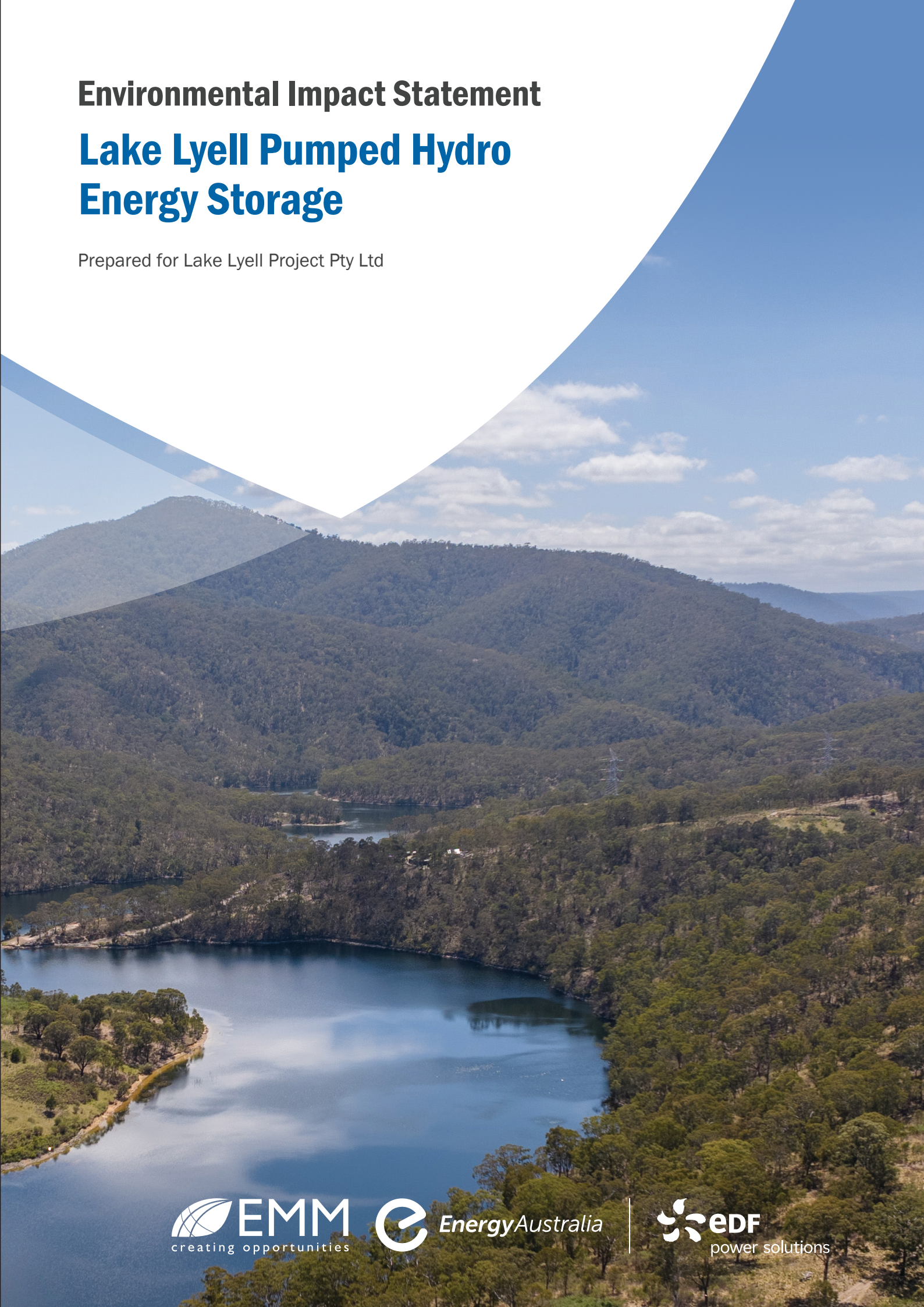
Environmental Impact Statement

Lake Lyell Pumped Hydro Energy Storage

Prepared for Lake Lyell Project Pty Ltd



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EDF power solutions

Acknowledgement of Country

EDF power solutions Australia, EnergyAustralia and EMM acknowledge Aboriginal and Torres Strait Islander peoples as the Traditional Owners and Custodians of the lands on which we live and work throughout Australia.

We acknowledge that the site of the proposed Lake Lyell Pumped Hydro Energy Storage is on the traditional Country of the Wiradjuri People. We recognise their continued connection to land, waterways and community, and we pay our respect to Elders past and present.

EIS declaration

Project details		
Project name	Lake Lyell Pumped Hydro Energy Storage	
Application number	SSI-77018220	
Address of the land on which the infrastructure is to be carried out	Sir Thomas Mitchell Dr, South Bowenfels NSW 2790. Land properties within the project areas are provided in Table 2.2 of Appendix B..	
Proponent details		
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Declaration by registered environmental assessment practitioner		
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Organisation registered with	Certified Environmental Practitioner (EIANZ)	
Declaration	The undersigned declares that this EIS: • has been prepared in accordance with the Environmental Planning and Assessment Regulation 2021; • contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; • does not contain information that is false or misleading; • addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project; • identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; • has been prepared having regard to the Department's State Significant infrastructure Guidelines - Preparing an Environmental Impact Statement; • contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development; • contains a consolidated description of the project in a single chapter of the EIS; • contains an accurate summary of the findings of any community engagement; and • contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.	
Signature		
Date	25 February 2026	

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Chapter 1

Introduction

Environmental Impact Statement | Lake Lyell PHES Project

1 Introduction

1.1 Overview

The Lake Lyell Pumped Hydro Energy Storage (PHES) project (the project) provides a critical firming solution in support of the energy transition in New South Wales (NSW) and the National Energy Market (NEM). The project will have the capacity to store up to 3,080 megawatt hours (MWhrs) of energy and generate at 385 MW for 8 hours or generate up to around 440 MW for a shorter period (i.e. over 4 hours). The project will provide services to the wholesale 'spot' market on the NEM, and support ancillary services used by the Australian Energy Market Operator (AEMO) to manage the power system reliably.

The project is intended to act as an electrical energy storage system through the conversion of electrical to kinetic energy to gravitational energy and back via water as it is transferred from the elevated upper reservoir to a lower reservoir. The location of the project near the existing Lake Lyell will allow this to be achieved without the need to construct a lower reservoir or new transmission infrastructure. Water will be passed between the upper and lower reservoir through underground tunnels and an underground powerhouse, the latter of which will contain equipment that will act as a water pump or an electricity generator depending on the mode of operation.

A conceptualisation of the project's operation is shown in Figure 1.1.

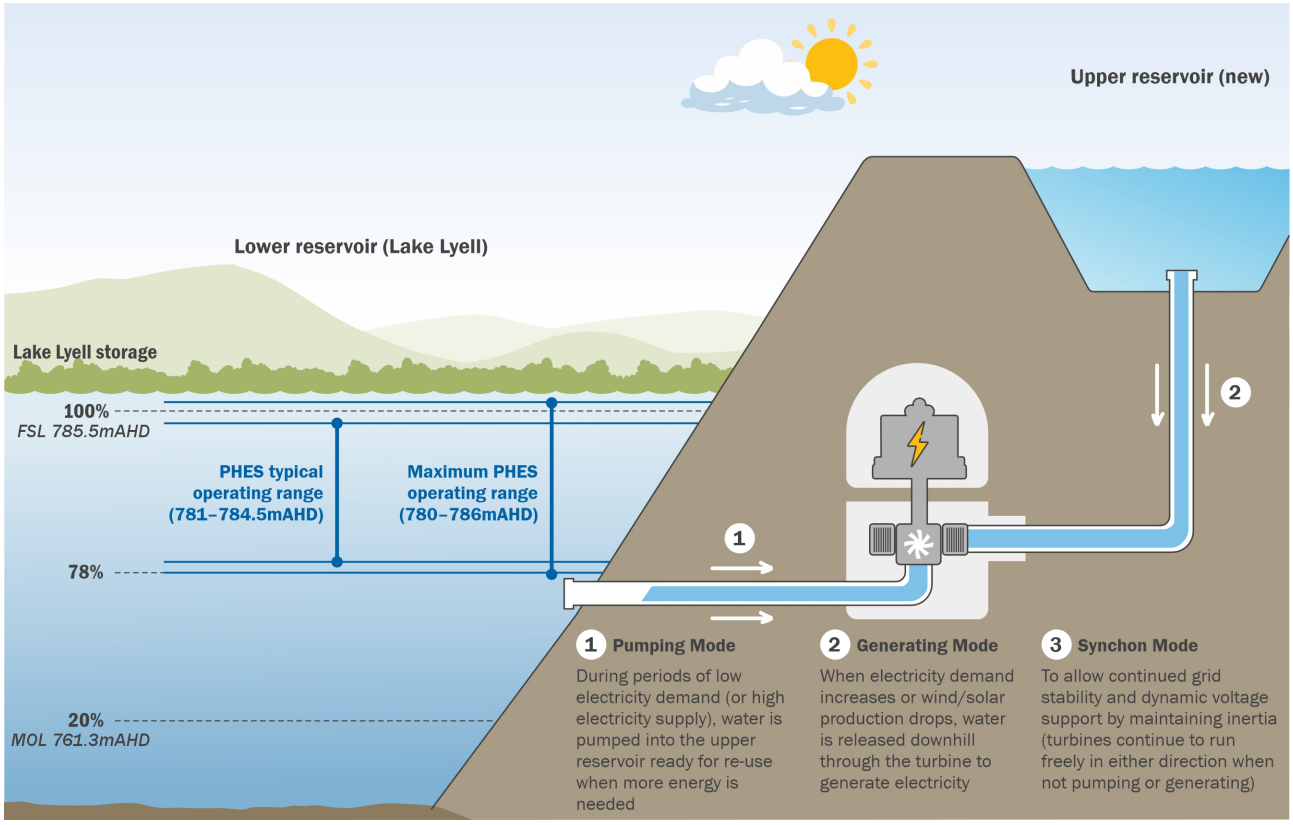


Figure 1.1 Conceptualised operation of the Lake Lyell PHES project

The project is located about 5 kilometres (km) west of Lithgow, primarily on land owned by EnergyAustralia.

In June 2024, the Minister for Planning and Public Spaces (Minister) declared the project to be State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) as it is a development that is essential for the State for economic, social, and environmental reasons. As CSSI, the project is subject to Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), which requires the preparation of an environmental impact statement (EIS) in accordance with Secretary's environmental assessment requirements (SEARs) and the approval of the Minister.

1.2 Lake Lyell Pumped Hydro Energy Storage

1.2.1 Project description overview

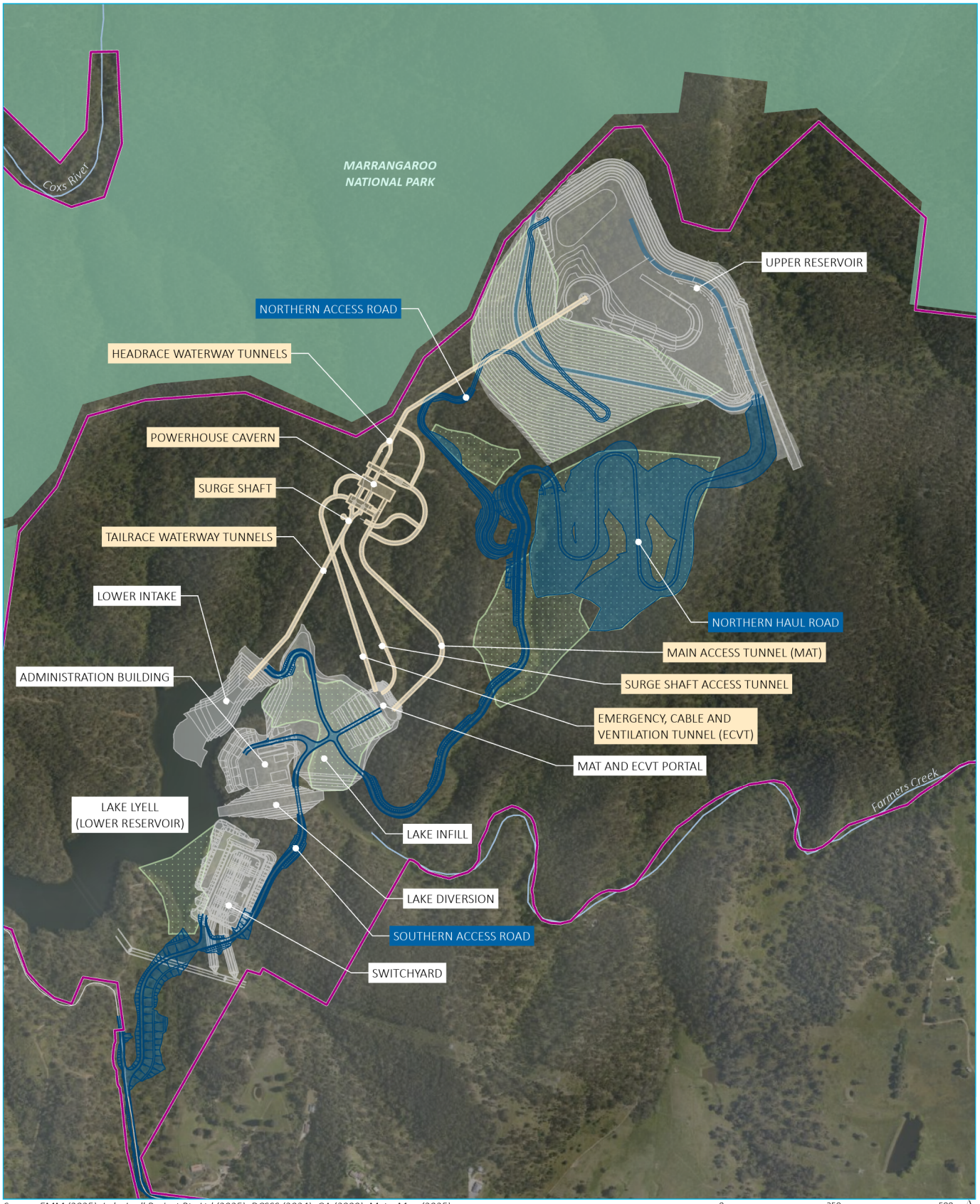
Key elements of the project design are shown in Figure 1.2 and include:

