland Government has mapped a number of potential surface expression GDEs within or adjoining the Project impact area, including:

- derived surface expression GDEs of low confidence associated with fractured metamorphic rocks
- derived surface expression GDEs of low confidence associated with fractured igneous rocks with intermittent flow
- derived surface expression GDEs of moderate confidence associated with alluvial aquifers with intermittent flow.

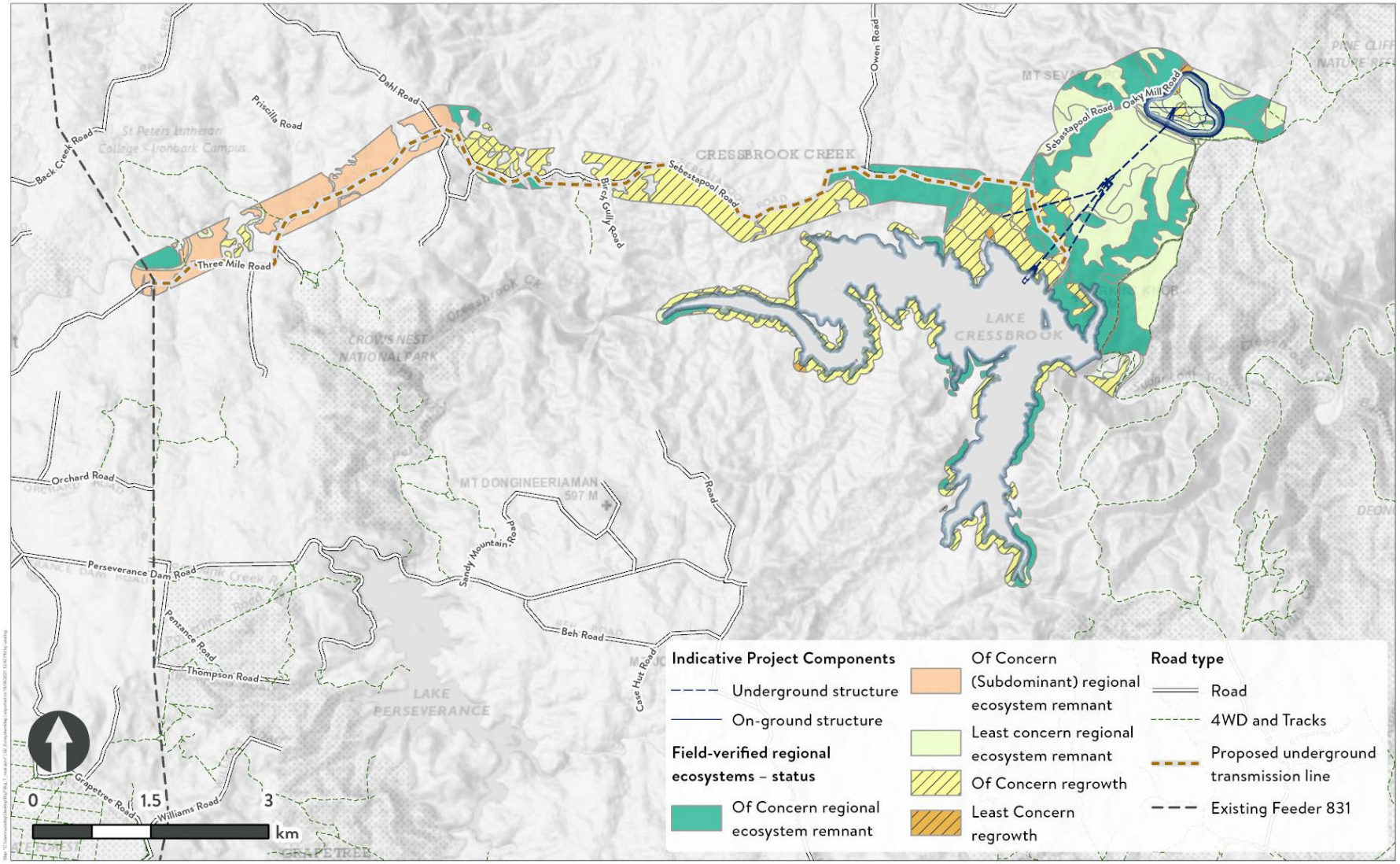

Figure 5.6: Regional ecosystem mapping of the broader Project area

Table 5.2: Environmental values for sub-catchments intersected by the Project area

	Lake Cressbrook	Upper Cressbrook Creek	Lower Cressbrook Creak	Maronghi Creek
Aquatic ecosystems	✓	✓	✓	✓
Irrigation			✓	✓
Farm supply/use		✓	✓	✓
Stock water	✓	✓	✓	✓
Aquaculture	✓	✓	✓	✓
Human consumer	✓	✓	✓	✓
Primary recreation			✓	✓
Secondary recreation	✓		✓	✓
Visual recreation	✓	✓	✓	✓
Drinking water	✓	✓	✓	✓
Industrial use			✓	✓
Cultural and spiritual values	✓	✓	✓	✓

5.1.4.6 Weeds and introduced species

Desktop assessment of the Project site identified the potential occurrence of 29 invasive species that are classed as a Category 3 Restricted Matter species listed under the Queensland *Biosecurity Act 2014* and/or identified as a Weed of National Significance (**WoNS**).

A total of 40 introduced plant species were recorded during the field surveys, of which two are a Restricted Matter and four are both Restricted Matter and a WoNS (Table 5.3).

Table 5.3: Restricted pest plants and WoNS present in Project area

Scientific name	Common name	QLD Bio Act	National significance
Baccharis halimifolia	Groundsel bush	3	-
Dolichandra unguis-cati	Cat's claw vine	3	WoNS
Lantana camara	Lantana	3	WoNS
Lantana montevidensis	Creeping lantana	3	WoNS
Ligustrum lucidum	Large-leaved privet	3	-
Opuntia tomentosa	Velvety tree pear	3	WoNS

5.1.5 Flora and fauna

Flora

The majority of the Project area comprises eucalypt woodlands to open forests that are likely to provide habitat for a number of threatened and common flora species.

Searches of the EPBC Act Protected Matters database (DAWE 2021), Queensland WildNet database (DES 2021) and Atlas of Living Australia (ALA 2021) identified the potential occurrence of 30 EVNT flora species. These include species listed under the Queensland *Nature Conservation Act 1992* (**NC Act**) and the Commonwealth EPBC Act. Based on habitat preferences and species records in proximity to the Project area 19 Endangered, Vulnerable or Near Threatened **(EVNT)** species have potential to occur in the vicinity of the Project site:

- Helidon ironbark (*Eucalyptus taurina*) – Endangered (NC Act)
- *Leionema obtusifolium* – Vulnerable (EPBC Act and NC Act)
- *Paspalidium grandispiculatum* – Vulnerable (EPBC Act and NC Act)
- scrub turpentine (*Rhodamnia rubescens*) – Critically Endangered (EPBC Act and NC Act)
- blotched sarcochilus (*Sarcochilus weinthalii*) – Vulnerable (EPBC Act), Endangered (NC Act)
- hairy-joint grass (*Arthraxon hispidus*) – Vulnerable (EPBC Act and NC Act)
- three-leaved bosistoa (*Bosistoa transversa*) – Vulnerable (EPBC Act)

- stream clematis (*Clematis fawcettii*) – Vulnerable (EPBC Act and NC Act)
- cockspur flower (*Coleus torrenticola*) – Endangered (EPBC Act and NC Act)
- leafless tongue-orchid (*Cryptostylis hunteriana*) – Vulnerable (EPBC Act)
- *Grevillea quadricauda* – Vulnerable (EPBC Act and NC Act)
- tall velvet sea-berry (*Haloragis exalata* subsp. *velutina*) – Vulnerable (EPBC Act and NC Act)
- wandering pepper-cress *(Lepidium peregrinum)* – Endangered (EPBC Act)
- macadamia nut *(Macadamia integrifolia)* – Vulnerable (EPBC Act and NC Act)
- *Nicotiana wuttkei* – Endangered (NC Act)
- Mt Berryman phebalium (*Phebalium distans*) – Critically Endangered (EPBC Act), Endangered (NC Act)
- *Picris conyzoides* – Vulnerable (NC Act)
- austral cornflower (*Rhaponticum australe*) – Vulnerable (EPBC Act and NC Act)
- native guava (*Rhodomyrtus psidioides*) – Critically Endangered (EPBC Act and NC Act).

No EVNT flora species were detected within the Project area during baseline surveys, including targeted surveys for the above species. Based on non-detection surveys method and/or lack of preferred habitat these species are considered unlikely to occur within the project site.

The Project area intercepts locations mapped by the State as a High Risk Area (**HRA**) for protected plants. Further protected plant surveys are planned.

Fauna

Searches of the EPBC Act Protected Matters database (DAWE 2021), Queensland WildNet database (DES 2021) and Atlas of Living Australia (ALA 2021) identified the potential occurrence of 51 EVNT fauna species. These include species listed under the Queensland NC Act and the Commonwealth EPBC Act. Based on non-detection during baseline and targeted surveys and lack of preferred habitat within the Project site, eight ENVT species are known or considered likely to occur in the project area.

Five ENVT were recorded during surveys:

- koala (*Phascolarctos cinereus*) – Vulnerable (EPBC Act and NC Act);
- greater glider (*Petauroides volans*) – Vulnerable (EPBC Act and NC Act);
- brush-tailed rock wallaby (*Petrogale penicillata*) – Vulnerable (EPBC Act and NC Act); and
- powerful owl (*Ninox strenua*) – Vulnerable (NC Act).
- white-throated needletail (*Hirundapus caudacutus*) – Vulnerable (EPBC Act and NC Act);

In addition, the grey-headed flying-fox (*Pteropus poliocephalus*), listed as Vulnerable under the EPBC Act, is likely to utilise the survey area on occasion (during mass flowering events), despite not being detected during surveys.

The Mary River cod (*Maccullochella mariensis*) (Endangered EPBC Act) and silver perch (*Bidyanus bidyanus*) (Critically Endangered EPBC Act) are stocked in Lake Cressbrook (refer Section 5.1.4.2).

It is understood that 'platypus spotting' is promoted as an attraction in the nearby Crows Nest National Park. The platypus (*Ornithorhynchus anatinus*) is classified as a Special Least Concern (**SLC**) species under the *Nature Conservation Act 1992* (**NC Act**) for their cultural significance. According to desktop research undertaken as part of ecological studies to date, there has been recordings of platypus within 10 km of the Project area, including in Crows Nest National Park andLake Perseverance. Lake Cressbrook lacks the banks and other habitat features considered suitable for platypus burrow construction and platypuses are not anticipated to occur in Lake Cressbrook. However, there is potential for platypuses to occur upstream and downstream of Lake Cressbrook in Cressbrook Creek. Further surveys will be completed in Lake Cressbrook to verify the absence of platypus from Lake Cressbrook.

Matters of State and National Environmental Significance

A number of Matters of National Environmental Significance (**MNES**) and Matters of State Environmental Significance (**MSES**) occur within the Project area, including:

- regulated Of Concern vegetation (MSES)
- regulated vegetation that intersects watercourses (MSES)
- regulated vegetation that is mapped Essential Habitat (MSES)
- large tracts of vegetation that would provide connectivity across the landscape (MSES)
- core koala habitat and locally refined koala habitat (MSES)
- wildlife habitat for Endangered or Vulnerable wildlife
- wildlife habitat for Special Least Concern wildlife
- habitat for 6 migratory bird species and potential habitat for a further four migratory bird species (MNES)
- habitat for five ENVT species that are known to occur in the Project site, comprising:
    - koala (MNES and MSES)
    - greater glider (MNES and MSES)
    - brush-tailed rock-wallaby (MNES and MSES)
    - white-throated needletail (MNES and MSES)
    - powerful owl (MSES).