- power generation components, including above ground and underground infrastructure including:
  - the upper reservoir, to be created through the construction of a dam located on Mount Walker
  - the existing lower reservoir (Lake Lyell)
  - inlet/outlet structures for both reservoirs
  - underground power waterway connecting the reservoirs
  - an underground hydroelectric powerhouse
  - access tunnels and portals
- transmission components, including:
  - high voltage (HV) switchyard
  - 150 metres (m) of transmission connection from the switchyard to an existing 330 kilovolt (kV) transmission line
- other ancillary and permanent infrastructure, including:
  - site access roads, tracks and bridges, including upgrade of existing roads used as the primary access route
  - a diversion to Lake Lyell
  - an administration and utilities building.

Ancillary infrastructure and activities are required for the project construction phase, including geotechnical investigations, site works pads, laydown areas and facilities, batch plant, and a temporary workforce accommodation facility (accommodation camp) to house construction workers. Two options for the accommodation camp are presented in the EIS (refer to Section 3.4.2), however only one will ultimately be built.

Excavated rock would be re-used in the project's construction as much as possible, with most of the excavated rock forming the embankment of the upper reservoir. Excavated rock would also be used in the construction of the lake diversion (the lake infill), to form level work pads, and provide fill for access roads. These emplacement areas will be retained permanently as shown on Figure 1.2.

A description of the project is included in Chapter 3 of this EIS and a detailed project description is included as Appendix B.1, with detailed maps and plans provided in Appendix B.2.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); MetroMap (2025)

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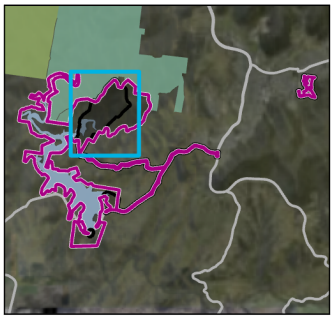

KEY

- Project area
- Permanent road
- Above ground design
- Underground design
- Permanent spoil emplacement

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Key elements of the project

Lake Lyell PHES
Environmental Impact Statement
Figure 1.2

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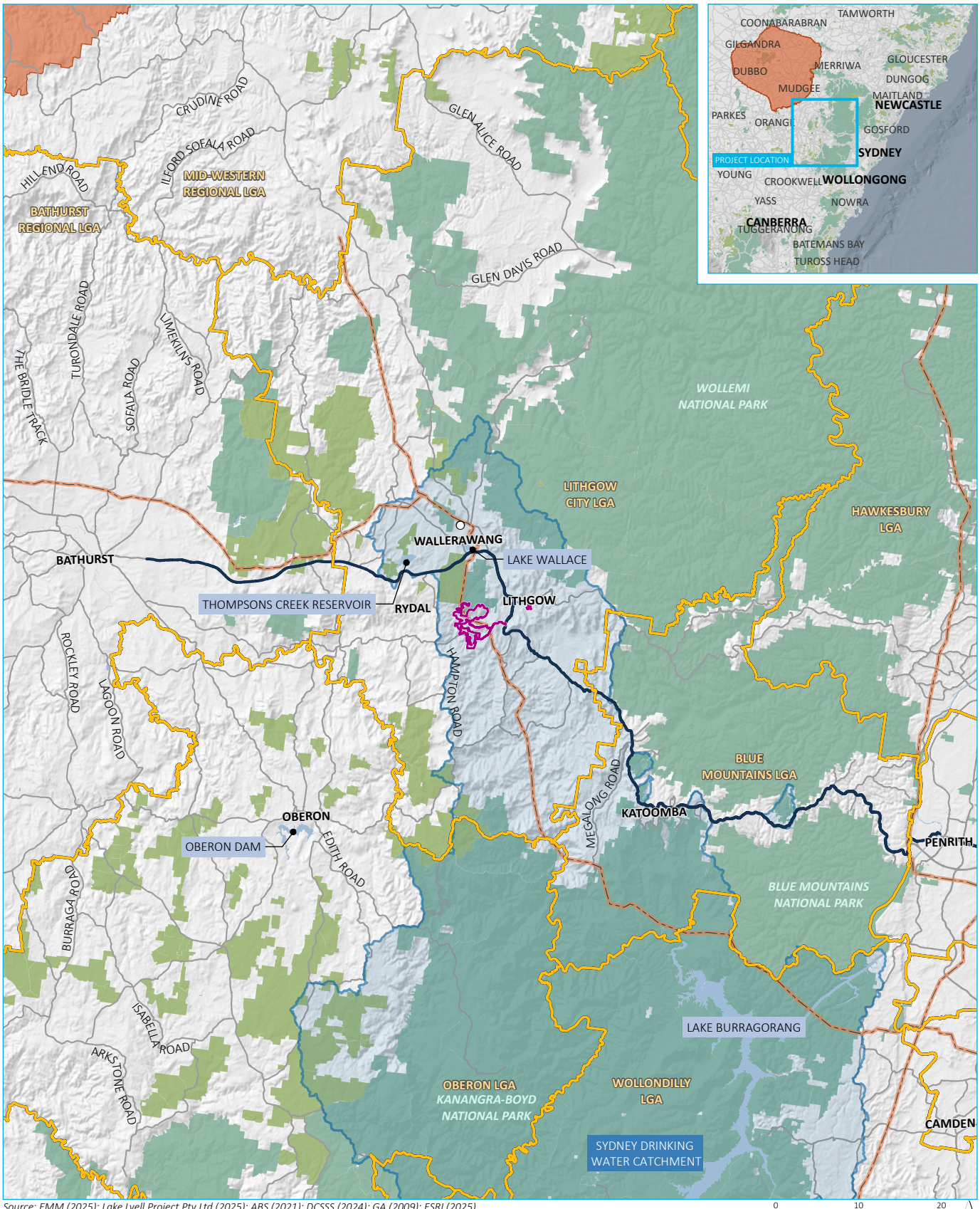
1.2.2 Project location

The project's location is shown in Figure 1.3. The project is located about 5 km west of the city of Lithgow in NSW's Central West region, approximately 110 km west of Sydney's central business district. A 'project area' has been defined to identify the area where key components of the project will be located, including the existing Lake Lyell – a core component of the project and its operation. Other water supply reservoirs in the region include Lake Wallace, Thompsons Creek Reservoir and Oberon Dam, and Lake Burragorang some 90 km downstream from the project.

In addition to the Lithgow urban area and surrounds to the east of the project, the local setting of the project is characterised by a mix of rural landscapes and densely vegetated areas. Rural landscapes dominate to the south, south east and west of the project, and two conservation areas, Marangaroo National Park and Lidsdale State Forest, are located to the north of the project (refer to Figure 1.4). The project area is on land primarily owned by EnergyAustralia. Access to the project is from the Great Western Highway, via Magpie Hollow Road and Sir Thomas Mitchell Drive.

The area immediately north of Lake Lyell contains Mount Walker, which has a peak of about 1,190 m above sea level. This provides steep gradients down to the shores of Lake Lyell. It is this steep relief that provides a suitable and essential height differential for a pumped hydro project. This location is also suitable for the installation of pumped hydro infrastructure because of its accessibility, topography, zoning, and the existing infrastructure present. These site features are explored further in Chapter 2 and within the relevant technical assessments that support, and are appended to, this EIS.



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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); ABS (2021); DCSSS (2024); GA (2009); ESRI (2025)

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GDA2020 MGA Zone 56

N

KEY

- Project area

Existing environment

- Mt Piper Power Station
- Major road
- Great Western Highway
- 330 kV transmission line
- Named waterbody
- NPWS reserve
- State forest
- Local government area
- Sydney Drinking Water Catchment
- Central West Orana Renewable Energy Zone

INSET KEY

- Major road
- NPWS reserve
- State forest
- Central West Orana Renewable Energy Zone

Regional context

Lake Lyell PHES
Environmental Impact Statement
Figure 1.3

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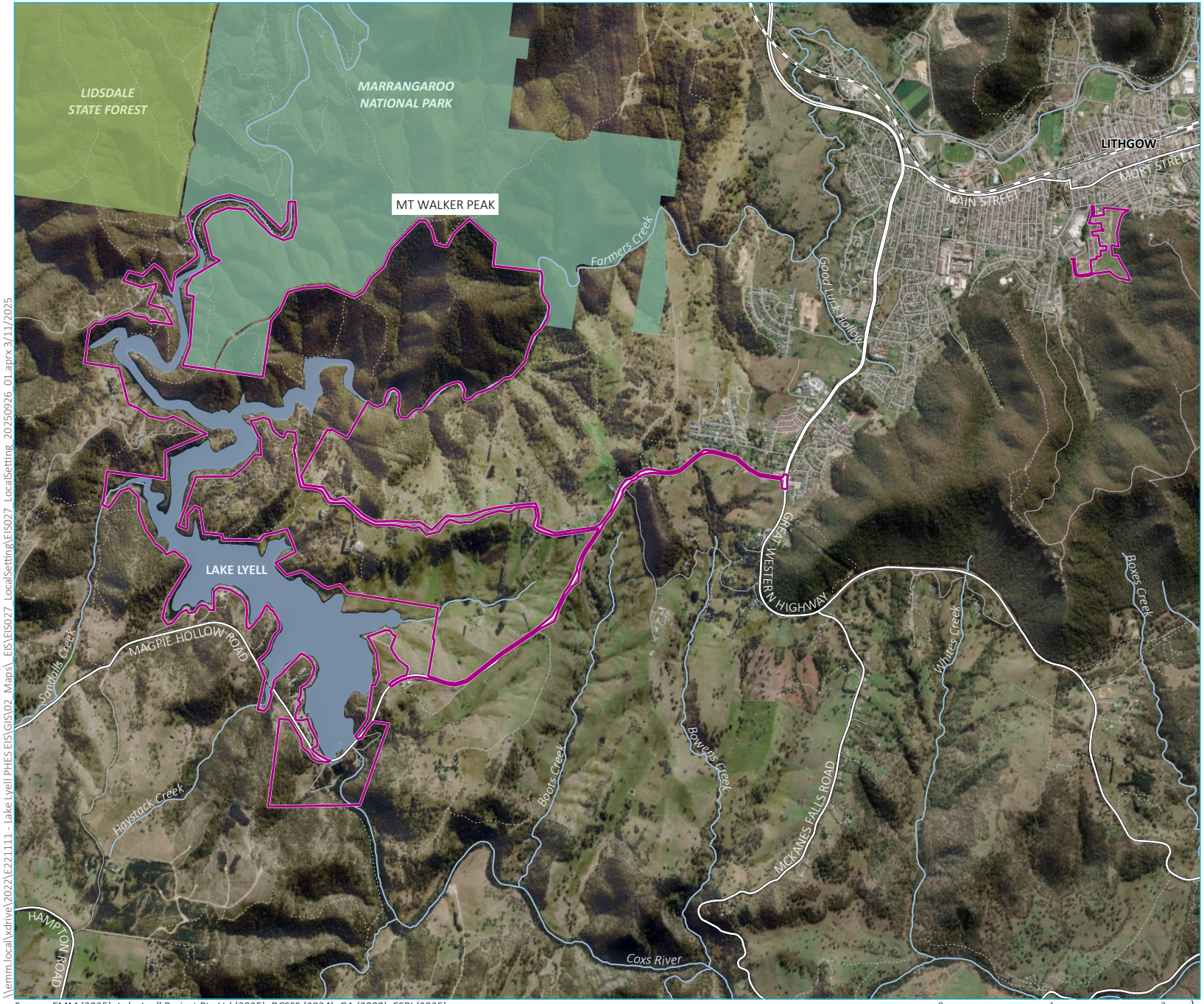

KEY

- Project area

Existing environment

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); ESRI (2025)

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Local setting

Lake Lyell PHES
Environmental Impact Statement
Figure 1.4

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1.2.3 Project objectives

EnergyAustralia has had a longstanding presence in the Lithgow region through the operation of Mount Piper power station and the now decommissioned Wallerawang power station. The project provides a unique opportunity to utilise land earmarked for energy generation and re-purpose existing assets (Lake Lyell) to support the transition from coal to cleaner energy, as well as provide energy storage capacity.

The key objectives of the project are to:

- deliver a reliable energy system for the future and contribute to Australia's goal to achieve net zero emissions by 2050
- support a more affordable, secure and diverse NEM for NSW electricity consumers
- plan and design the pumped hydro facility with the aim of avoiding or mitigating environmental impacts wherever possible
- re-purpose existing power generation assets for long term support of NSW energy storage needs while ensuring the project can coexist with lake users and can create wider benefits for the Lithgow community.

The project aims to respond to the need to transition away from coal fired power generation and supports the Commonwealth and NSW Government's plans for the provision of reliable and clean electricity. The nature of the project will synergise effectively with other renewable energy generation technologies such as wind and solar and will compliment other storage technologies such as large-scale batteries.

1.2.4 Project proponent

EnergyAustralia Portfolio Holdings Pty Ltd (EnergyAustralia) in partnership with EDF power solutions Australia (EDFA), referred to as Lake Lyell Project Pty Ltd (LLP) (ACN 688 084 899), as trustee, is the proponent developing the project.

EnergyAustralia Holdings Pty Ltd is an Australian private company specialising in the generation and supply of electricity and gas. EnergyAustralia Holdings Pty Ltd has been operating since 1995 and has been a wholly owned subsidiary of China Light and Power (CLP) Group since 2011. EnergyAustralia is a leading energy generator and retailer, operating energy generation facilities powered by coal, gas and renewables, combined with large-scale storage. EnergyAustralia is committed to the clean energy transition and will be retiring coal fired assets by 2040 in support of this transition.

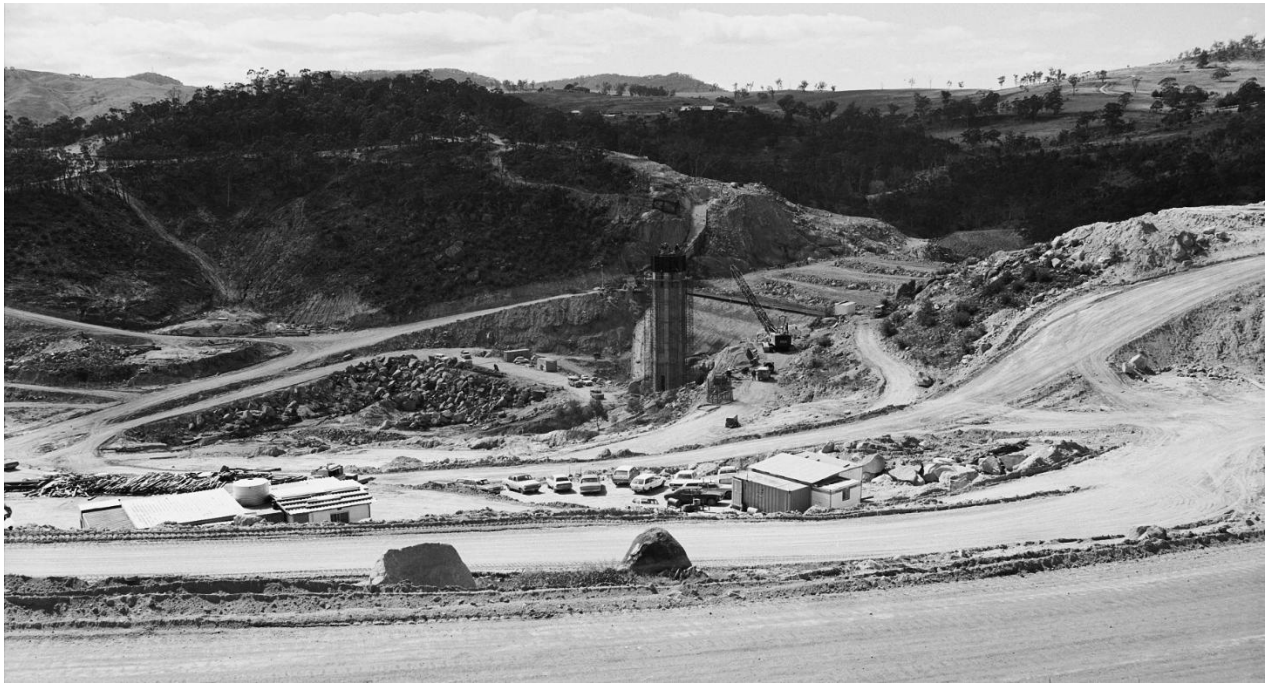
EDF power solutions Australia (EDFA) is an indirect wholly owned subsidiary of Électricité de France SA (EDF), which is 100% owned by the French Government. EDF is one of the world's largest, diversified low-carbon energy producers. EDF develop, own and operate complex, socially impactful, clean energy infrastructure across the energy value chain (including electricity generation, transmission, distribution, storage, energy supply and optimisation, retail/trading, alternative clean fuels and adjacent businesses).

The partnership between EnergyAustralia and EDFA, as LLP, provides extensive local and international experience across the project life cycle.

1.3 Background to the project

1.3.1 History of Lake Lyell and power generation

Lake Lyell is an artificial lake that was created for the purpose of supplying water to the nearby (now decommissioned) Wallerawang and (still operating) Mount Piper coal-fired power stations via the Lilyvale pumping station. The lake formed after the creation of the Lilyvale dam, a 46 m high concrete-face rockfill dam situated on the Coxs River approximately 7 km southwest of Lithgow. The dam itself was constructed in 1981/82 (refer to Photograph 1.1) and subsequently underwent a series of upgrades in the 1990s and early 2000s to increase the capacity of Lake Lyell and to improve the durability and safety of the dam.



Source: Museums of History NSW. State Archives Collection NRS-20347-1-31-13447

Photograph 1.1 Archive photography of Lilyvale dam construction (4 September 1981)

Lake Lyell has been owned by EnergyAustralia since September 2013. The Wallerawang coal-fired power station was decommissioned in 2014, and as such no longer requires water from Lake Lyell. The lake is still used to supply water to the Mount Piper power station; however, this will cease once the Mount Piper power station is retired – this is presently planned for 2040. The lake itself is a popular area for recreation; activities such as boating, kayaking, water-skiing, swimming, camping, and fishing.

EnergyAustralia's ongoing use of water from Lake Lyell is regulated by the NSW Government in accordance with the *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023* as per the *Water Management Act 2000* and EnergyAustralia's water access licence.

1.3.2 Energy market transition

Australia's NEM delivers electricity throughout Australia's east and south – only the Northern Territory and Western Australia lie outside its jurisdiction. Approximately 80% of all electricity consumed in Australia is carried by the NEM; most of which is generated from fuels such as coal, gas and renewable sources, transported through high voltage transmission lines and then stepped down to low voltage electricity for delivery to approximately 10 million Australian homes and businesses.

The Integrated System Plan (ISP) developed by AEMO is a whole-of-system plan that provides an integrated roadmap for the efficient development of the NEM over the next 20 years and beyond. The most recent draft ISP (2026) calls for investment that would triple total generation and storage capacity. Of direct relevance to the project, is the need to increase storage capacity 5-fold from sources alternative to coal that can respond to a dispatch signal, using grid-scale batteries, pumped hydro and other hydro, coordinated consumer energy resources as virtual power plants (VPPs), and gas-powered generation. The draft 2026 ISP forecasts the need for 33 GW of utility storage by 2050, including a requirement for 6 GW of pumped hydro storage.

At a State level, the NSW Government released the *NSW Electricity Strategy* (the Electricity Strategy) and the *NSW Electricity Infrastructure Roadmap* (the Electricity Roadmap) to transform the NSW electricity system from a coal-fired based system to one focused on renewable energy supported by energy storage. The transition is well underway however there is an ongoing and urgent need for medium to large scale generation and storage to provide fast-dispatch energy and firming capacity to the NEM.

In line with the government commitments to retire coal-fired generation plants and transition to more renewable forms of energy generation, LLP is seeking to develop projects that would support this transition.

Mount Piper power station is owned and operated by EnergyAustralia and is likely to be one of the last coal-fired power stations in operation until its planned closure in 2040. Lake Lyell is an associated asset that would no longer be needed for energy generation once Mount Piper closes, therefore creating uncertainty in its ongoing ownership, use and maintenance. EnergyAustralia, through its partnership with EDFA, has a unique opportunity to continue Lake Lyell's purpose for energy generation by supporting a pumped hydro scheme. This would also allow continued public access and recreation on the lake for the long term.

1.3.3 Avoiding and minimising impacts

LLP recognises that there is a need to avoid and minimise environmental and social impacts where possible, in particular given the site's proximity to Marangaroo National Park and the Lithgow urban area.

The project was announced in 2021 and included an initial concept for the upper reservoir to sit atop the southern ridge of Mount Walker. While the concept provided a feasible engineering design, detailed environmental assessment and community feedback was yet to be considered. Since this time, further site investigations and a community and stakeholder engagement program have been carried out to provide input to the design of the project and reduce the overall impacts of its construction and operation.

A key decision in this process was re-siting the upper reservoir location to below the southern ridge of Mount Walker. This decision was in direct response to community feedback and to avoid and minimise the significant visual impacts that would have otherwise resulted. An ongoing design iteration and environmental assessment process was followed as part of the preparation of the EIS, to continue to avoid and minimise impacts where possible. The project is based on a concept design and therefore it is anticipated that ongoing refinements will also occur as part of the detailed design. This is discussed further in Section 3.2. The project as presented in this EIS provides the preferred design, balancing design efficiency and constructability, environmental, social and economic impacts.

1.4 Related developments

There are no related developments relevant to the project. All ancillary upgrades needed to facilitate the project's construction and operation have been included in this EIS.

1.5 Purpose of this document

This EIS has been prepared by EMM Consulting Pty Limited (EMM) on behalf of LLP to support the CSSI application for approval of the project under Part 5, Division 5.2 of the EP&A Act. It has been prepared to the form and content requirements set out in clauses Section 190 and 192 of the NSW *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation). It has also been prepared to align with the *State significant infrastructure guidelines - preparing an environmental impact statement* (DPIE 2022) and reviewed by a Registered Environmental Assessment Practitioner (REAP). This EIS has been prepared to address the SEARs and supplementary SEARs. The SEARs and where they have been addressed in this EIS are provided in Appendix A.

1.6 Structure of the EIS

This EIS is structured as follows:

- Chapter 1 – Introduction
- Chapter 2 – Strategic context
- Chapter 3 – Project description
- Chapter 4 – Statutory context
- Chapter 5 – Community and stakeholder engagement
- Chapter 6 to Chapter 17 – description and assessment of environment, social and economic considerations of the project
- Chapter 18 – Cumulative impacts
- Chapter 19 – Environmental risk management
- Chapter 20 – Justification and evaluation of the project
- Appendix A – SEARs compliance table
- Appendix B – Detailed project description (B1) and detailed maps and plans (B2)
- Appendix C – Statutory compliance tables
- Appendix D – Engagement and consultation technical report
- Appendix E – Mitigation measures
- Appendix F to Appendix Y – Technical assessment reports

Chapter 2

Strategic context

Environmental Impact Statement |
Lake Lyell PHES Project

2 Strategic context

The strategic context for the project is presented in this chapter, including relevant Commonwealth and NSW Government plans that underpin the projects need. Key features of the regional and local environment are considered and the potential for cumulative impacts with other developments in the area is established.

2.1 Need for Lake Lyell PHES

The project has been declared CSSI by the Minister. This means it is essential for economic, environmental and social reasons. Consistent with the principles outlined in the '*Declaration of SSI and CSSI- State Significant Infrastructure Guide*', the Minister identified the following key reasons in reaching this determination.