As part of surveys, fauna habitat was scored against their relevant guidelines. Ground-truthing of the Project area recorded 17.8 ha as core koala habitat and 729.8 ha of locally refined koala habitat, as defined in the *South East Queensland Koala Strategy 2020 – 2025,* though noting that all recorded locally refined koala habitat also met the definition of core koala habitat. This equates to over 99% of the terrestrial habitat surveyed (refer Figure 5.7). The koala habitat within the Project site forms part of the broader mapped koala habitat within the southeast Queensland region (refer Figure 5.8).

Surveys confirmed the presence of an active koala population on the Project site, with all koala habitat recorded meeting the definition of *habitat critical for the survival of the koala* contained in the Commonwealth *EPBC Act referral guidelines for the vulnerable koala*.

There is also foraging habitat for the greater glider and brush-tailed rock wallaby across the whole Project area; however, breeding and roosting habitat is isolated to the northeast of Lot 2.

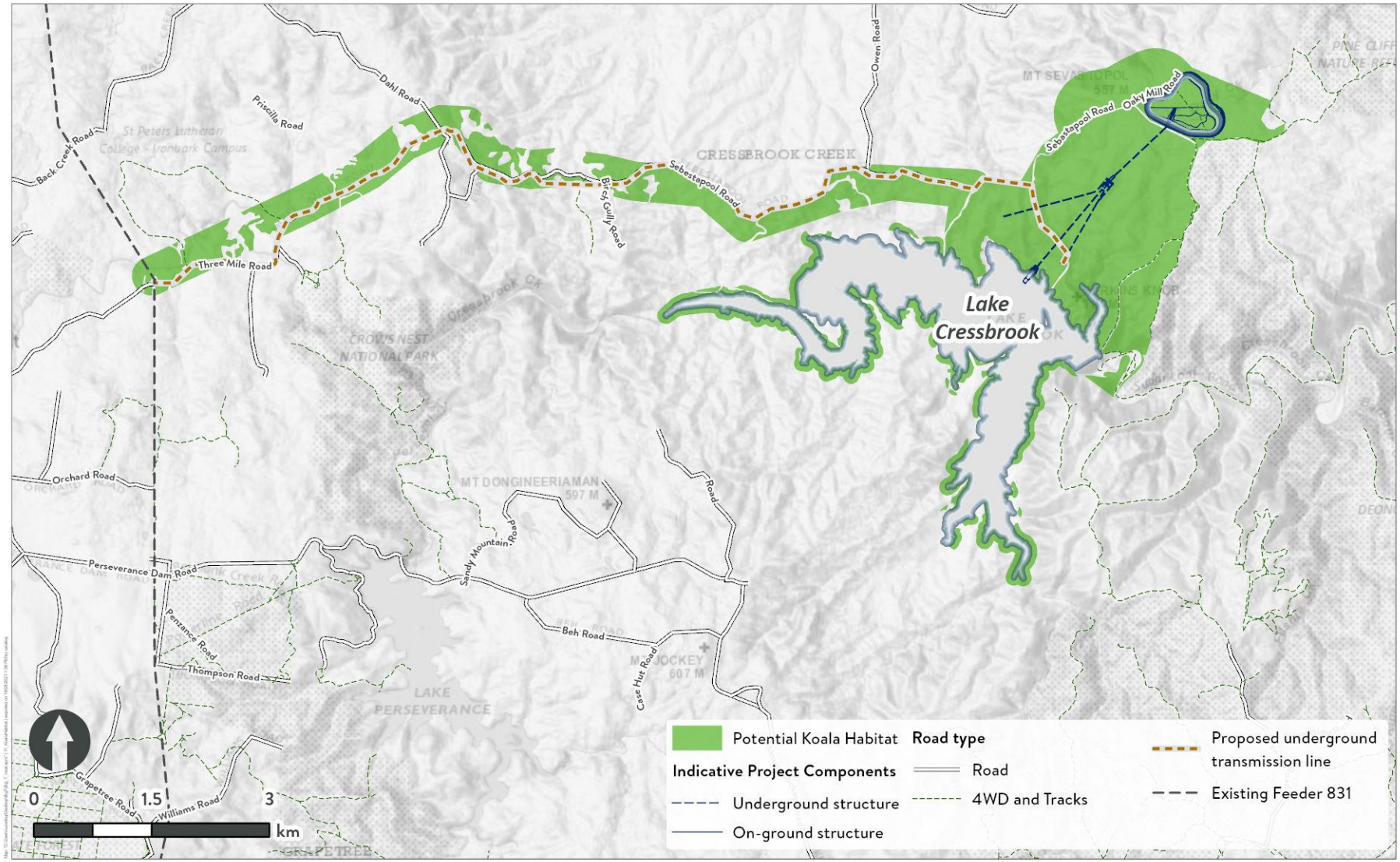

Figure 5.7: Koala mapping of the Project area

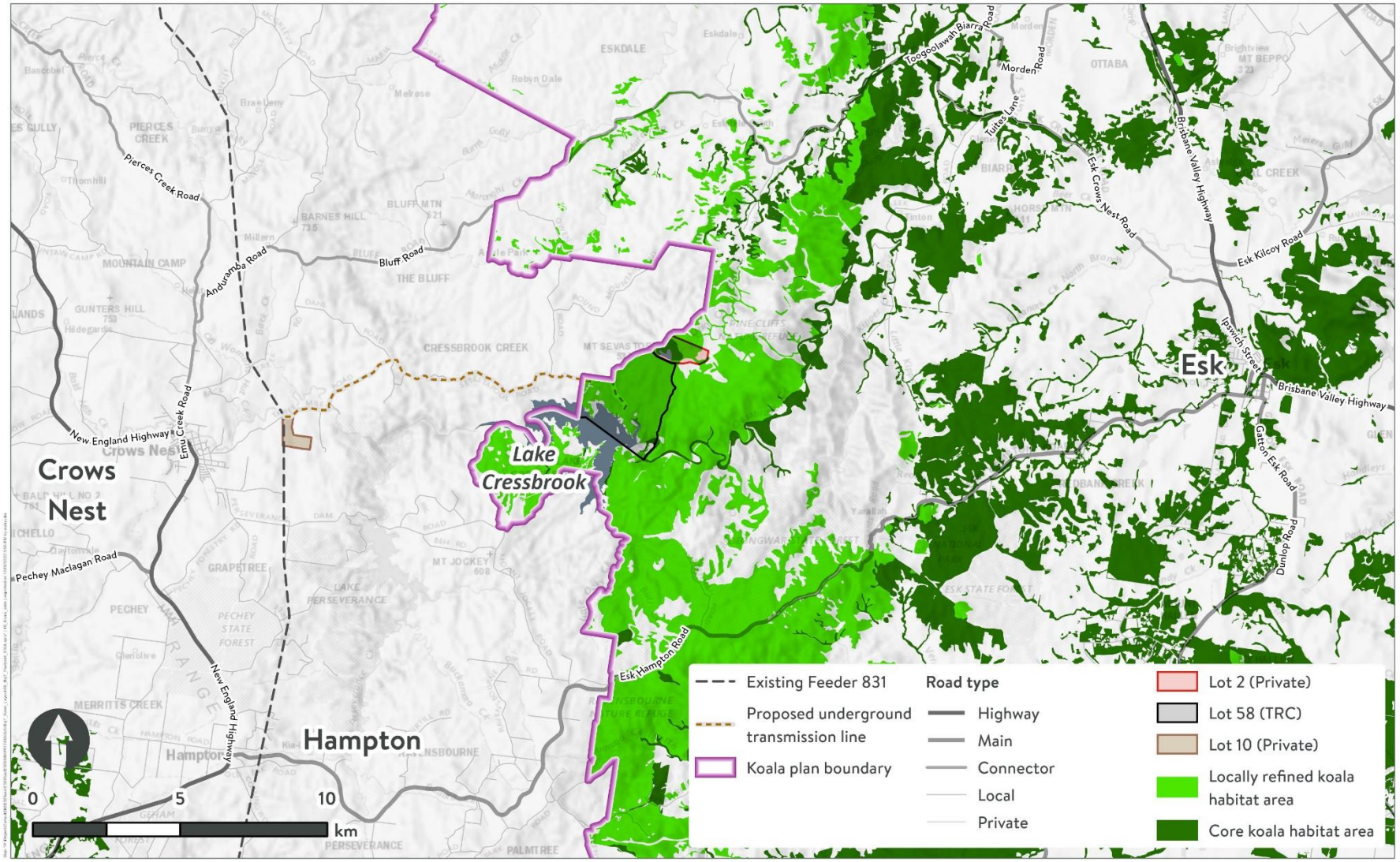

Figure 5.8: State koala mapping within the Project region

5.2 SOCIAL AND ECONOMIC ENVIRONMENT

5.2.1 Accommodation and housing

5.2.1.1 Toowoomba

The Project is largely located within the Toowoomba region (and fringes of the Somerset region).

As a local government area, Toowoomba spans almost 13,000 km^2 and is a growing residential area with significant rural and rural-residential areas, also present are areas of industrial and commercial land use.

The social profile of Toowoomba city, based on latest census data published by the Australian Bureau of Statistics (**ABS**), is included in Table 5.4.

The main urban centre is Toowoomba, which is also Queensland's largest inland city, along with smaller urban areas such as Crows Nest and Oakly. Rural land is largely for beef, sheep and cattle grazing, cropping, vegetable growing and some forestry, energy production and tourism.

Table 5.4: Social profile of Toowoomba city

Indicator	Toowoomba
Population (2016)	149,512
Median age	37
Male	48.3%
Female	51.7%
Aboriginal/Torres Strait Islander population	3.9%
Area of locality	498.1 km^2
Dwellings (occupied)	90.7%
Dwellings (unoccupied)	9.3%
Private dwellings	62,689
Full time equivalent employment	21.8%
Non-employed population	26.7%
Median weekly household income	$1,298
Median weekly rent	$290

5.2.1.2 Biarra and Crows Nest

The Project is located across the rural localities of Biarra and Crows Nest. Biarra is located 100 km (by car) north-east of Toowoomba, and is characterised by clusters of rural dwellings, while Crows Nest, situated 44 km north of Toowoomba, is a small service township with basic health, education and recreational facilities to service its population.

Latest ABS census data (2016) suggest that the character of both communities, apart from population, are similar. There is a slightly higher proportion of females to males. While the median age would suggest that the population would be in the workforce, employment figures indicate that a substantial portion of the population are unemployed. The social profile for Biarra and Crows Nest are included in Table 5.5.

The nearest emergency facilities (ambulance, emergency services and police) are located in town centre of Crows Nest, including the Crows Nest Medical Centre. The nearest hospitals (private or public) are located in Toowoomba.

Apart from the national parks, there are a range of recreational facilities within the Project area including the Crows Nest Golf Course, Crows Nest caravan park, as well as Esk Country Golf Club. The Project area is serviced by several education facilities, including Crows Nest State School and St Peters Lutheran College (Ironbark Campus) to the west of the Project area, as well as Esk State School to the south-east in the township of Esk.

According to the latest available information published by the ABS and as presented in Table 5.5, the number of unoccupied dwellings in Biarra and Crows Nest is limited, suggesting that the number of available dwellings in both townships is also limited.

Table 5.5: Social profile of Biarra and Crows Nest

Indicator	Biarra	Crows Nest
Population (2016)	257	2,160
Median age	48	52
Male	47.5%	47.9%
Female	52.5%	52.1%
Aboriginal/Torres Strait Islander population	2.7%	2.5%
Area of locality	235 km^2	96.1 km^2
Dwellings (occupied)	83.2%	91.2%
Dwellings (unoccupied)	16.85%	8.8%
Private dwellings	126	983
Full time equivalent employment	20%	8.8%
Non-employed population	26.7%	44%
Median weekly household income	$891	$814
Median weekly rent	$170	$240

5.2.2 Cultural heritage (Indigenous and non-Indigenous)

Review of the Aboriginal Cultural Heritage Database and Register of the Department of Aboriginal and Torres Strait Islander Partnerships (**DATSIP**) in February 2021 confirmed that there are no previously recorded Aboriginal cultural heritage sites or registered places within 500 m of the Project area. There is also no registered Aboriginal party,

Cultural Heritage body, or cultural heritage management plans over the Project area.

The Project meets the definition of *Aboriginal Cultural Heritage Act 2003* (**ACH Act**) Duty of Care Guidelines Category 5 (Activities causing additional surface disturbance). In reviewing the 'landscape features' as described in the guidelines which are commonly identified as places of importance to Aboriginal people, the Project area provides rock outcrops (Mount Sevastopol), waterholes (Lake Cressbrook) and remnant native vegetation. However, analysis of historical aerial imagery from 2009 to 2021 also confirmed that the broader area has been subject to some ground and surface disturbance in the form of earthworks.

Field inspection by a qualified archaeologist in March 2021 validated the results of the desktop assessment as described above, and confirmed that the landscape is moderately steep, which is ill-suited to past Aboriginal occupation. Notwithstanding this, Lake Cressbrook and its tributaries may retain intangible cultural heritage values.

5.2.3 Economic environment

According to the latest ABS information, the largest industry in Toowoomba is health care and social assistance, generating over 10,750 (15.6% of the employed population) full-time-equivalent (**FTE**) jobs in 2019/2020, followed by construction, education and training, retail trade, and manufacturing.

The global coronavirus pandemic has also inevitably affected economic activity in the Toowoomba region. Latest available data from September 2020 shows that the sectors most impacted are accommodation and food services (reduction of 1,505 local jobs), construction (reduction of 1,027 local jobs) and mining (reduction of 804 local jobs). Additionally, the gross regional product (**GRP**) was down by 4.35% being at $11.5 million (as opposed to $12 million in 2019), the latest fall in the last two decades.

5.3 BUILT ENVIRONMENT

There is very little built infrastructure within the Project area. The most prominent features in the vicinity are Cressbrook Dam and the intake located adjacent to the Project area. The Lake Cressbrook boat ramp and campground are located on the opposite shore of the outlet structure. Scattered dwellings and buildings are also located on parcels accessed off Sebastapool and Three Mile roads.

There are no coordinated Projects within the broader Project area. To the best of the proponent's knowledge, there are also no proposed major infrastructure or development projects near the Project area.

Cressbrook Dam is due for an upgrade to comply with the Australian National Committee on Large Dams (**ANCOLD**) Guidelines. The existing spillway on the left-hand side of the dam is to be widened to accommodate for additional flood release.

5.4 TRAFFIC AND TRANSPORT

Two highways within the broader Project area facilitate connection to other parts of the region. These are the New England Highway (14 km west) and Brisbane Valley Highway (20 km east), both occurring in a north–south direction. These highways are joined by two key link roads in a west–east manner – Bluff Road (which transitions to Esk Crows Road) to the north of the Project area, and Esk Hampton Road to the south.

Access to the Project site is provided through Sebastapool and Three Mile Roads. Three Mile roads exits to the New England Highway at Crows Nest.

Alternative routes to the Project site can be afforded through Owen Road via New England Highway, Anduramba and Pierces Creek Road (Figure 6.2). Owen Road adjoins Sebastapool Road approximately 1 km from the boundary of Lot 58. As an alternative to Three Mile Road, Sebastapool Road can be accessed via Dahl Road and Back Creek Road, which also exit to the New England Highway north of Crows Nest, or further afield to the Brisbane Valley Highway via Bluff Road and Esk Crows Road.

The public access to Lake Cressbrook is provided by Perseverance Dam Road, which exits to New England Highway most directly through Peachy Forestry Road, or Brisbane Valley Highway via a number of local roads.

5.5 NOISE

Existing noise levels within the Project vicinity are likely to be low given the area is dominated by rural activity.

The closest sensitive receptors to the Project are Lake Cressbrook and campsite (treated here as the equivalent of a park or garden open to the public), located within and adjacent to the Project site, and private residences along Sebastapool and Three Mile roads.

A number of other residential buildings are located within 5km of the Project site (assumed as 5km from the relevant parcel boundaries) as shown in Figure 5.9.

5.6 LAND USE AND TENURES

5.6.1 Key local and regional land uses

A review of the available information on Queensland Globe (2021) identified that the predominant land use in the local Project area is ‘grazing native vegetation’, as well as ‘residual native cover’ as shown in Figure 5.10. The Deongwar State Forest is identified as ‘production native forests’ while Pine Cliffs Nature Refuge to the north-east of Lot 2 is determined as ‘managed resource protection’. Regionally, the land use closer to the township of Crows Nest is ‘residential’, with isolated parcels of ‘nature conservation’, ‘mining’ and ‘transport and communication’.

Lot 58 is predominantly ‘residual native cover’ with the south-western portion classified as grazing, while Lot 2 is mostly ‘residual native cover’ with small portions for grazing. The Project will result in a permanent, partial change in land use for Lot 2 due to the construction of the upper reservoir on the land. The land use for the remainder of the Project area will remain largely unchanged as the other components of the Project will be located underground.

Lot 10 is marked as ‘other minimal use’ with an easement running along its western boundary. The easement is for Powerlink’s Feeder 831 which traverses the western portion of the site. Presently, the parcel hosts an inhabited residential building. There will be partial change in land use to Lot 10; however, the change is expected to occur within the easement of the property. The change is associated with the construction of a switching station for the underground transmission line to resurface and connect into the existing Feeder 831 overhead transmission line.

There is no land use change anticipated for the transmission line, as it will be located underground along Sebastapool and Three Mile roads.

There are no state development areas, World Heritage Areas or Commonwealth or defence land within proximity to the Project area.

There are no mining leases or claims in the Project vicinity, including exploration tenures as exploration permits coal (**EPC**) or exploration permits petroleum (**EPP**). The majority of mining leases in the broader area are located south of the Project, with the nearest being ML 50211, situated almost 15 km southwest from the Project area and covering an area of 71 ha. The lease was granted in September 2005 and expires in 2025.

5.6.2 Key local and regional tenures

The Project is located wholly on land of freehold tenure (refer Figure 5.11). Three parcels which share a boundary with Lot 2 are of 'Profit à Prendre' tenure which indicates secondary interests on those three parcels. The three parcels are 84/CA311287, and two sub-parcels of 41/CSH403. Other areas adjacent to the Project area are largely freehold parcels, as shown in Figure 5.11.

Land of 'State Forest' tenureship, belonging to the Deongwar State Forest (parcel reference 528/FTY1889), adjoins the project parcels to the south (Lot 2) and east (Lot 58). While it does not directly adjoin the Project area, the Crows Nest National Park is situated on tenure identified as 'National Park'.

5.6.3 Native title

There are no active native titles or native title claims over the Project area or its immediate vicinity.

The nearest determined native titles are located over 30 km east of the Project area, including:

- Jinibara People – QCD2012/011, registered 21 November 2012 and covers 716 km^2 of scattered locations bound by the Brisbane Valley Highway and Bruce Highway
- Yuggera Ugarapul People and Turrbal People – QCD2015/001, registered on 20 March 2015 and covers 1167 km^2 of Brisbane and its broader areas.

There are also registered native title claims in areas closer to the Project site (approximately 8 km south) however are not yet determined.

These include:

- Yuggera Ugarapul People – QC2017/005, registered on 4 August 2017 and covers 6,165 km^2
- Githabul People (Waringh Waringh) – QC2021/001, registered on 14 May 2021 and covers 4,152 km^2
- Danggan Balun (Five Rivers) People – (QC2017/007), registered on 14 September 2017 and covers 3,094 km^2.

The nearest currently registered cultural heritage parties within the greater Project area are the Yuggera Ugarapul People, with the party boundary approximately 7km south of the Project area.