The project would:

- Provide reliable and dispatchable energy when solar or wind are unavailable and contributes to NSW Government's aim to establish a pipeline of up to 3 GW of pumped hydro.
- Take advantage of existing infrastructure associated with Mount Piper power station, offering a lower impact alternative to a greenfield project.
- Inject capital expenditure into the region of around $1 billion and the creation of hundreds of construction and ongoing jobs in regional NSW.
- Assist NSW (and Australia) in meeting its target of net zero emissions by 2050.
- Contribute to the substantial economic and social benefits for NSW that will be delivered by the NSW Government's Electricity Infrastructure Roadmap.

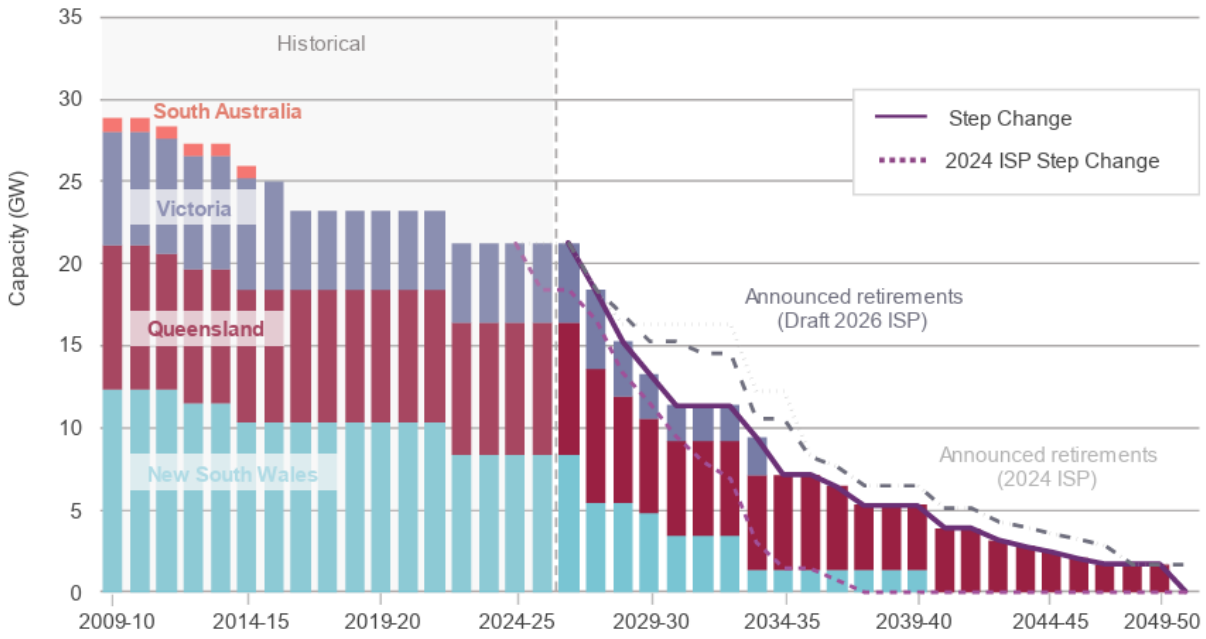
This strategic need for the project is described further in the following sections.

2.1.1 Supporting the energy transition

i Strategic alignment with firming objectives

The NEM is one of the world's largest interconnected power networks, providing electricity throughout Australia's eastern and southern states and is overseen by an independent body, the AEMO. Electricity within the NEM has traditionally been dependent on coal-fired power plants, however the energy transition is well underway with sources of electricity within the NEM set to shift drastically, with variable renewable energy (VRE) technologies and firming technologies set to supplant coal-fired assets.

AEMO's *2024 Integrated System Plan* (2024 ISP) forecasts that under the 'step change' scenario (considered the most likely scenario), '…about 90% of the current 21 gigawatts (GW) of coal capacity would retire by 2034-35, and all before 2040'. Under AEMO's draft 2026 ISP, coal is retained in the NEM until 2049, compared to 2038 under the 2024 ISP, largely reflecting the changing transition priorities in Queensland (refer to Figure 2.1). The draft 2026 ISP idicates that '…about 66% of the NEM's coal fleet would retire by 2035 (more than that announced), with all to retire by 2049. From 2040 only Queensland coal plants would operate, to align with the Queensland Energy Roadmap intention to keep coal in the system for as long as needed or as technically viable'.



Source: AEMO, Draft 2026 ISP

Figure 2.1 Forecast coal capacity within the NEM

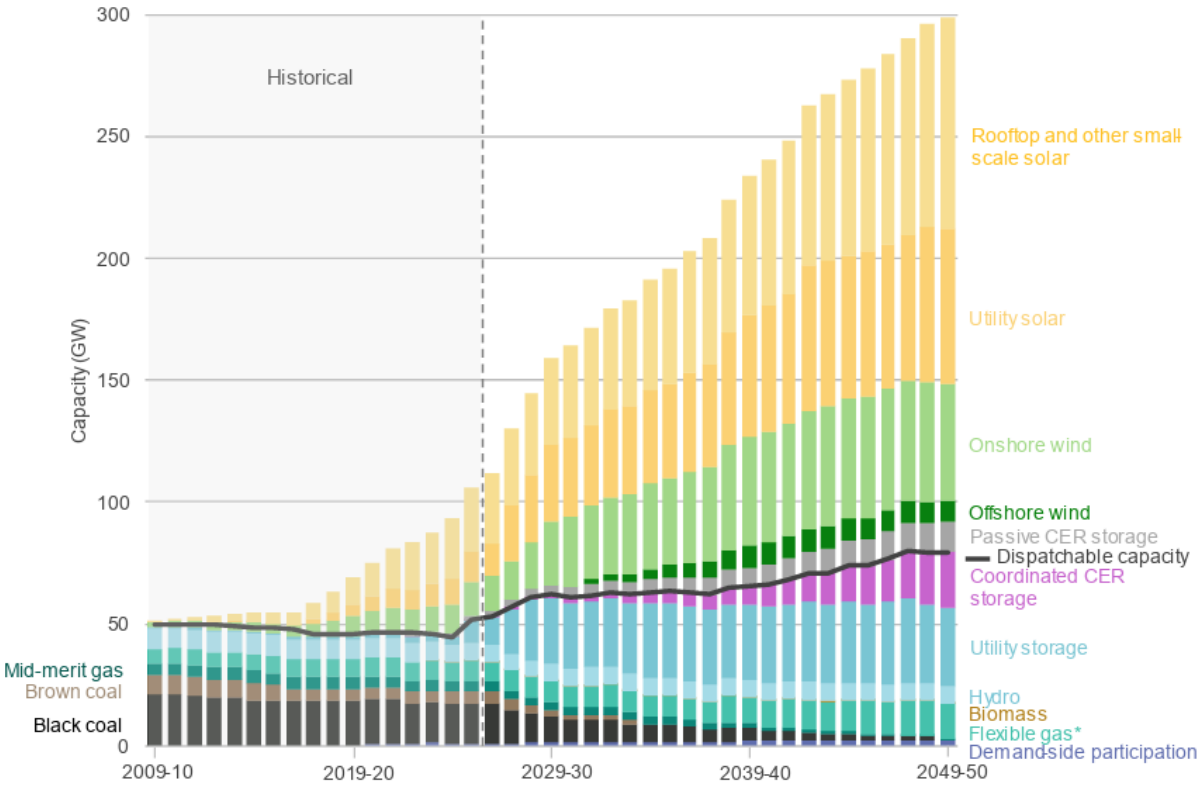
In response to the closure of ageing coal-fired assets, and in recognition of the need for urgent investment in renewable energy, AEMO's 2024 ISP lays out several development paths through which Australia can reach its emissions reductions targets. AEMO has developed an optimal development path (ODP) that outlines the requirements in the NEM through to 2050 in terms of the capacity of new grid-scale generation, firming, storage and transmission. The ODP adopts the 'step change' scenario, a position that is also supported by the draft 2026 ISP, with the forecast NEM capacity through to 2050 shown in Figure 2.2.

Under the step change scenario, both the 2024 ISP and draft 2026 ISP call for investment that would triple total generation and storage capacity. Of direct relevance to the project, is the need to increase storage capacity 5-fold from sources alternative to coal that can respond to a dispatch signal, using grid-scale batteries, pumped hydro and other hydro, coordinated consumer energy resources as virtual power plants (VPPs), and gas-powered generation.

With 120 GW of grid-scale wind and solar needed to replace coal, the NEM is forecast to need 27 GW of dispatchable storage capacity in 2030, rising to 33 GW of dispatchable storage capacity in 2050 (AEMO, draft 2026 ISP), and will require a mix of storage, comprising:

- Consumer-owned storage: behind-the-meter household, business or industrial batteries
- Shallow storage: grid-connected storage to dispatch electricity for less than four hours
- Medium storage: to dispatch electricity for four to 12 hours, including batteries or pumped hydro projects (such as Lake Lyell PHES) which can shift large quantities of electricity to meet evening or morning peaks
- Deep storage: to dispatch electricity for more than 12 hours, to shift energy over weeks or months (such as Snowy 2.0 or the potential Borumba PHES in Queensland).

Pumped hydro projects are particularly well suited to providing medium and deep storage due to the large energy storage potential of water reservoirs. The draft 2026 ISP forecast of 33 GW of utility storage by 2050 includes a requirement for 6 GW of pumped hydro storage.



Source: AEMO, 2026 Draft ISP

Figure 2.2 Forecast NEM capacity under the step change scenario

The NSW Electricity Infrastructure Roadmap (the Roadmap) provides a framework for the development of energy infrastructure in NSW. The Roadmap set a target of 2 GW / 16 GWh of long duration storage capacity to enhance the state's existing energy supply during VRE lulls. Since the release of the Roadmap however, the *Energy Amendment (Long Duration Storage and Investment) Bill 2024* passed in November 2024, which increases the long duration storage target with an additional 12 GWh by 2034, bringing the total to 28 GWh. Approximately 0.6 GW of this target has been secured, with the majority being battery-based solutions, even while battery storage faces scalability challenges for long-duration applications. With the ability to generate at up to 440 MW and to store up to 3,080 MWh, the project would provide meaningful contribution to the remaining capacity needed to meet the Roadmap's objectives.

As the energy market transitions to more VRE generation, PHES plays an important role in both storing VRE when supply is greater than demand to enable a "time shift" in electricity supply, as well as firming the VRE to help maintain grid stability. With construction to occur over 4 to 5 years from late 2026, and operation anticipated from 2031 (refer to Figure 2.3), Lake Lyell PHES is ideally placed to meet the urgent and critical need to deliver 6 GW of pumped hydro storage in support of the energy transition as the NEM moves from coal-fired to VRE technologies.

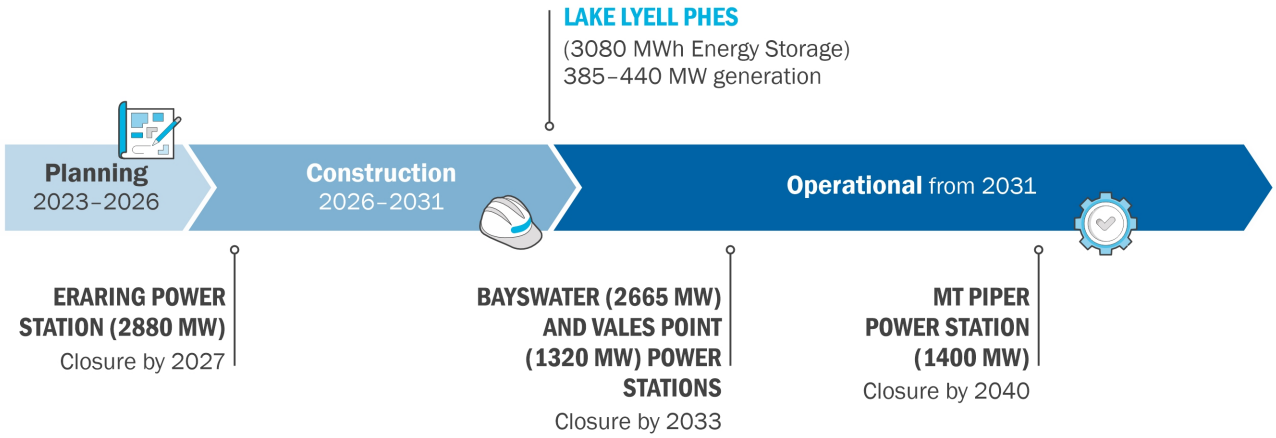


Figure 2.3 Project timeline overview relative to key coal closures in NSW

ii Transmission loading and utilisation

The location of dispatchable generation and pumping load at Lake Lyell and its grid connection will provide significant benefits to firm nearby large-scale intermittent renewables. Utilising latent network capacity made available after the closure of Wallerawang power station, and without increasing congestion (by time shifting renewables supply to smooth it over the daily cycle), this has the effect of significantly increasing the utilisation of existing transmission capacity. This acts as a buffer between the Central-West Orana Renewable Energy Zone (CWO REZ) and major Sydney load and could reduce transmission line loadings and the need for further augmentation.