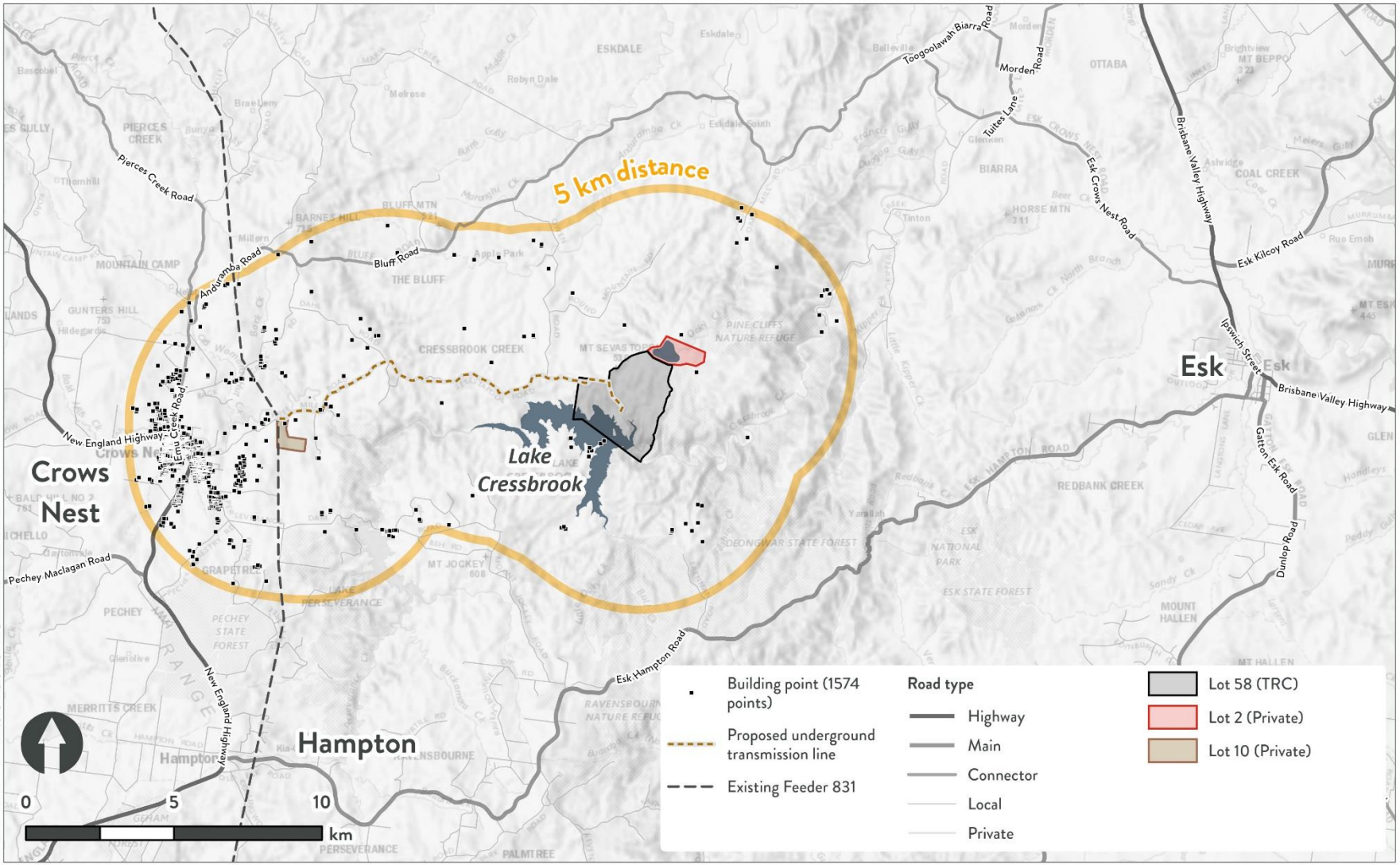

Figure 5.9: Dwellings within 5 km of Project parcels

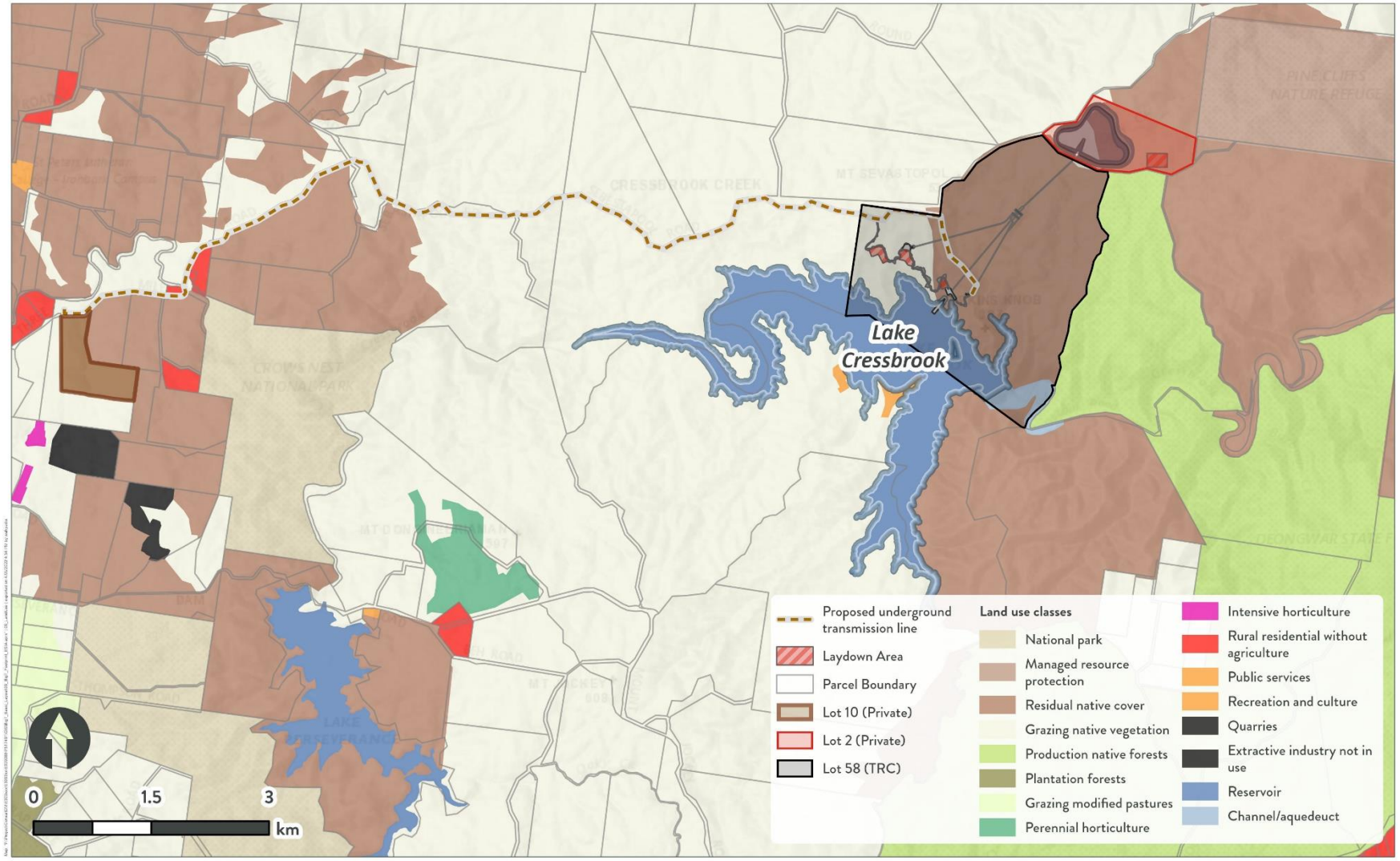

Figure 5.10: Land use in Project vicinity

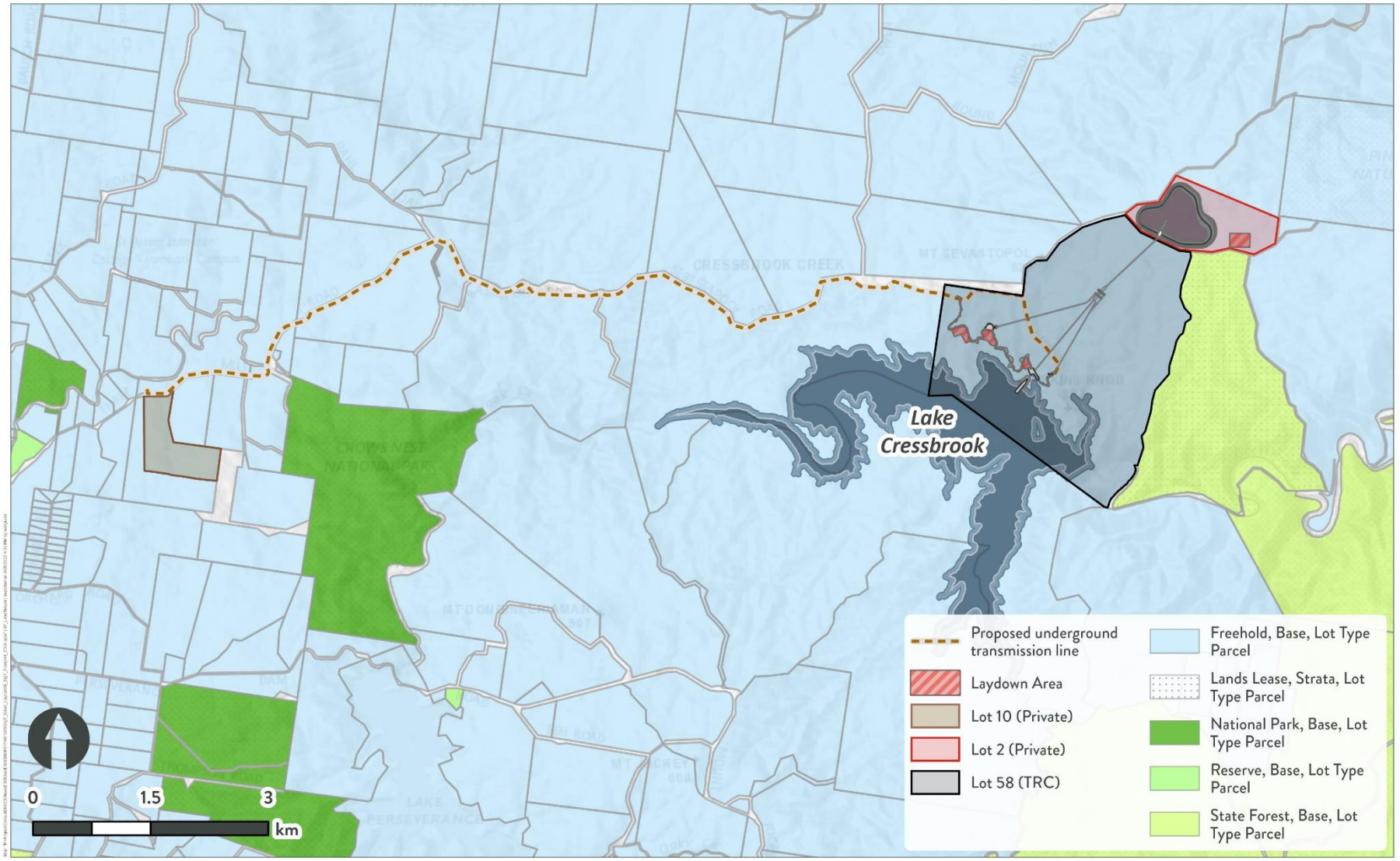

Figure 5.11: Land tenure in Project vicinity

6 POTENTIAL PROJECT IMPACTS

This section provides details of the existing physical, social, environmental and land use features of the area within which the Project is located, as well as the potential impacts which may arise due to the construction and/or operation of the Project.

This information is provided on the basis of desktop information unless otherwise stated.

6.1 NATURAL ENVIRONMENT

6.1.1 Land

The Project has the potential to impact the land at the Project site by:

- alteration of the existing landform from construction of the upper reservoir and potentially by the placement of spoil stockpile(s) in case of any material excess from excavation that cannot be utilised for construction of the upper dam or other Project elements.
- change of existing land use at the location of the upper reservoir and other ancillary above ground infrastructure, including permanent access roads and site offices. Note that the use of Lake Cressbrook as a drinking water supply reservoir and Sebastapool Road as a public road is not expected to be changed by the Project.
- potential to disturb actinolite (naturally occurring asbestos) from Tremolite-Actinolite type minerals, which may require additional health and safety controls during construction.

6.1.2 Surface water

Potential water quality impacts from the construction and operation of the Project are expected to be confined to Lake Cressbrook.

Water quality monitoring in Lake Cressbrook for a range of physical and chemical parameters has been undertaken historically by the TRC and more recently by DPM Enviroscience specifically as part of the Project environmental studies. Conceptual hydrodynamic modelling has been completed and further modelling is planned. The results of hydrodynamic modelling will be used to inform the design of the intake / outlet to ensure the efficient dispersion of water and to identify potential positive impacts of the Project on water quality in Lake Cressbrook.

Water quality impacts arising from the construction of the Project may include a temporary reduction in water quality as a result of increased turbidity in Lake Cressbrook due to sediment disturbance, particularly during the construction of the lower intake / outlet.

The key potential impacts resulting from the operation of the Project are described below.

- Increased water circulation during PHES operation

  Discharging water to or drawing water from Lake Cressbrook during operation of the project at rates higher than those currently observed in the lake has the potential to result in greater mixing of the water column and potential resuspension and redistribution of sediments.

Greater mixing between surface and bottom layers within the reservoir has the potential to reduce or eliminate reservoir stratification in the warmer months of the year.

- Regular water level fluctuation

  The Project is proposed to be operated such that the water level in Lake Cressbrook stays within the current normal minimum operating level (**NMOL**) and full supply level (**FSL**). However, the operation of the Project will result in more frequent water level changes in the lake. These fluctuations have the potential to cause erosion and resuspension of shoreline sediments leading to an increase in turbidity and decrease in water quality in Lake Cressbrook depending on the rate of water level change.

- Destratification

  Lake Cressbrook currently appears to have persistent thermal stratification over the warmer months of the year. Thermal stratification usually coincides with oxygen stratification. The density gradient formed by the thermal stratification prevents mixing between upper and lower layers of the lake.

  Under these circumstances, oxygen is consumed by microbes in the deeper parts of the lake and is unable to be replenished through contact with the atmosphere. As a result, oxygen levels may fall to very low concentrations in deeper parts of the reservoir.

  Existing catchment reports available publicly and provided by the TRC indicate that Lake Cressbrook has water quality problems that are exacerbated by stratification, including cyanobacterial blooms. The change in mixing conditions within the lake from the Project may promote mixing, changing or eliminating stratification. This may in turn provide conditions that promote more favourable water quality in those parameters that are currently exacerbated by stratification.

The upper reservoir may also require an emergency spillway that, in the highly unlikely event it was activated, would be likely to discharge back into Lake Cressbrook. The only reason an emergency spillway might be required on the upper reservoir is if the pumped storage pumps do not turn off at the end of a full pumping cycle when the upper reservoir is restored to its FSL. There are other engineering solutions providing electrical and mechanical redundancies to avoid such an event which would be the most likely solution for the Project.