Furthermore, the location of the project within the broader NSW transmission network acts as an excellent balancing mechanism to manage operational conditions that are often characterised by either very high import from QLD or very high import from VIC/SA. The project's location provides an excellent and quite unique balancing mechanism for power flows and will act to alleviate bottlenecks between the Hunter Valley and Newcastle as well as the Snowy region into Sydney West. Few other connection sites offer this balancing benefit

iii Direct reliability impacts in NSW

AEMO's 2025 Electricity Statement of Opportunities (AEMO, 2025) report and analysis show a growing gap against the reliability standard in NSW from 2030/31 onwards when looking at the committed and anticipated investments scenario. This is when the project is scheduled to be fully operational, and therefore it will provide a direct and material improvement to supply reliability.

Current government forecasts extend only to 2034, yet the energy landscape will continue to evolve rapidly beyond that point. The project facility offers a long-term solution that maintains its storage capacity without progressive degradation compared to Lithium Iron BESS – thereby supporting grid reliability, system strength, and decarbonisation goals well into the future. Its operational flexibility and strategic location will allow it to serve as a dispatchable backbone for NSW's clean energy future, ensuring resilience as the state transitions away from coal and toward a high-renewables grid.

2.1.2 Government policy and legislation context

The project supports, and is supported by, the objectives of a variety of government energy policy and legislation at both the Commonwealth and State levels. An overview of the alignment between the project and these policies is provided in Table 2.1.

Table 2.1 Government policies and legislation relevant to the project

Government plan or policy	Project alignment with policy
International context	
The Paris Agreement *The Paris Agreement* is a legally binding international treaty designed to strengthen international efforts to limit the effects of climate change. It aims to hold the global increase in temperature to below 2 degrees Celsius (^{0}C) above pre-industrial levels. The Paris Agreement has been adopted by 196 countries, including Australia. In June 2022, the Australian Government committed to reduce emissions by 43% on 2005 levels, by 2030. This will put Australia on track to achieve net zero emissions by 2050.	The project will provide medium-duration energy storage services to the NEM and support the transition to a low carbon future. While the project will be a net consumer of energy, the energy storage it provides will enable greater renewable energy penetration into the NEM. The electricity it generates will be reflective of the emissions intensity of electricity generation within the region, and it is anticipated to replace the need for more carbon-intensive sources of electricity; notably coal and gas-fired generation. Hence the implementation of the project will result in decreased carbon emissions from the NEM.
National context	
Commonwealth *Climate Change Act 2022* The *Climate Change Act 2022* (CC Act) mandates the Australian Government's commitment under the Paris Agreement to reduce GHG emissions by 43% on 2005 levels, by 2030.	As stated above, the project will facilitate meeting the objectives of decarbonisation policies by encouraging the uptake of renewable energy technologies and generating electricity in place of carbon-intensive alternatives.
Large-scale Renewable Energy Target The Australian Government Clean Energy Regulator administers the Large-scale Renewable Energy Target (LRET) which incentivises investment in eligible renewable energy power stations. The LRET aims to deliver 33,000 GWh of extra renewable electricity each year.	Pumped hydro-electric power stations, such as the Project, are classified as eligible renewable power station energy sources under the LRET. Hence, electricity that it generates will contribute to the LRET.
2024 ISP and draft 2026 ISP AEMO's 2024 ISP and draft 2026 ISP provide a plan for investment in renewable energy technologies that will enable the Federal Government policies to be realised, notably a 43% decrease in emissions by 2030 and a 100% decrease by 2050. Included in the ISP's optimal development path for the most likely energy transition are the following: • tripling grid-scale variable renewable energy by 2050 • five-fold increase in firming capacity, including adding 33 GW of dispatchable storage (including 6 GW of pumped hydro).	AEMO's ISP highlights the urgency surrounding the need for investment in the generation of renewable energy. The project represents a significant investment in renewable energy that will assist in the accomplishment of the key milestones specified by directly providing firming capacity and supporting further introduction of renewable energy projects into the NEM.
State context	
NSW Electricity Strategy The Electricity Strategy is the NSW Government's plan for a reliable, affordable, and sustainable electricity future that supports a growing economy. Developed at a time when four of NSW's five remaining coal-fired generators were scheduled to close by 2033, the strategy outlines a reliable energy system	The project will support the development of renewable energy projects in the nearby CWO REZ. In turn, the CWO REZ will play a key role in providing the secure supply of renewable energy needed for NSW's energy transition. The large amount of energy storage to be made available by the project will also contribute directly to the objectives of the strategy by applying downward pressure to electricity prices during periods of high demand, and by providing highly flexible generation.

Government plan or policy	Project alignment with policy
which meets NSW's energy requirements and emission reduction targets. The Electricity Strategy includes three layers: 1. supporting the market to deliver reliable electricity at the lowest price, while protecting the environment 2. setting an Energy Security Target (EST) to ensure NSW has enough generation capacity to cope with unexpected generator outages during periods of peak demand, such as heatwaves 3. ensuring the NSW Government has sufficient powers to deal with an electricity emergency if one arises. The Electricity Strategy, together with the Electricity Roadmap and its enabling legislation the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) supports the rolling out of renewable energy zones (REZs).	
NSW Electricity Infrastructure Roadmap The Electricity Roadmap builds on the Electricity Strategy and is the NSW Government's plan to transform the electricity system into one that is cheap, reliable and clean. The Electricity Roadmap coordinates investment in transmission, generation, storage and firming infrastructure as ageing coal-fired generation plants retire. The Electricity Roadmap includes actions that will deliver 'whole-of system' benefits. These include: • a plan to deliver the State's first five REZs in the Central-West Orana, New England, South-West, Hunter-Central Coast, and Illawarra regions • a Transmission Acceleration Facility to fast-track the delivery of critical transmission infrastructure • commitment to further funding to pumped hydro projects and the *Pumped Hydro Recoverable Grants Program*. To achieve the needed energy reliability, the Electricity Roadmap draws on AEMO's projection of approximately 2.3 GW of long duration storage required in NSW over and above the 2 GW from the Snowy 2.0 Project. Pumped hydro energy storage is the primary source of long duration energy storage globally and is able to provide the bulk energy time shifting when needed.	The large capacity and flexible generation of the project will allow it to operate effectively alongside the energy generation of renewable energy technologies located within the CWO REZ and to stabilise their generation profile. It will smooth out peaks and troughs in both supply and demand for electricity by pumping water to the upper reservoir when intermittent renewable energy output is high, and by providing quick-start electricity generation when renewable energy output is low and when demand is high. Also, the construction required by the project primarily comprises civil works. For this reason, the project will provide a significant number of local employment opportunities. In 2022, EnergyAustralia was awarded funding as part of the New South Wales Government's Pumped Hydro Recoverable Grants program. The $50 million Pumped Hydro Recoverable Grants Program is a key action in the NSW Government's Electricity Infrastructure Roadmap.
NSW Energy Security Target and Safeguard The objective of the *NSW Energy Security Target* (DPIE 2020) is to give the market certainty about how much new electricity is needed to deliver a reliable energy system over the medium to long term, in light of the retirement of several large coal-fired generators. The *NSW Energy Security Target* is established under the EII Act. The latest Energy Security Target Monitor report (AEMO, 2023) forecasts an Energy Security Target (EST) breach from 2025–26 onwards following the potential early retirement of Eraring Power Station. This signals the critical and urgent need for new generation and transmission infrastructure to ensure energy security for NSW consumers.	The scale of the project is sufficiently large for it to make a significant positive impact on the ongoing energy reliability and security of NSW. Based on the target breach identified in the latest AEMO's Energy Security Monitor Report, the project will provide essential resilience and energy security for NSW consumers. It will support the transition in the NEM away from coal-fired generation.

Government plan or policy	Project alignment with policy
NSW Climate Change Policy Framework The *NSW Climate Change Policy Framework* (the Framework) defines the NSW Government's role in reducing carbon emissions and adapting to the impacts of climate change. It commits NSW to achieving net zero emissions by 2050 and sets policy directions to help guide implementation of the Framework.	The project will contribute to the overall reduction of carbon emissions in NSW, aiding NSW in achieving its objective of net-zero emissions by 2050.
Net Zero Plan Stage 1: 2020–2030 Following on from the Framework, the *Net Zero Plan Stage 1 2020–2030* (DPIE 2020) is the foundation for NSW action on climate change. It outlines the NSW Government's plan to grow the economy and create jobs while helping the state to deliver a 50% cut in emissions compared to 2005 levels. The implementation of the Net Zero Plan, together with the Electricity Roadmap, will result in more than 9,000 jobs and up to $37B in private investment, the majority of which is expected to be delivered across regional NSW.	Four priorities are identified within the Net Zero Plan Stage 1, the first of which is to "drive uptake of proven emissions reduction technologies that grow the economy, create new jobs or reduce the cost of living". The project contributes directly to this objective. The Economic Assessment (appended to the EIS) contains an in-depth discussion of the economic impacts of the project and the benefits to the local and regional economies.
Pumped Hydro Roadmap and Handbook The Pumped Hydro Roadmap, completed in late 2018, sets out actions aimed towards encouraging and promoting increased pumped hydro energy storage across NSW. The key actions of the roadmap include: • bringing forward private investment by opening state-owned water infrastructure and supporting the commercialisation of new, large scale, on-demand electricity projects • mapping the landscape for pumped hydro energy storage • providing guidance on the regulatory process for large-scale hydro energy projects.	As a proposed pumped hydro project, the project is directly aligned with the objectives of the *Pumped Hydro Roadmap.*
Regional and local context	
Central West and Orana Regional Plan 2041 The *Central West and Orana Regional Plan 2041* (DPE 2022) establishes a 20-year land use plan with a focus on the first five years of the period. Supporting the State's transition to net-zero carbon emissions and delivering the CWO REZ comprises Objective 2 of the plan, which the project is directly relevant to.	The project is closely aligned with Objective 2, as its energy storage supports the proposed renewable projects within the CWO REZ while also facilitating the decarbonisation of the State.
Our Place Our Future, the Lithgow City Council Community Strategic Plan 2035 Key areas identified in the *Lithgow City Council Community Strategic Plan* include furthering economic development, attracting additional job opportunities and contributing to the localised shift towards net zero for current and future generations.	The significant construction involved in the creation of the project has the potential to provide numerous local job opportunities and indirect economic benefits to the community as outlined in the Economic Assessment (appended to the EIS).

Government plan or policy	Project alignment with policy
Lithgow 2040 Local Strategic Planning Statement Key themes identified in the Statement include infrastructure, the economy, the environment, and liveability.	The specified goals of Lithgow City Council will be supported by the project through the following means: • by delivering new renewable energy infrastructure • by providing employment opportunities for local people • by contributing to the local economy, both directly and indirectly. Areas adjacent to the project area have been identified as having high environmental significance. Ecological impacts have been minimised wherever possible. A biodiversity development assessment report and a water resources impact assessment have been prepared for the project and are appended to the EIS.

2.1.3 Project justification and benefits

PHES currently supplies about 95% of all existing energy storage worldwide (CSIRO, 2023). It is noted that PHES developments have topographic and water requirements and often require a large development footprint. However, a PHES in the location such as the project, capitalises on a unique opportunity with direct access to an existing reservoir and existing high voltage transmission line to minimise impacts (discussed further in Section 2.3).

The project will utilise existing land and assets used for power generation and transmission and aligns with key government strategy and policy in supporting the transition of the energy market to renewable and low carbon alternatives. The project has a lifespan of over 80 years, with no reduction in storage or generation capacity. Without the project, the opportunity to re-purpose existing assets would be lost, and the future management of Lake Lyell uncertain. Other medium storage projects will be required to support the stability of the NEM, and at present, there are insufficient projects in development that would satisfy the targets set by AEMO. Detailed consideration of options and alternatives, including the project not proceeding, is provided in Section 2.3.

The project will provide immediate and long-term benefits to the regional and local community through:

- reliable, renewable energy generation and storage – the project will store large volumes of energy which will be available for generation when other renewables aren't available (such as solar). It also provides much-needed grid and system stability for NSW and the NEM
- security of the operation of Lake Lyell – by incorporating the project, the purpose of Lake Lyell remains available for energy generation and will also continue to be available for broad public recreation purposes. The project will ensure water entitlements required for maintaining the level of Lake Lyell are held beyond the operation and subsequent closure of the coal-fired Mount Piper power station
- job creation and training opportunities – the construction of the project will create over 600 jobs and create opportunities for training of the local workforce. These skills can then be utilised long term to support other development in the region
- community benefits sharing – if the project proceeds, a range of community benefits can be funded such as recreational improvements on Lake Lyell and other infrastructure or activities, to be identified and co-designed by the community and LLP.

2.2 Regional and local environment

2.2.1 Lithgow LGA and the regional area

Situated within the City of Lithgow local government area (Lithgow LGA), the project is located on the western edge of the Blue Mountains in the Central Tablelands region of NSW. Lithgow is about a 2 hours' drive from Sydney.

i Lithgow urban area

The city of Lithgow is the nearest population centre to the project area. Located approximately 110 km north-west of Sydney and home to approximately 21,000 people, Lithgow has a heritage that is closely tied to heavy industry. The closest residential area to the project area is the suburb of Bowenfels, situated approximately 2.5 km east of the project's boundary. Population growth in Lithgow was historically driven by nearby underground and open cut coal mining and steel production activities. These have historically formed the basis of Lithgow's economic profile, along with manufacturing and electricity generation.

Today, Lithgow's economy is less reliant on heavy industry. Industrial activities continue to be economically significant; however, the commercial character of the city has diversified to include a greater focus on the tourism, retail, and services industries. This has been partially driven by the environmental and cultural heritage sites which Lithgow is proximate to. The Greater Blue Mountains World Heritage Area, Jenolan Caves and Zig Zag Railway are examples of attractions which draw tourists to the surrounding region.

Source: EnergyAustralia, 2025

Photograph 2.1 Aerial view of Lithgow urban area

ii Land use and community

Covering an area of 4,550 square kilometres (km^2), the Lithgow LGA is spread over several towns such as Lithgow, Portland, Wallerawang, and Bowenfels among others (.idcommunity, 2023). The region is predominately rural, with nearly two-thirds of Lithgow LGA being National park or State forest. In Lithgow LGA, the rural land is mainly used for farming, grazing, and mining, in particular, underground coal mining. However, there are rural-residential and residential areas in several townships as well as some industrial land use.

Coal mining is the largest employment industry for the region and the local area (about 6.9% of the workforce within the LGA and higher within the local area). The Lithgow City Council's Community Strategic Plan (CSP) identified the region as "previously perceived to be an inland mining and industrial centre", however the area has been recognised as an important tourism destination, heritage centre and a desirable residential area due to recent developments (Lithgow City Council, 2022a).

The Lithgow LGA falls into the Blue Mountains tourism region. In the Blue Mountains tourism region, tourism contributes $287 million (7.4%) to the economy, with food services being the largest contributing sector (25.0%). Furthermore, tourism accounted for 11.3% of the Blue Mountain's workforce, with 55.0% of tourism-related businesses in the Blue Mountains region employing staff (TRA, 2021).

iii Renewable energy zones

Mount Piper is a coal-fired power station and is the dominant large scale energy generator in the region. In line with the transition of the NEM, Mount Piper power station is scheduled to cease operating by 2040 and other, new VRE projects are in planning and development.

The NSW Government has established REZs to group new VRE projects into locations where energy can be efficiently stored and transmitted across NSW (refer to Figure 2.4). Whilst the project is outside of the proposed REZs, it is strategically located (as shown previously in Figure 1.3) to utilise existing 330 kV transmission infrastructure that passes through the project area and to take advantage of the proximity to key distribution infrastructure associated with Mount Piper power station (approximately 10 km north) and the decommissioned Wallerawang power station site nearby. This allows the project to provide storage and network services in support of development of VRE infrastructure within the REZs, in particular the Central West Orana REZ located approximately 80 km to the north-west.

Source: EnergyCo, 2024

Figure 2.4 Renewable Energy Zones and project's strategic regional location

2.2.2 Lake Lyell and surrounding area

The project is located around the northern shores of Lake Lyell, on land characterised by steep gradients. The project area is situated wholly within the Lithgow LGA, as shown in Figure 1.3. The project area is zoned under the *Lithgow Local Environmental Plan 2014* (refer to Figure 2.5) as SP2 Electricity Generating Works, RU1 Primary Production and RU2 Rural Landscape. Marrangaroo National Park, which the project area is situated immediately to the south of, is classified as C1 National Parks and Nature Reserves. Some areas around the foreshore of Lake Lyell are classified as RE1 Public Recreation, as the lake is a popular location for various water sports. One option is to use a temporary workers accommodation on land zoned SP2 Electricity Generating Works adjacent to Lake Lyell. An alternative option is a town accommodation camp located on land classified as R1 General Residential and MU1 Mixed Use. The key features of the project area that could be affected by the project are discussed below.

i Marrangaroo National Park

Marrangaroo National Park lies directly to the north of the project area, covering an area of approximately 1,670 hectares (ha). The woodland forest within the National park has high potential for containing native fauna and flora – though few formal surveys have been undertaken. The National park does not include Lake Lyell, but includes the Coxs River and an upstream section of Farmers Creek. The area is also enjoyed for recreation and tourism. Popular activities undertaken in the National park include swimming, camping, fishing, wildlife watching, mountain biking, four-wheel driving, bushwalking, canoeing and kayaking.

The statement of management intent (Office of Environment and Heritage, 2014) also lists potential Aboriginal heritage value, the scenic quality of Mount Walker, and the water catchments of Farmers Creek and the Coxs River as key values of the National park.

ii Lake Lyell

Lake Lyell is wholly within the project area and is owned and managed by EnergyAustralia. The lake itself is artificially made, with a capacity of 32.1 GL when full and a catchment area of 380 km^2. Originally created for the purpose of providing cooling water for coal-fired power stations, it is now also widely enjoyed for public recreational activities. Water from Lake Lyell will no longer be needed to supply power stations once the Mount Piper power station is retired – which is currently planned for 2040. Popular recreational activities undertaken in and around Lake Lyell include:

- Fishing – the lake is stocked with several fish species, making it popular with anglers. Approximately 25,000 fish were stocked in 2023/24, including 20,000 Australian bass and smaller numbers of rainbow and brown trout
- Boating, swimming and water sports – the large size of the lake, warm climate during summer months, and picturesque scenery makes it suitable for activities such as water skiing, kayaking, canoeing and others
- Camping and picnicking – designated camping areas and basic facilities are present on the foreshore of Lake Lyell, which people often utilise for day trips and overnight stays.

Lake Lyell is fed by the Coxs River, located to the west of the project area, and Farmers Creek, which lies to the east of the project area. The Farmers Creek arm of Lake Lyell lies within the project area.

The presence of Lake Lyell within the project area will allow it to be used as the lower reservoir during pumped hydro operations. This will prevent the need for significant amounts of construction and environmental impacts that would otherwise be associated with the construction of a second reservoir.

Source: EnergyAustralia, 2025

Photograph 2.2 Aerial view of Lake Lyell towards Mount Walker and the project site

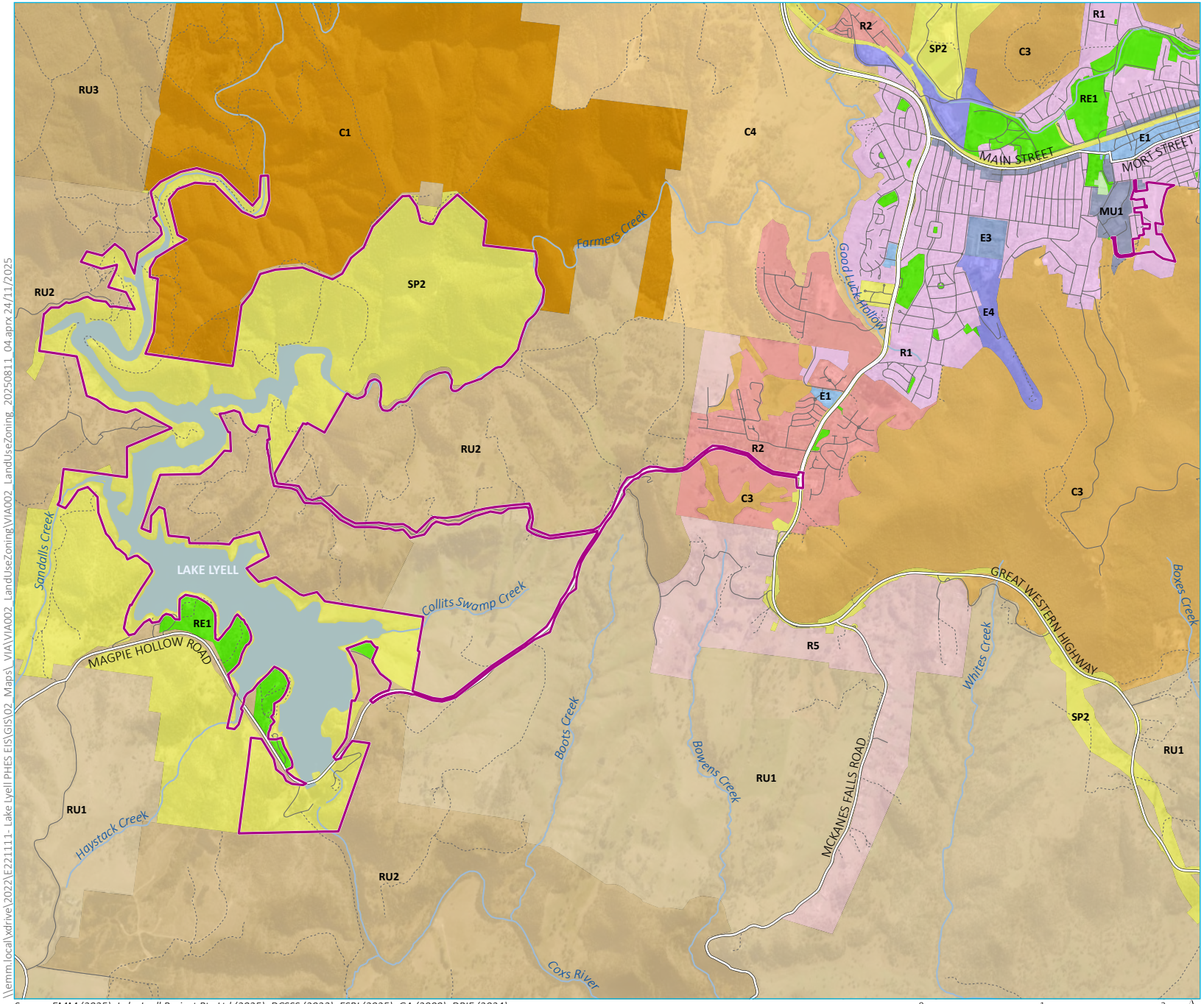
iii Nearby infrastructure

The presence of nearby infrastructure is one of the driving factors for the selection of the project site. Established transportation and electrical transmission infrastructure is of particular importance.

The Great Western Highway is a major transportation route which extends from Sydney to Bathurst and passes close to the project area. It lies approximately 5 km east of the project area and is well equipped to carry the volumes of both light and heavy vehicles which would be necessary for the construction of a large-scale infrastructure project such as Lake Lyell PHES. The proximity of the Great Western Highway prevents the need for the construction of extensive new transportation infrastructure.

Similarly, useful electrical transmission infrastructure is also already established around the project area. Notably, a 330 kV transmission line passes directly through the project area which is presently used to connect Mount Piper power station to the NEM. As a major producer of electricity, Mount Piper power station requires high-capacity transmission lines to effectively carry large amounts of electrical energy while minimizing losses – these features are also required for power lines carrying electricity to/from a large-scale PHES system such as the project. These existing power lines are intended to be utilised by the project – thereby negating the need to construct additional transmission infrastructure, which would cause considerable environmental and visual impacts.

The presence of such existing infrastructure in close proximity to the project area offers a crucial opportunity to reduce the environmental and social impacts of the project. Utilising these existing transportation and electrical transmission paths, as well as using Lake Lyell as the project's lower reservoir, will minimise disruption to the local community and significantly reduce the project's construction timeframe.