Baseline data collection of various parameters which determine the overall water quality of the lake, as well as subsequent modelling will be undertaken to understand the potential changes and impacts to the water quality of Lake Cressbrook.

6.1.3 Groundwater and ground water dependent ecosystems

Pending the completion of geotechnical investigations and hydrogeological investigations (if required) the potential impacts to ground water are difficult to determine. If the excavation or underground works for the Project intersect the ground water table wastewater will be generated during construction that will require disposal, potentially including treatment.

Water stored in the upper reservoir will not interact with ground water (should the upper reservoir excavation intersect the ground water table) as the upper reservoir will be watertight either through natural geology or artificial works (e.g. grouting or lining). It is expected that there will be minimal loss due to seepage. Similarly underground shafts, tunnels and caverns will be lined preventing the ingress of ground water.

Regardless of the Project's interaction with groundwater, the recharge area for existing groundwater may be reduced by the construction of the upper reservoir.

Anticipated impacts of the Project on potential GDEs are expected to be minimal and include alteration of local recharge catchments resulting from construction of the upper reservoir and minor clearing of potential terrestrial GDEs.

6.1.4 Ecosystems

Vegetation clearing for the Project has the potential to disturb terrestrial and riparian flora species, vegetation communities, fauna and fauna habitat. The Project will require the permanent clearance of up to approximately 156 ha, predominately for the upper reservoir, but also for the lower intake/outlet, access roads, permanent spoil storage and tunnel portals. There will also be up to 24 ha of temporary clearance to facilitate construction (e.g. for site offices and laydown areas) that will be revegetated as part of the Project.

Of the permanent clearance area (up to 156 ha), vegetation that will be impacted includes:

- 50 ha of 'least concern' remnant vegetation
- 8 ha of 'of concern' remnant vegetation
- 20 ha of 'of concern' regrowth vegetation
- 5 ha of 'least concern' regrowth vegetation.

Wherever possible, disturbance areas will be positioned in areas of lesser environmental values (away from fauna habitat and 'of concern' remnant vegetation) during detailed design.

In terms of suitable koala habitat, vegetation clearing may permanently disturb up to 122 ha, all of which meets the Commonwealth definition as habitat critical for the survival of the koala. It is noted that according to the koala mapping that is publicly available, there are other areas in the immediate vicinity and those adjoining the Project area which are mapped as core koala habitat and locally refined habitat, however ground-truthing will be required to determine the suitability and condition as koala habitat and whether an active koala population is present.

Vegetation clearing may also impact on foraging habitat for the two other Commonwealth-listed species – greater glider, and the brush tailed rock wallaby – however, breeding or roosting habitat for these species is located to the north-east of the Project site and is not expected to be disturbed.

It is anticipated that up to 92 ha of potential greater glider habitat may be impacted by vegetation clearing for the Project. There is, however extensive similar habitat remaining in the immediate surrounds, and it is expected that the species will utilise the area more widely.

While there is no potential refuge habitat for the brush tailed rock wallaby within the Project footprint, there is potential to impact on up to 141.7 ha of potential foraging and dispersal habitat for the species.

Foraging habitat for the state-listed powerful owl, as well as the white-throated needletail may also be disturbed.

Two ENVT species are known to occur in Lake Cressbrook: the Mary River cod and silver perch however, both are translocated and stocked populations. The Project has the potential to impact aquatic ecosystems, flora, and fauna in Lake Cressbrook through:

- temporary, localised decrease in water quality resulting from the construction of the lower intake and outlet and commissioning on the Project
- influencing of the hydrodynamics of Lake Cressbrook through the operation of the Project potentially resulting in increases in subaqueous and shoreline erosion and alteration of water quality (e.g. cyanobacteria – refer Section·6.1.2)

Construction also has the potential to introduce species, including weeds, to the Project site, or spread introduced species within the Project site which may impact existing ecosystems, flora and fauna.

6.2 AMENITY

6.2.1 Air

The Project is not expected to release a significant quantity of any indicators for protection of environmental values as described in the Queensland *Environmental Protection (Air) Policy 2019*.

The construction of the Project has the potential to generate dust which may result in localised reduced air quality. Dust may be generated where land is disturbed for the construction of the upper reservoir, access roads, tunnel portals, switchyard and laydown areas as well as through excavation and associated earth works, concrete batching and crushing plant and haulage and placement of spoil.

Additionally, the use of diesel generators and plant and blasting may generate minor quantities of air pollutants during construction.

The operation of the Project is not expected to generate any significant air emissions.

6.2.2 Noise

The Queensland *Environmental Protection (Noise) Policy 2019* identifies environmental values that the policy aims to protect, as well as acoustic quality objectives for sensitive receptors to achieve protection. The environmental values and sensitive receptors relevant to the Project include the health and wellbeing of residences and the community amenity of parks or gardens open to the public.

The main noise generating sources during construction of the Project are likely to include:

- concrete batching plant
- mobile crushing plant
- plant used in underground works (power station caverns, shafts and tunnels) including:
    - blasting
    - tunnel boring plant
    - fans and pumps
    - excavators and loaders
    - trucks.
- plant used in above ground works (upper reservoir, access roads, lower intake/outlet and spoil disposal) including:
    - excavators and bulldozers
    - scrapers
    - graders
    - heavy machinery.

The operation of the Project is not expected to have any significant noise impacts on sensitive receptors. The power station is located underground, and noise is expected to be attenuated prior to reaching sensitive receptors.

6.2.3 Visual and built environment

6.2.3.1 Visual aesthetics and built environment

A majority of the visible components of the Project will be located in a bushland setting within a rural locality. A preliminary view shed analysis shows that the visual impact of the Project will be greatest for users of Lake Cressbrook, while visibility of the upper reservoir from surrounding areas is negligible and therefore will not impact the public open space or users of Lake Cressbrook (Figure 6.1).

The visual impact at Lake Cressbrook is expected to be partly mitigated by the existing Cressbrook Dam and water intake both of which are prominent existing built features in the landscape.

BE Power has opted for an underground transmission line that avoids visual impact from aboveground transmission lines.

6.2.3.2 Lighting and urban design

The Project is not located in an urban environment and, other than potential security lighting at onsite facilities, is not expected to be lit.

6.2.4 Traffic and transport

6.2.4.1 Potential impacts

Access to the Project site during construction will be afforded through Sebastapool and Three Mile roads (refer Figure 6.2). As part of construction the roads will need to be upgraded and partially realigned. There is also a potential for temporary road widening to facilitate delivery of heavy machinery and project components.

Traffic impacts from the operation of the Project are anticipated to be minor and limited to light vehicles for service and maintenance personnel.