KEY

- Project area

Land zone

- C1- National Parks and Nature Reserves
- C3- Environmental Management
- C4- Environmental Living
- E1- Local Centre
- E3- Productivity Support
- E4- General Industrial
- MU1- Mixed Use
- R1- General Residential
- R2- Low Density Residential
- R5- Large Lot Residential
- RE1- Public Recreation
- RE2- Private Recreation
- RU1- Primary Production
- RU2- Rural Landscape
- RU3- Forestry
- SP2- Infrastructure

Existing environment

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

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009); DPIE (2024)

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N

Land zoning of the project area

Lake Lyell PHES
Environmental Impact Statement
Figure 2.5

EMM
creating opportunities

2.3 Alternatives and options considered

2.3.1 Site selection

The intended project site was selected as a result of analysis of the attributes present within it. These attributes include:

- the presence of Lake Lyell, which can readily be repurposed from providing water to coal-fired power stations to storing water for a PHES project
- a satisfactory height differential between Lake Lyell and the upper reservoir to provide for pumped hydro energy generation
- a small distance between Lake Lyell and Mount Walker, reducing the length of tunnels that would be required
- the presence of Line 76/77 Sydney South – Wallerawang – Ingleburn; an existing 330 kV electricity transmission line that passes through the south of the project area
- favourable terrain and geological characteristics within the project area
- a short distance between the project and the Great Western Highway for the delivery of materials to site
- a short distance to an existing urban centre (Lithgow) and workforce opportunity
- compatible land usage in the project area and the surrounding area
- high water security with Lake Lyell integrated with Coxs river catchment and the off-river storage of Thompsons Creek Reservoir.

These factors combine to create an area which is highly suitable for the construction of a PHES scheme. A significant portion of the infrastructure necessary to enable the operation of a pumped hydro project is already present, and there are clear pathways through which the remaining infrastructure can be constructed. For this reason, the project site has been concluded to be uniquely suited to its proposed purpose.

2.3.2 Design options considered

Design optioneering and iteration has been key in developing the concept design for the project as presented in Chapter 3. Key design options considered and why they were progressed, or not, is described in Table 2.2.

Table 2.2 Design options and alternatives considered

Design aspect	Description of options considered	Assessment outcome
Powerhouse and tunnels arrangement	• Above ground powerhouse – at multiple positions, including both elevated locations or at lake level • Below ground powerhouse • Dual tunnel arrangement (2x tailrace and 2x headrace tunnels) • Single tunnel arrangement • Various tunnel sizing	A below ground powerhouse reduces visual impacts and environmental impacts (reduces vegetation clearing and ground disturbance compared to above ground options) A single, optimised tunnel arrangement is able to achieve the required generation capacity while minimising tunnelling and spoil generation (and therefore also reducing cost and environmental impacts) compared to a dual tunnel arrangement.

Design aspect	Description of options considered	Assessment outcome
Upper reservoir dam	• Rockfill dam • Concrete dam • Alternative siting and sizing arrangements	A rockfill dam provides the ability for re-use of a significant volume of material excavated for the reservoir while maintaining engineering integrity and stability. The rockfill dam provides reduced embedded energy. Located to maximise the gravitational energy, balancing elevation with spoil movements whilst nesting within the natural valley on the south of Mount Walker.
Diversion of Farmers Creek arm of Lake Lyell	• No diversion • Tunnel diversion • Open diversion • Open diversion with fall grade considerate of fish and platypus passage	A diversion protects the inlet structure from flood events and debris. An open diversion provides greater opportunity of managing fish and aquatic fauna entrainment (by providing an alternative fish passage). The open diversion allows peak flood events to pass by, away from the lower inlet/outlet.
Lower inlet	• Low velocity inlet (larger infrastructure) vs higher velocity inlet (smaller infrastructure) • Fish screen vs no fish screen	An inlet design with water velocity up to 1.5 metres per second (m/s) provides an optimum balance between engineering efficiency and environmental management. With the absence of threatened or native fish, a fish screen is not considered necessary as the infrastructure and earthworks needed to incorporate a fish screen would be orders of magnitude larger and on balance, would result in a greater environmental impact. Other mitigation measures will be included to reduce risk of entrainment (such as floating boom) and a re-stocking program.
Switchyard	• Single circuit cut in on line 76 vs dual circuit turn in off lines 76 and 77 • Buried vs overhead transmission from the switchyard to the machine hall • On the infill pad area vs on the switchyard pad area	The single circuit turn in provided a similar system benefit, lower cost and less complex maintenance. Buried cables reduces visual impacts. The undulating site required flat areas for the construction laydown area, the switchyard pad area allows this dual use.
Spoil management	• On-site spoil disposal (100% re-use) • Offsite spoil disposal (up to 25%)	Ideally all spoil generated on site would be contained on site. However, it cannot be assumed that the quantity and quality of excavated material will allow this. Although up to 75% of spoil was proposed to be re-used on site, this would have generated a significant peak in construction traffic for offsite disposal that was not reasonable or feasible to be managed. Further engineering and optimisation was completed and reduced the amount of spoil requiring offsite disposal to less than 10%, significantly reducing offsite traffic impacts.
Site access (roads, bridges and jetties)	• Several road alignments with different cut/fill requirements • Additional temporary and permanent bridges • No water access jetties	Entry off Sir Thomas Mitchell Drive allow a Transgrid conforming connection to the switchyard. The diversion channel allows the bridge to be built in the dry and then the diversion to be mined out from under it which improves construction safety and reduces works in the bed of the Farmers Creek arm of Lake Lyell. The northern haul road and steep haul road section winds up the valley and face of the ridge to maintain a steady grade to meet haulage vehicle requirements.

Design aspect	Description of options considered	Assessment outcome
External/offsite infrastructure	• Road and intersection upgrades • Offsite laydown areas • Accommodation camp siting and sizing arrangements	Making the dominate route from the project site to highway reduces vehicle noise from breaking. From an engineering perspective, both accommodation options are considered feasible. As such, both options are presented in the EIS to allow community feedback to inform a final decision by LLP on which option to proceed with.
Construction methods	• Tunnelling options – drill and blast, tunnel boring • Raised bore and reem vs sunk shaft • Local coffer dams vs adding the diversion channel and coffer dams across the Farmers Creek arm • Lowering the lake for construction	Drill and blast tunnelling provides the most robust and adaptable construction method. Given the length, tunnel boring machine (TBM) mobilisation is not cost effective. Raised bore and reem seen are more efficient. Lowering the water level allows construction of the coffer dams from the dry land, reducing turbidity and lake disturbance risk and improving construction safety. The coffer dams allow the lower inlet/outlet to be constructed from dry land. Allows access to the site via the bed of farmers creek, reduces the coffer dam wall height, allows simpler construction methods for the coffer dam.

2.3.3 Alternatives to the project considered

Alternatives to proceeding with the project include the investigation and development of:

- other PHES sites that could provide medium to large generation and storage capacity to the NEM
- alternative energy generation and alternative storage technologies, such as wind, solar and batteries
- a “do-nothing” option where LLP does not proceed with the project.

i Alternative project sites

While there are other reservoirs within the Lithgow region (such as Lake Wallace and Thompsons Creek reservoirs), Lake Lyell is the only existing reservoir with surrounding suitable topography close enough to the reservoir that would allow for a technically and economically feasible PHES scheme. Alternative project sites and upper reservoir locations were explored during the feasibility and scoping phases of the project, as documented in the project’s Scoping Report (EMM, 2023). This included a review of an Australian National University (ANU) study (2017) where several PHES sites were identified across Australia and in the Central West region. Lake Lyell was not listed as a site in the ANU study. However, a recent review of the database noted many bluefield sites that were excluded due to their proximity to State or National parks may be feasible with sensitive development and may be very good PHES sites (GHD, 2025). It also noted that many of the sites listed may not be feasible as screening has not considered site-specific aspects such as availability of water, land zoning and ownership- all of which are favourable for PHES at Lake Lyell.

Above all alternatives, Lake Lyell provides the most unique opportunity for the project given the lake and surrounding land are owned by EnergyAustralia, and both suitably zoned for electricity generation, as well as containing or within proximity to key existing infrastructure needed to support a PHES (i.e. existing lower reservoir, high voltage transmission line, and site access).

ii Alternatives to PHES

A report prepared by CSIRO (2023) reviewed technology maturity and options for renewable energy storage in Australia to support sustainable progress towards net zero emissions. It describes how each renewable energy technology has its own benefits and limitations, and the locational context of a given storage system can affect the risk and cost of its development. Pumped hydro has topographical and water requirements, long construction times, and often a large development footprint by comparison to other technologies. However, pumped hydro provides a large opportunity to reduce cost per kilowatt and has low reliance on critical minerals when compared to utility scale batteries, and provides a longer operating timespan.

LLP realises that other alternatives are needed in addition to pumped hydro and not instead of. This aligns with the ISP and other plans previously discussed in Section 2.1, which highlights the need for increased grid-scale VRE as well as increased firming capacity from dispatchable sources such as pumped hydro and utility scale storage. As such, the project is part of a portfolio of flexible capacity projects being developed by EnergyAustralia and EDFA to deliver a reliable energy system for the future and support the Australian energy market to achieve net zero emissions by 2050.

Other projects supported or being developed by EnergyAustralia include battery projects at Riverina and Darlington Point in partnership with Edify Energy, the Wooreen battery at Jeeralang in Victoria, and the Mount Piper battery in the Central West of NSW. Other projects supported or being developed by EDFA in NSW include the Dungowan Pumped Hydro Energy Storage project, Nottingham Park Solar Farm and Yarrowyck Wind Farm.

Solar and wind power and energy storage systems such as batteries and pumped hydro work together to provide reliable energy year-round. While solar and wind may provide improving MW generation capacity, they do not offer storage capabilities. Large-scale batteries do have a role in the NEM, particularly for services such as frequency control. However, they suffer from prohibitive costs when it comes to delivering the same products and services that the project offers and require replacement over the same timeframe.

iii Do-nothing alternative

The option to not proceed with the project in any form has been considered. This option would result in forgoing numerous potential project benefits, resulting in:

- a lost opportunity to contribute to State and Commonwealth emissions reductions policies and commitments for a more affordable, secure and diverse NEM
- the loss of crucial medium-duration energy storage, leading to reduced energy security for NSW electricity consumers
- uncertainty in the ongoing, long-term use of Lake Lyell. On closure of Mount Piper power station the inherent ownership, management, and maintenance of Lake Lyell would likely also end
- the loss of the direct and indirect economic benefits that would arise from the project, including numerous employment opportunities and increased demand for local goods and services.

The failure to realise these potential benefits would have a detrimental impact on the proposed governmental climate change targets, the NEM and its users, the local economy, and would neglect a project that has been determined by the NSW Minister for Planning to be critical for the State for economic, environmental and social reasons.

Not proceeding with the project would prevent the direct negative environmental impacts that the project will incur if it proceeds. The project's construction will result in vegetation clearing, habitat loss, dust and noise generation, visual alterations and traffic impacts. Most of these impacts will not extend beyond the project's construction phase however, and as such are not anticipated to result in substantial adverse impacts to the environment or the local community over the medium and long term.

Ultimately, the project has the potential to deliver considerable benefits if it proceeds. It is for this reason that the do-nothing approach is not favoured, as a holistic assessment of economic, environmental, and social outcomes indicates that it can deliver considerable positive outcomes. Further evaluation of the project's justification is provided in Chapter 20.

2.4 Cumulative impacts

The project is located in Lithgow LGA, near the outskirts of Western Sydney and the Blue Mountains. Cumulative impacts arising from the project and other developments within the region have been assessed in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2022). These impacts are addressed in Chapter 18.

2.5 Agreements with other parties

At the time of this EIS, LLP has not entered into any agreements with other parties to mitigate or offset the impacts of the project. However, LLP has developed a framework to guide the agreement and implementation of mitigation measures for specific landowners that will be most impacted by the project –referred to as the Neighbour Agreement Guide. More information on near neighbour engagement and the Neighbour Agreement Guide is provided in Chapter 5 and Appendix D.

Chapter 3

Project description

Environmental Impact Statement |
Lake Lyell PHES Project

3 Project description

This chapter presents a summary description of the project. A detailed description of the project that forms the basis for the environmental impact assessment undertaken is provided at Appendix B.1, and should be read with the supporting detailed maps and plans provided at Appendix B.2.

3.1 Project overview

The project is intended to act as an energy storage system, storing electrical energy from the grid as gravitational potential energy by pumping water from the lower reservoir to the elevated upper reservoir, before releasing from the upper reservoir back to the lower reservoir converting the water's kinetic energy back to electrical energy. Underground tunnels will carry the water between the reservoirs via an underground powerhouse which will house equipment that will operate as a water pump or an electricity generator. Lake Lyell itself will act as the lower reservoir.

The project will have the capacity to store up to 3,080 MWh of energy and generate at 385 MW for 8 hours or up to 440 MW for a shorter period. It will be connected to the electricity grid via an existing 330 kV transmission line which passes through the project area. Construction of the project is anticipated to take around four to five years and the operational life of the project will be approximately 80 to 100 years.