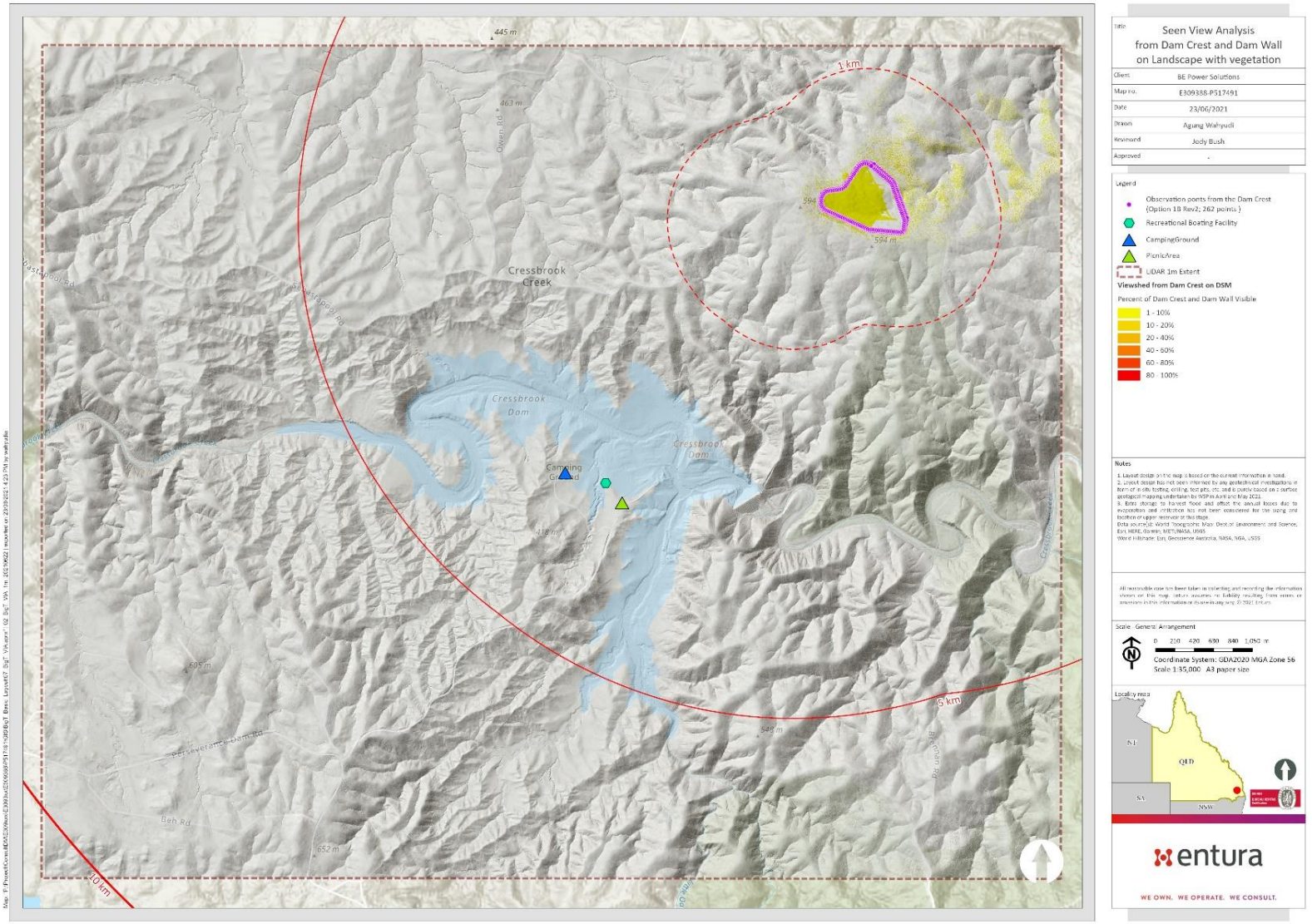

Figure 6.1: Viewshed from upper reservoir

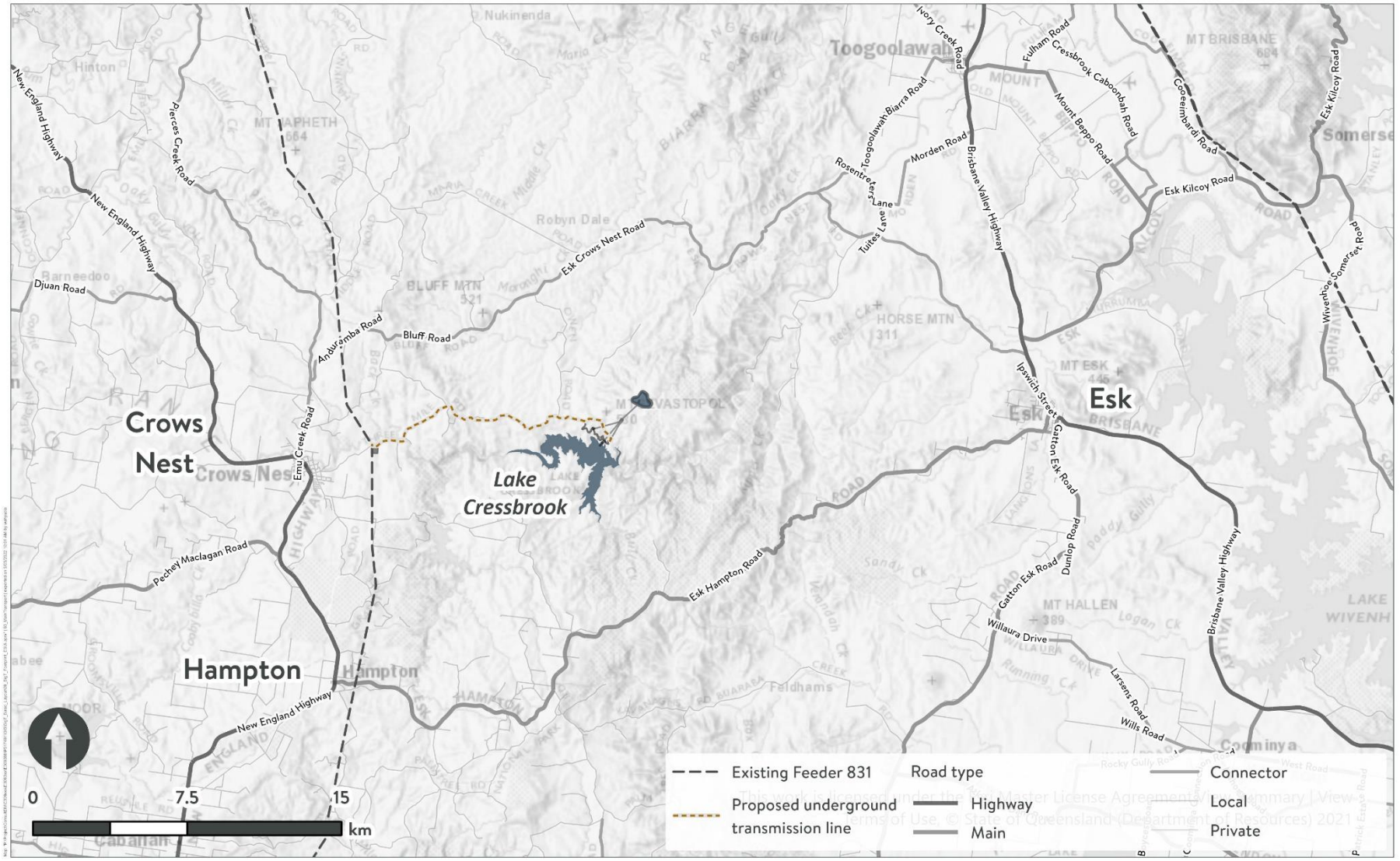

Figure 6.2: Location of main transport routes in the Project area

6.3 SOCIAL AND RECREATIONAL

The primary social impact of the Project is likely to result from the influx of workers during the construction phase. While this will have positive benefits such as local cashflow and employment opportunities, it may also bring indirect negative impacts, such as increased incidents (e.g. traffic accidents, crime rates), road closures, increased disturbance particularly from noise, vibration and reduced air quality.

It is anticipated that Lake Cressbrook would still be open for recreational use. A relatively small exclusion zone around the intake/outlet is anticipated, while water quality (turbidity, cyanobacteria levels) may be impacted from the operation of the Project.

For the workforce, based on high level working age population and regional industrial base data, as well as safe journey management principles that include journey duration, quality of roads, traffic volumes and fatigue management, the project's working hypothesis is as follows:

Temporary disturbances to the amenity of users of Lake Cressbrook are likely during the construction phase; however, it is important to note that currently the lake is shut during parts of the year due to poor water quality.

Further socio-economic baseline and social impact studies will be undertaken as part of the environmental assessment to understand the pre-existing matters of the affected townships (and therefore determine what issues are likely to be affected by the activities relating to the Project), capacity of existing accommodation to cater for an influx of workers during the construction phase, and capacity of existing services (including health, recreation, education, goods and services) to accommodate for influx of the workforce. The assessment will be undertaken in accordance with the Coordinator General's *Social Impact Assessment guideline* (Department of State Development, 2018).

6.3.1 Cultural heritage

A preliminary heritage assessment, undertaken in March 2021, determined the site to have low to moderate risk of likelihood for impact on Aboriginal cultural heritage. The Project footprint at the time had not been finalised and therefore only a site inspection was undertaken to confirm desktop assessment.

Further archaeological surveys, investigations as well as engagement with local and regional Aboriginal parties and cultural heritage bodies will be undertaken as part of further environmental assessment for the Project.

6.4 ECONOMIC EFFECTS

Economic contributions and impacts will be considered during the assessment process, and in accordance with the Coordinator General's *Economic Impact Assessment Guideline* (Department of State Development, 2017).

6.5 MNES UNDER THE EPBC ACT

Matters of National Environmental Significance (MNES) potentially impacted by the Project are summarised in Table 6.1.

A Commonwealth referral (reference 2021/9140) for the Project was submitted in December 2021. The project was determined as a 'Controlled Action' in March 2022, and will require assessment and approval under the EPBC Act for potential significant impacts on two listed threatened species as discussed below.

Baseline ecological studies which have been completed to date have surveyed for Commonwealth matters, and likelihood of significance assessments undertaken for communities and species identified in the DoAWE's Protected Matters Search Tool results. These are included in appendices to Appendix A.

Table 6.1: MNES potentially impacted by the Project

MNES	Relevance to Project
World and National Heritage properties	No World Heritage Properties or National Heritage Places are located within the Project site.
Great Barrier Reef Marine Park and Commonwealth Marine Area	The Project is located inland and not in proximity to marine areas.
Wetlands of International Importance	No Wetlands of International Importance are located within the Project site or potentially impacted by the Project. The closest Wetland of International Importance is Moreton Bay located 80 km to the east of the Project site.
Threatened Ecological Communities	The Protected Matters Search Tool (**PMST**) identified six TECs that potentially occur on the Project site. Field surveys verified that none of the potentially occurring TECs are present on the Project site.
Threatened Species	Four species listed under the EPBC Act were recorded from the Project site during field surveys. These are the koala, greater glider, brush-tailed rock-wallaby, and white-throated needle tail. All four species are listed as vulnerable under the EPBC Act. Koala habitat within the Project area meets the definition of *habitat critical for the survival of the koala* contained in the Commonwealth *EPBC Act referral guidelines for the vulnerable koala* (DoAWE, 2014). The Project avoids breeding or roosting habitat of the brush-tailed rock wallaby and greater glider but will impact foraging habitat for these species as well as the white-throated needle tail. The Project site is also considered likely to provide habitat for the grey-headed flying-fox listed as vulnerable under the EPBC Act. The Mary River cod and silver perch, listed as endangered and critically endangered respectively under the EPBC Act are present in Lake Cressbrook but both have been translocated to Lake Cressbrook and are stocked. No flora species listed under the EPBC Act were recorded during field surveys and none are considered likely to occur.

MNES	Relevance to Project
Migratory Species	Lake Cressbrook provides known habitat for six migratory species that were recorded during surveys and potential habitat for a further four migratory species.
Nuclear actions	Not relevant to the Project.
A water resource	Not relevant to the Project. Water resources are a matter of National Environmental Significance when in relation to coal seam gas and large coal mining developments.

7 ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

This section outlines proposed measures to manage and mitigate potential environmental impacts associated with the construction and operation of the Project.

7.1 NATURAL ENVIRONMENT

7.1.1 Geology and soils

A geology and geotechnical investigation, including a program of drilling/test pitting, will be completed as the Project is developed. The results of the investigations will be used to further assess, and develop management and mitigation measures, for potential environmental and social impacts including:

- potential interaction of the Project with the groundwater table – refer Section 7.1.3
- identification of potential rock types that may require environmental management such as naturally occurring asbestos or potentially acid forming deposits
- development of erosion and sediment control measures during construction and operation.

A geomorphological assessment will also be completed to assess the potential for shoreline and subaqueous erosion resulting from the construction and operation of the Project.

7.1.2 Surface water

During the operation of the Project water quality in Lake Cressbrook will be maintained such that the TRC is able to continue to use the lake as a drinking water supply and there is no reduction in the availability of the lake for recreational use as a result of poor water quality compared to present.

A program of water quality monitoring is currently being undertaken to further understand the baseline water quality in Lake Cressbrook and the upper reservoir catchment, particularly those parameters that may be impacted by the operation of the Project. The results of the water quality monitoring program will be used to develop operational management measure (if required) to maintain the water quality in Lake Cressbrook.

The water quality monitoring program includes:

- in-situ measurements of physico-chemical water quality at depth profiles from the lake surface to bed

- water sampling from the lake surface and depth for a range of parameters including:
    - total nitrogen
    - total phosphorus
    - nitrate and dissolved ammonia
    - dissolved reactive phosphorus
    - soluble and total manganese
    - soluble and total iron
    - chlorophyll a, and
    - cyanobacterial cell counts
- sediment sampling.

An assessment of the potential impact of the Project on cyanobacteria (*Raphidiopsis*) in Lake Cressbrook particularly with regard to the use of the lake for drinking water supply and recreational use is also planned.

A hydrodynamic model will be developed to help understand the potential impacts of the Project on water quality and water circulation in Lake Cressbrook. In particular the model will be used to predict the effects of the Project on thermocline development in Lake Cressbrook to inform water quality assessments.

Mitigation measures will be implemented to minimise impacts to surface water quality, including in Lake Cressbrook, during construction. A surface water quality management plan will be prepared that identifies potential impacts to surface water (e.g. sediment mobilisation in Lake Cressbrook, erosion and sedimentation, chemical spills), proposes mitigation measures (e.g. silt curtains, progressive rehabilitation, hazardous materials controls) to control potential impacts and describes a monitoring plan to ensure mitigation measures are effective.

7.1.3 Ground water

If geotechnical assessment find that the Project is likely to intersect with groundwater a hydrogeological assessment, including development of a conceptual hydrogeological model, will be developed to determine the potential impacts on ground water dependent ecosystems and wastewater management requirements during both construction and operation of the Project. A ground water management plan will be developed if required.

7.1.4 Ecosystems

The Project site contains significant environmental values including Commonwealth and State listed species and habitats. The design of the Project has sought to avoid impacts to terrestrial environmental values by undergrounding key project components including the water conveyances and power station (pending geotechnical conditions) as well as the transmission line. Further mitigation measures will include:

- undertaking further ecological surveys to better understand potential values impacted by the project including a Protected Plant survey.
- preclearance surveys and relocation of the known koala population to a suitable location, including follow up monitoring, in consultation with Commonwealth and State agencies.
- continued focus on retaining vegetation and habitat through project design and construction planning.

- progressively rehabilitating disturbed areas to re-establish vegetation as soon as possible.

BE Power is committed to developing an offset for the loss of fauna habitat that cannot be avoided. The offset will be developed in accordance with Commonwealth and State guidelines and in consultation with the TRC.

7.2 BUILT ENVIRONMENT

7.2.1 Air

Management of air quality (dust and emissions) will be included in construction environmental planning and include standard management and mitigation measures (e.g. stabilisation of exposed soils, progressive rehabilitation, etc.).

7.2.2 Noise and vibration

A noise and vibration impact assessment will be completed that will identify the key potential noise and vibration sources during both construction and operation of the Project and estimate the noise and vibration levels at sensitive receivers. Management and mitigation of noise and vibration during construction will be included in construction environmental planning and will include standard noise and vibration mitigation measures (e.g. constraining construction hours, attenuation of noise emissions).

7.2.3 Visual

A visual impact assessment will be completed to help understand the potential impact of the Project. The design of the project will seek to minimise visual impacts through siting of project infrastructure and consideration of use of materials with lower visual impacts

7.2.4 Traffic and transport

A traffic and transport assessment will be completed that will identify transport routes and the potential impacts to the existing road network during both construction and operation of the Project. Mitigation measures for local roads will be developed in consultation with the TRC.

7.3 CULTURAL HERITAGE MANAGEMENT PLAN (INDIGENOUS)

A detailed Cultural Heritage Management Plan (**CHMP**) will be prepared and is mandatory as part of the preparation of the EIS. The CHMP must be in place and approved under Division 2 of Part 7 of the *Aboriginal Cultural Heritage Act 2003* as a prerequisite to the granting of any lease, licence, permit, approval or other authority required under any Act for the Project.

7.4 NON-INDIGENOUS CULTURAL HERITAGE MANAGEMENT

As part of the cultural heritage studies which will be commissioned for the preparation of the EIS, non-Indigenous cultural heritage assessments will be undertaken.

7.5 WASTE MANAGEMENT

Waste management will be included in construction environmental planning. Wastewater (if generated) will be captured and disposed of

in such a way as to not negatively impact existing water quality (e.g. by treatment if returning to existing water way such as Lake Cressbrook). The amount of spoil permanently disposed of on site will be minimised by reuse on site where possible (e.g. construction of the upper reservoir) and by making spoil available to external parties for offsite use. Where stockpiles are required, they will be engineered to appropriate standards.

7.6 HAZARD AND RISK, AND HEALTH AND SAFETY

Relevant hazard and risk assessments will be incorporated into supporting studies which will be undertaken for the preparation of the EIS. These predominantly include flooding, cyclone, and bushfire.

Mitigation measures will be incorporated into the relevant environmental management plan (**EMP**) and/or the Construction Environmental Management Plan (**CEMP**).

7.7 ENVIRONMENT MANAGEMENT

BE Power is committed to developing the Project to meet or exceed current best practice environmental management. BE Power will review its current Environmental Management System (**EMS**), Health, Safety and Environment (**HSE**) system as well as other relevant policies for the Project to guide the implementation of environmental management commitments and strategies.

A comprehensive environmental management and monitoring program will be developed and implemented for the Project. Management and monitoring measures will be documented in a CEMP and an Operational Environmental Management Plan (**OEMP**) or equivalent. It is anticipated that both plans will contain a range of sub-plans addressing specific requirements.

7.8 SUMMARY OF PROPOSED IMAPCT ASSESSMENTS AND MANAGEMENT PLANS

A number of impact assessments and management plans will be prepared by specialists as part of the EIS process. This are summarised in Table 7.1, however, it should be noted that the list is subject to change, and will be guided by the Terms of Reference.

Table 7.1: Proposed impact assessments and management plans

Aspect	Discipline	Proposed impact assessments
Natural environment	geology and soils	• geotechnical assessment • contaminated soils assessment (if required) • geomorphological assessment
	surface water	• water quality monitoring (underway) • hydrodynamic modelling • cyanobacteria assessment • surface water assessment
	groundwater	• groundwater assessment • hydrogeological assessment • groundwater dependent ecosystem assessment
	ecosystems	• protected plant surveys • aquatic ecology surveys
Built environment	air	• air quality assessment • greenhouse gas emissions assessment • bushfire assessment
	noise and vibration	• noise and vibration assessment
	visual	• landscape character and visual impact assessment

Aspect	Discipline	Proposed impact assessments
	traffic and transport	• traffic impact assessment
	cultural heritage	• Aboriginal heritage assessment • cultural heritage management plan • non-Indigenous cultural heritage assessment
Socio-economic	social	• social impact assessment
	economic	• economic impact assessment • cost benefit assessment

8 APPROVALS REQUIRED FOR THE PROJECT

A range of statutory approvals will be required for the Project, as outlined in Table 8.1. Changes to the Project or to legislation during the course of the Project may require the approval requirements to be reconsidered. Approvals will need to be sought from Commonwealth, State and local government departments, including but may not be limited to:

- Commonwealth Department of Agriculture, Water and Environment (**DoAWE**)
- Queensland Department of State Development, Infrastructure, Local Government and Planning (**DSDILGP**)
- Queensland State Agency and Referral Authority (**SARA**)
- Queensland Department of Resources (**DR**)
- Queensland Department of Environment and Science (**DES**)
- Queensland Department of Aboriginal and Torres Strait Islander Partnerships (**DATSIP**)
- Queensland Department of Energy and Public Works (**DEPW**)
- Queensland Department of Transport and Main Roads (**DTMR**)
- Toowoomba Regional Council (**TRC**)
- Somerset Regional Council (**SRC**).

Table 8.1: Statutory approvals for the Project

Legislation	Approval	Trigger	Relevance	Authority	Within EIS scope
Commonwealth					
Environment Protection and Biodiversity Conservation Act 1999	EPBC Act referral and approval	Referral to the Commonwealth Minister of the Environment to determine if the Project is a 'controlled action' requiring approval under the EPBC Act due to potential significant impact on MNES.	**Applicable** Development is determined to have a significant impact on MNES, predominantly on habitat that is considered to be critical for the survival of the koala. The Project (proposed action) was determined to be a 'controlled action' on 22 March 2022 (referral reference 2021/9140). Further assessment is expected through the bilateral agreement between the Commonwealth and State of Queensland under s.45 of the EPBC Act.	DoAWE	Yes
State – SDPWO Act					
State Development and Public Works Organisation Act 1971	Coordinated Project declaration	The Coordinator-General may declare to be a 'coordinated Project' if it has: • Complex approval requirements • Significant environment effects, • Strategic significance to the locality • Significant infrastructure requirements.	**Applicable** This IAS forms part of the Application for Declaration. If declared, either and IAR or EIS is required to be prepared in accordance with the SDPWO Act. This process allows the Coordinator-General to coordinate the assessment process.	Coordinator-General, DSDILGP	Yes

Legislation	Approval	Trigger	Relevance	Authority	Within EIS scope
State – Planning Act and Regulation Approvals					
Planning scheme *Planning Act 2016 & Planning Regulation 2017*	Development approval	Development approvals relevant under planning schemes for operational works (e.g. excavation and filling, clearing of native vegetation), material change of use and building works.	**Applicable** The Project is likely to trigger a material change of use for change in land use assessable under the local government planning scheme, as well as clearing of native vegetation and building work.	TRC/SRC	Yes
Vegetation Management Act 1999 (**VM Act**)	Clearing permit	Clearing of native vegetation is likely to trigger the need for a development application for Operational Works for Clearing Native Vegetation, pursuant to *Planning Regulation 2017,* Schedule 10, Part 3, Division 2, section 5.	**Applicable** The Project will require clearing of native vegetation for the new upper reservoir, and other supporting infrastructure such as access tracks, laydown areas and temporary construction areas. Further, a coordinated project under the SDPWO Act is considered a 'relevant purpose' under the VM Act.	SARA/DES	Yes
Water Act 2000	Development application	Operational works for taking or interfering with water in a watercourse, or a dam constructed on a water course, pursuant to *Planning Regulation 2017,* Schedule 10, Part 19, Division 1.	**Applicable** The Project will involve works for taking or interfering with water in a watercourse. There are likely also considerations for the use of Lake Cressbrook being used as part of a hydroelectric facility as well as a town water supply.	SARA/DR	Yes

Legislation	Approval	Trigger	Relevance	Authority	Within EIS scope
Water Supply (Safety and Reliability) Act 2009 (**WSSR Act**)	Development application	Operational works for a referrable dam, pursuant to *Planning Regulation 2017,* Schedule 10, Part 19, Division 3.	**Applicable** The Project involves the construction of a new upper reservoir. Once a Failure Impact Assessment (FIA) is accepted for a proposed dam, and the dam is referrable, application must be made for Operational Works under the Planning Act for a development permit to construct a dam.	SARA/DR	Yes
State – Other Approvals					
Aboriginal Cultural Heritage Act 2003 (**ACH Act**)	Cultural heritage management plan	Where an EIS is required, a CHMP must be in place and approved under Division 2 of Part 7 of the ACH Act as a prerequisite to the granting of any lease, licence, permit, approval or other authority required under any Act for the Project.	**Applicable** While there is no registered native title over the Project site, an EIS is required for the Project and a CHMP will need to be developed.	DATSIP	Yes
Electricity Act 1994	Generation authority licence	Generation of electricity and connection to the transmission grid and supply network. Note that the transmission line will be owned and operated by Yurika.	**Applicable** The Project will involve the generation of electricity from the pumped hydro facility, and connection to the transmission grid and supply network via a new 275 kV underground transmission line.	DEPW	No

Legislation	Approval	Trigger	Relevance	Authority	Within EIS scope
Environmental Offsets Act 2014 (**EO Act**)	Biodiversity offsets	Clearing of fauna habitat areas will require biodiversity offsets.	**Applicable** Any applicable offsets will be conditioned as part of the EA and EPBC Act approval.	DES & DoAWE	Yes
Environmental Protection Act 1994 (**EP Act**)	Environmental authority (**EA**)	In accordance with s124 of the Act, a single, site-specific Environmental Authority is required for the Project. The EA will authorise activities under the Act which includes Environmental Relevant Activities (**ERAs**) that may be undertaken as part of the Project: • Regulated dams • environmental offsets • ERA 8 – chemical storage • ERA 16 – extractive and screening activities • ERA 63 – sewage treatment • ERA 64 – waste treatment.	**Applicable** The Project involves a material change of use (**MCU**) for ERAs for chemical storage, and crushing and screening. Other potentially relevant ERAs include waste and water management at the construction management areas.	SARA/DES	Yes
Environmental Protection Act 1994	Registration as a suitable operator	In accordance with s318F of the Act, applicant must be registered as a suitable operator prior to issue of the EA.	**Applicable** Required to undertake ERAs in Queensland.	DES	Yes

Legislation	Approval	Trigger	Relevance	Authority	Within EIS scope
Forestry Act 1959	Removal of quarry material	Potential for the removal of rock, sand or gravel from the project site due to on-site excavation or off-site excavation for transport to and use on project site.	**Potentially applicable** This is potentially applicable however is dependent on the final construction methodology adopted by the construction contractor and whether any or all of the material will be reused for the project components.	DR	Yes
Nature Conservation Act 1992 (**NC Act**)	Protected plants permit	Clearing of threatened or near threatened protected plants and/or their supporting habitat.	**Likely applicable** A licence is likely to be required for the removal of native plants. In addition, a clearing permit will be required for the removal of any endangered, vulnerable or near threatened (EVNT) plants.	DES	Yes
Transport Infrastructure Act 1994 (**TI Act**)	Road corridor permit	Departmental approval is required if a third party is to locate a structure or thing, or undertake an activity in state-controlled road corridors.	**Possibly applicable** If the construction of the Project involves permanent or temporary road closures, all relevant state and local authorities need to be consulted.	DTMR	Yes
Water Act 2000	Riverine protection permit	Works within Lake Cressbrook, including but not limited to the cofferdam for intake construction	**Likely applicable** A permit is required for excavation, placing of fill, or destroying vegetation within a watercourse, lake or spring unless exempted under the Act.	DRDMW	Yes

Legislation	Approval	Trigger	Relevance	Authority	Within EIS scope
Local					
Local Government Act 2009 (**LG Act**)	Local road permit	Carrying out works on a road or interfering with the road or its operation.	**Applicable** Development of the transmission line will involve carrying out works on a road or interfering with the road or its operation. In addition, construction activities are likely to require upgrades to roads and/or changes to operation during construction.	TRC	No
Planning schemes	Development approval	Development assessable under a local government planning scheme for MCU, operational works, plumbing and drainage, and building work.	**Applicable** Project will require assessment against the relevant planning schemes.	TRC/SRC	Yes

9 COSTS AND BENEFITS SUMMARY

This section provides an overview of how the Project addresses key government priorities for growth in Southeast Queensland, and how the project may impact on physical and socio-economic environments.

9.1 LOCAL, STATE AND NATIONAL ECONOMIES

The Project facilitates a number of government priorities as outlined across a range of Queensland government policies, including:

- creating a more sustainable future – through supporting the local, regional and State economies
- address climate change vulnerability – through the development of a Project that will further facilitate more sustainable forms of energy generation
- providing infrastructure and services – through the development of a new energy project and supporting infrastructure such as transmission line
- protecting the regional landscape – through carefully co-designing to avoid or mitigate environmental values.

The Project will provide significant employment opportunities for construction contractors, as well as long-term flow-on social and economic benefits to the regional community including opportunities for local and regional industries. BE Power is committed to engaging a workforce of primarily local and regional personnel.

Additionally, once operational the Project will be an enabler for other renewable developments such as wind and solar, furthering local and regional economies. The Project will also directly support the stabilisation of the NEM which in turn will positively impact the broader community by reducing blackouts.

9.2 NATURAL AND SOCIAL ENVIRONMENTS

The Project will inevitably have some impacts on the natural and social environments of the local area, some of which will be permanent.

As part of initial development of the Project, BE Power has adopted measures through project design to minimise environmental and social impacts, and is committed to offsetting the residual impacts through establishment of reserves as well as other strategies deemed suitable by applicable state and federal regulators.

Given the remote nature of the Project area, the impact on the social environment is considered to be minor. The primary social impacts are likely to arise during the construction phase, such as temporary road closures, increased noise, vibration and dust, disruptions to recreational usage of Lake Cressbrook, and influx of people to nearby towns.

Potential impacts on the natural and social environments will be considered in detail as part of the technical and impact assessments that will be undertaken as part of the environmental and approvals

process. Where specific methodology is required to understand baseline data and therefore determine the degree of impact, BE Power and its consultants will work with the relevant departments and agencies to undertake what is necessary.

During construction, some parts of Lake Cressbrook will be closed for public access to facilitate works. A works exclusion area will be set up. Outside the exclusion area the lake will remain open for public use.

10 COMMUNITY AND STAKEHOLDER CONSULTATION

10.1 STAKEHOLDER ENGAGEMENT

BE Power, in consultation with its stakeholder consultant and the TRC, has developed a Stakeholder Engagement Plan.

The plan identifies a range of stakeholders, spanning local, state and federal levels, and considerations for preliminary and advanced implementation. The plan also considers a timeline and specific levels of engagement with relevant stakeholders during the anticipated approvals process of the Project.

In preparing the plan, the Project team has identified goals and objectives, including but not restricted to:

- sharing accurate and timely information with stakeholders and the public about vision and benefits of the Project
- generating support and understanding of the reasons for the Project, the benefits for Queensland and the Toowoomba community, and what PHES means for the community
- recording stakeholder and public feedback within the approvals documentation.

To meet the goals and objectives, a range of communication and engagement methods and activities will be used to by the Project team to:

- build awareness among key stakeholders (particularly local community) of the benefits of the Project and build credibility for BE Power as a viable and appropriate project developer and owner/operator
- aid the public consultation process for the project to meet the State Government's requirements.

Additionally, BE Power will ensure all relevant affected and interested stakeholders are kept informed and engaged during project development. A dedicated website will go live after declaration of the Project to answer any questions the community may have and to provide real-time updates about the Project. As the construction stage nears, the proponent will also set up a project office near the Project site, which will be manned by BE Power's designated project stakeholder manager, and will be accessible by the public during normal working hours.

Stakeholders will be identified and engaged following a stakeholder matrix, which separates groups into four approaches:

- manage closely/engage/collaborate – those with a high stake in the project both in terms of influence and interest
- keep informed – those groups that will be highly impacted by the Project
- keep satisfied – those groups that will have a high level of influence
- monitor and respond – those that should be kept informed but will be less impacted by the Project.

10.2 KEY STAKEHOLDER GROUPS

A number of stakeholders have been identified as relevant for the Project as part of the preparation of the plan. These are summarised below; however, it should also be noted that it is highly likely more stakeholders will be identified as the consultation process continues:

- Commonwealth and state departments and agencies
- traditional owners and local custodians
- local governments of TRC and SRC, including elected representatives as well as members of the Councils
- adjoining landowners and neighbours
- landowners within the broader Project area
- infrastructure providers, such as:
    - Sunwater
    - SEQWater
    - Powerlink
- local community groups, including sporting, recreational and business groups, including but not limited to:
    - Crows Nest Flat Landers Walking Group
    - Darling Downs Sailing Club
    - Cabarlah Fishing Club
    - Rotary Club of Toowoomba
    - Garden City Fishing Classic
    - Cressbrook & Litton Flyfishers Club
    - QLD Dams Basstasstic Fishing Club
    - Australian Navy Cadets
- environmental groups, including but not limited to:
    - Birdlife Southern Queensland
    - Crows Nest Creek Catchment Group
    - Land for Wildlife South East Queensland
    - Darling Downs Environmental Council
    - HOPE Australia (Householders' option to protect the environment)
    - Wildlife Preservation Society Queensland Toowoomba Branch
    - Toowoomba Koala and Wildlife Rescue
    - The Australian Koala Foundation
    - Return To The Wild Inc.
- Broader Crows Nest, Biarra and Esk residents
- Toowoomba community.

To date, BE Power has commenced implementation of the Plan, including meeting with local business and lobby groups to introduce the Project.

10.3 KEY PROJECT PRINCIPLES

As part of the preparation for the engagement plan, the Project team has established eight key project principles to which they intend to develop, construct and operate the Project. These are summarised below:

- **Key Principle 1 – First Nations Cultural Heritage and Engagement**

  The Project Team acknowledge the Aboriginal parties whose song lines traverse the Project land and pay respect to Elders past, present and emerging. The Project Team will engage with the local Aboriginal community, and more particularly, the Western Wakka Wakka People to the west of the Project land, and the Jagera People and Yuggera Ugarapul people to the south of the Project land for their direction and engagement in the design of the Project to minimise impact on their land. The Project team considers such engagement crucial to ensuring the cultural heritage of the region is celebrated and preserved moving forward.

- **Key Principle 2 – Environmental Impact**

  The Project Team is committed to providing responsible stewardship of the natural resources over which we have control or influence. We believe that preserving, protecting and, where appropriate, remediating the natural environment is essential for the wellbeing of current and future generations.

- **Key Principle 3 – Lake Cressbrook Water Security and Water Quality**

  The Project Team acknowledges that the Project proposes to utilise a principal water supply (Lake Cressbrook) to the *Toowoomba Regional Council (TRC). The Project Team must ensure the Project does not impact on TRC water security or water quality (during construction and operation of the Project).*

- **Key Principle 4 – Safety in Design**

  The Project Team acknowledge that maintaining the integrity of the Lake Cressbrook Reservoir infrastructure and the safety in design of the Project infrastructure is of critical importance.

- **Key Principle 5 – Social and Economic Benefits**

  The Project Team acknowledges that the Project has the capability to deliver significant social and economic benefits to the Toowoomba Region, the State of Queensland, and the National Electricity Market.

- **Key Principle 6 – Lake Cressbrook Recreational Users**

  The Project Team commits to minimising the impact on the use and enjoyment of Lake Cressbrook and its associated recreation area by the general public.

- **Key Principle 7 – Long-term Economic Viability**

  The Project Team commits to ensuring the Project has long-term economic viability to ensure the Project (and its technology) is not made redundant during its engineering life cycle.

- **Key Principle 8 – Stakeholder Engagement**

  The Project Team is cognisant of and commits to open, accurate, transparent, and consultative communication and engagement with Project stakeholders and the public.

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12 GLOSSARY, ACRONYMS AND ABBREVIATIONS

Term	Definition
ABS	Australian Bureau of Statistics
AEMO	Australian Energy Market Operator
ACH Act	*Aboriginal Cultural Heritage Act 2003*
AHD	Australian Height Datum
Active storage	Reservoir capacity assigned to regulate reservoir inflow.
ANCOLD	Australian National Committee on Large Dams
ASS	Acid Sulfate Soil
BEP	BE Power Projects Pty Ltd as a trustee for the Big-T Unit Trust
BESS	Battery energy storage system
BE Power	Collective reference to BEP and GE Energy Llc
Big-T PHES	Big-T Pumped Hydropower Energy Storage Project
BOM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CG	Coordinator-General
CEMP	Construction Environmental Management Plan
CHMA	Cultural Heritage Management Agreement
CHMP	Cultural Heritage Management Plan
Dead storage	A water level at the dam, from where the water cannot be drained through gravity.
DEPW	Department of Energy and Public Works
DES	Department of Environment and Science
DDRP	Darling Downs Regional Plan 2013
DR	Department of Resources, formerly Department of Natural Resources, Mines and Energy
DRDMW	Department of Regional Department, Manufacturing and Water
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
ECVT	Excavation, Cable and Ventilation Tunnel
EIS	Environmental Impact Statement

EMP	Environmental Management Plan
EMR	Environmental Management Register
EMS	Environmental Management System
EO Act	*Environmental Offsets Act 2014*
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPC	Engineering, Procurement and Construction
ERA	Environmentally Relevant Activities
EVs	Environmental Values
EVNT	Endangered, Vulnerable and Near Threatened
FID	Final Investment Decision
FSL	Full Supply Level
FTE	Full Time Equivalent
GDE	Groundwater dependent ecosystem
GE	GE Energy Llc
GIS	Gas insulated switchyard
GL	Gigalitre
GRP	Gross Regional Product
ha	Hectare
Head	
HSE	Health, Safety and Environment system

IAR	Impact Assessment Report
IAS	Initial Advice Statement
ITT	Invitation to Tender process
km	Kilometres
km^2	Square kilometre
kV	Kilovolt
LGA	Local government area
LG Act	*Local Government Act 2009*
Lot 2	Refers to parcel with title reference 2/SP390042
Lot 10	Refers to parcel with title reference Lot 10 RP223812
Lot 58	Refers to parcel with title reference 58/CSH2241
MAT	Main access tunnel
MCU	Material change of use
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
MW	Megawatt
MWh	Megawatt hour
NC Act	*Nature Conservation Act 1992*
NEM	National Electricity Market
NMOL	Normal Minimum Operating Level

OEMP	Operational Environmental Management Plan
Permanent footprint area	Refers to the disturbance area required to locate the permanent components of the Project
PMST	Protected Matters Search Tool under EPBC Act
PHES	Pumped hydropower energy storage
Project	Big-T Pumped Hydropower Energy Storage Project
Project area	Comprises Lot 58, Lot 2, Lot 10 and road 'right of ways' of Three Mile and Sebastapool roads
RE	Regional ecosystem
REZ	Renewable energy zone
ShapingSEQ	*South East Queensland Regional Plan 2017*
SDPWO Act	*State Development and Public Works Organisation Act 1971*
TEC	Threatened ecological community
Temporary disturbance area	Refers to the areas which will be required to support temporary works during construction of the Project
TI Act	*Transport Infrastructure Act 1994*
ToR	Terms of reference
TRC	Toowoomba Regional Council
SARA	State Assessment and Referral Agency
SRC	Somerset Regional Council
UNGI	Underwriting New Generation Investment scheme
VM Act	*Vegetation Management Act 1994*
WoNS	Weeds of National Significance
WSSR	*Water Supply (Safety and Reliability) Act 2009*

Appendices

A Baseline ecology assessment