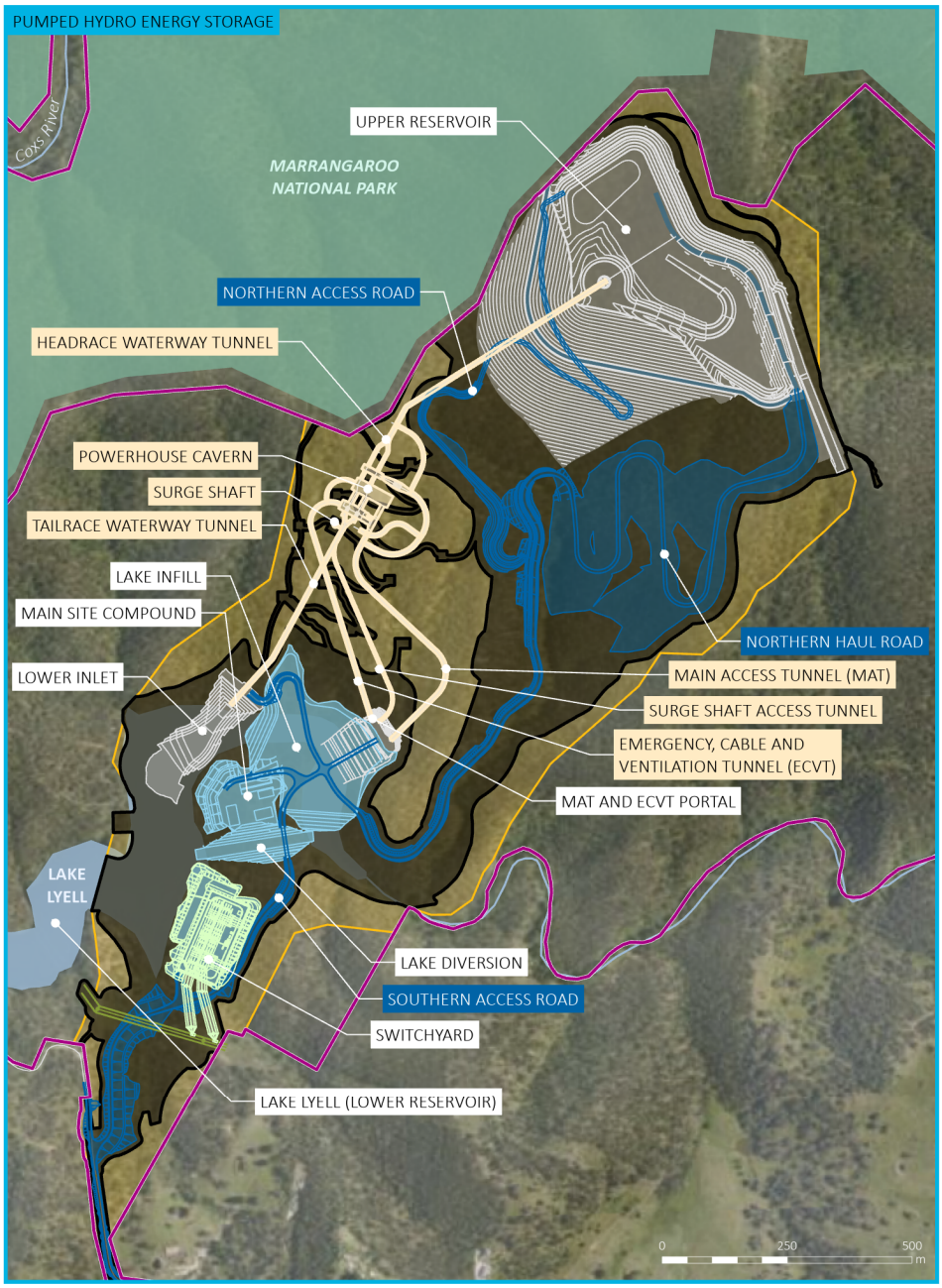
A summary of the project and its key elements is provided in Table 3.1 and shown in Figure 3.1.

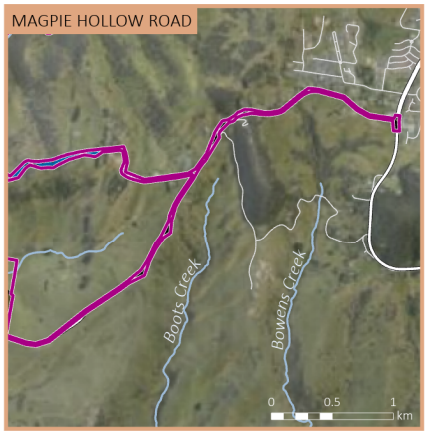
Table 3.1 Key project elements

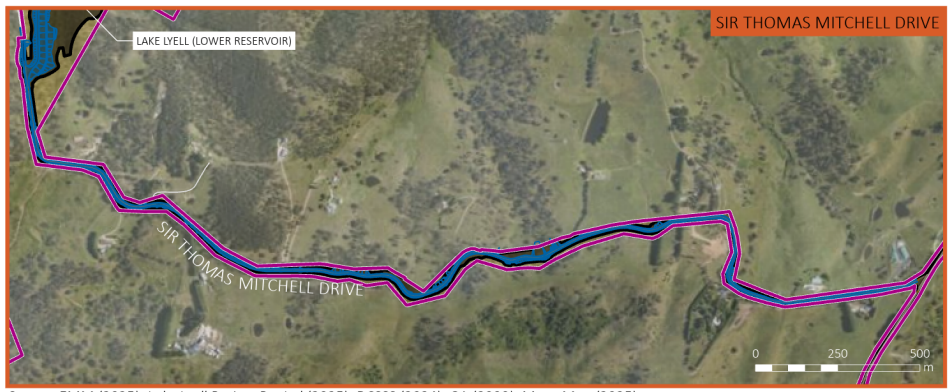
Project element	Description
Pumped hydro generation components – Above ground elements	• Upper reservoir and dam – a rockfill "gully dam" with a storage volume of ~5.3 GL. • Lower reservoir (Lake Lyell) – Lake Lyell will act as the project's lower reservoir; hence no new lower reservoir or dam will need to be constructed. • Upper reservoir inlet/outlet structure – located within the lowest point of the upper reservoir to draw water up to the upper reservoir through the power waterways during pumping mode and release water to the power waterway during generation mode. • Lower inlet/outlet structure – located within the lower reservoir (Lake Lyell) to draw water up to the upper reservoir through the power waterways during pumping mode and release water from the power waterway during generation mode.
Pumped hydro generation components – Below ground elements	• Power waterways – lined with a combination of steel and concrete, include: – a single vertical inlet/outlet shaft which will extend down from the upper inlet/outlet structure. The shaft is 7 m in diameter (internal) and about 170 m deep – an inclined single headrace tunnel that will extend downwards from the upper inlet shaft. The tunnel is approximately 7 m in diameter (internal) and 550 m long, before it splits into two tunnels leading to each Francis turbine in the powerhouse – two tunnels downstream of the powerhouse will rejoin into a single tailrace tunnel – a single tailrace tunnel will connect the lower inlet and the powerhouse. The lower waterway tunnel is approximately 7 m in diameter (internal) and approximately 500 m long. • Underground powerhouse – located in an underground cavern near the base of the headrace tunnel, the powerhouse will contain the two reversible pump-turbines, generators and control valves and a variety of electrical equipment. • One surge shaft will be located downstream of the powerhouse and connected to the tailrace tunnel and to the surface. The surge shaft will be around 11 m diameter.

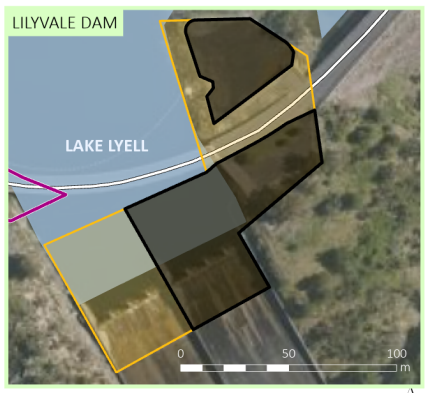
Project element	Description
Pumped hydro generation components – Access tunnels and portals	Access to the power waterways and the powerhouse will be attained via underground access tunnels and portals, which will include: • the main access tunnel (MAT), approximately 7.5 m wide and 8.2 m tall, and about 600 m long • the emergency, cable, and ventilation tunnel (ECVT), approximately 7m wide and 8.2 m tall, and about 500 m long. Each tunnel will have a portal/entrance at the surface, with a surface area of approximately 100 m x 50 m.
Transmission connection components	• A HV switchyard will contain the electrical equipment required to facilitate the connection between the project and the existing transmission network. • A short transmission connection will be constructed to connect the HV switchyard to the nearby Wallerawang to Sydney South 330 kV transmission line. • An underground cable in a trench will connect the main transformers and the switchyard.
Access and ancillary facilities – Upgrading external roads	• The project area will be accessed via Magpie Hollow Road and Sir Thomas Mitchell Drive, which will undergo upgrades to allow project-related vehicles safe access. • Upgrades to the intersection of Sir Thomas Mitchell Drive and Magpie Hollow Road is required. • The intersection of the Greater Western Highway and Magpie Hollow Road will require a temporary, signalised intersection modification to allow construction traffic. Only minor intersection adjustments will be required for the largest oversized equipment transport to site.
Access and ancillary facilities – Internal access roads and bridges	• Existing access roads within the project area will be upgraded as required and new ones will be constructed to allow access to key areas within the project area. Pioneering access tracks will be utilised for vehicle access before main construction access is completed, to allow pre-construction and enabling works such as geotechnical investigations. • Four temporary bridges will be established across Farmers Creek to provide construction access to the northern part of the project area. • A permanent bridge will be established to cross the diverted path of Farmers Creek arm of Lake Lyell.
Access and ancillary facilities – Lake Lyell diversion	• The Farmers Creek arm of Lake Lyell will be diverted near the lower inlet/outlet structure to mitigate risks to project operation from flooding, risks associated with sedimentation, and to improve the overall constructability of the project. The lake diversion will be an open channel and designed to allow continued upstream and downstream passage of fish and aquatic fauna.
Access and ancillary facilities – Administration and utilities (operation)	• An administration building will act as a control centre, staff centre and office.
Other construction components	• Geotechnical investigations – to assist ongoing design refinement, geotechnical and geophysical surveys and investigations are proposed. • Temporary workforce accommodation – a temporary workforce accommodation facility is proposed to house up to 500 workers (referred to as an accommodation camp). Two locations are proposed as options (a preferred Lakeside camp, and an alternative Town camp) with only one being selected and built for the project. • Site work pads, laydown areas and facilities – supporting construction facilities will be established throughout the disturbance footprint including site compounds, laydown and storage areas, stormwater basins, concrete batch plant and cofferdams. • Spoil management – spoil will be reused in construction of the dam wall, switchyard pad, laydowns and infill of the Farmers Creek arm of Lake Lyell subsequent to the diversion of Lake Lyell. Excess spoil will be transported offsite to a facility approved to accept the material.
Project areas	• Construction envelope – 197 ha • Disturbance footprint: – up to 137 ha for the project with preferred Lakeside camp – up to 132 ha for the project with alternative Town camp • Operational footprint – 47 ha Definitions of each area are provided in Section 3.2.3.

Project element	Description
Project duration	• Construction: approximately four to five years • Operation: about 80 years up to 100 years
Project workforce	• Construction: Peak of around 600 • Operation: Around 20 permanent staff









Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); MetroMap (2025)

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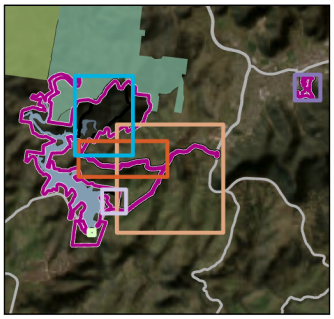

KEY

- Project area
- Construction envelope
- Disturbance footprint

Power generation component:

- Above ground design
- Underground design

Transmission component:

- Existing 330 kV transmission line
- Transmission design

Other ancillary infrastructure:

- Permanent road design
- Permanent infrastructure

Existing environment

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

Overview of key project elements

Lake Lyell PHES
Environmental Impact Statement
Figure 3.1

EMM
creating opportunities

3.2 Approach to design

3.2.1 Design integration and assessment

A design integration and assessment (DIAA) process (refer to Figure 3.2) was undertaken to develop the design and construction methods presented in the EIS, with the guiding principles of avoiding and minimising environmental impacts where possible and engaging with key stakeholders throughout the process.

The project, while complex in design, has had the advantage of an early contractor involvement (ECI) process. The ECI process provides a means to incorporate and "test" various design iterations, constructability and environmental recommendations, to ensure they are feasible, as part of the EIS preparation. This has provided a level of confidence in both the concept design and the projects ability to incorporate avoidance and mitigation measures.

The DIAA was applied collaboratively by the project team, including engineers, environmental specialists and community and engagement consultants, and incorporated feedback from government agencies, Lithgow City Council, and the community.

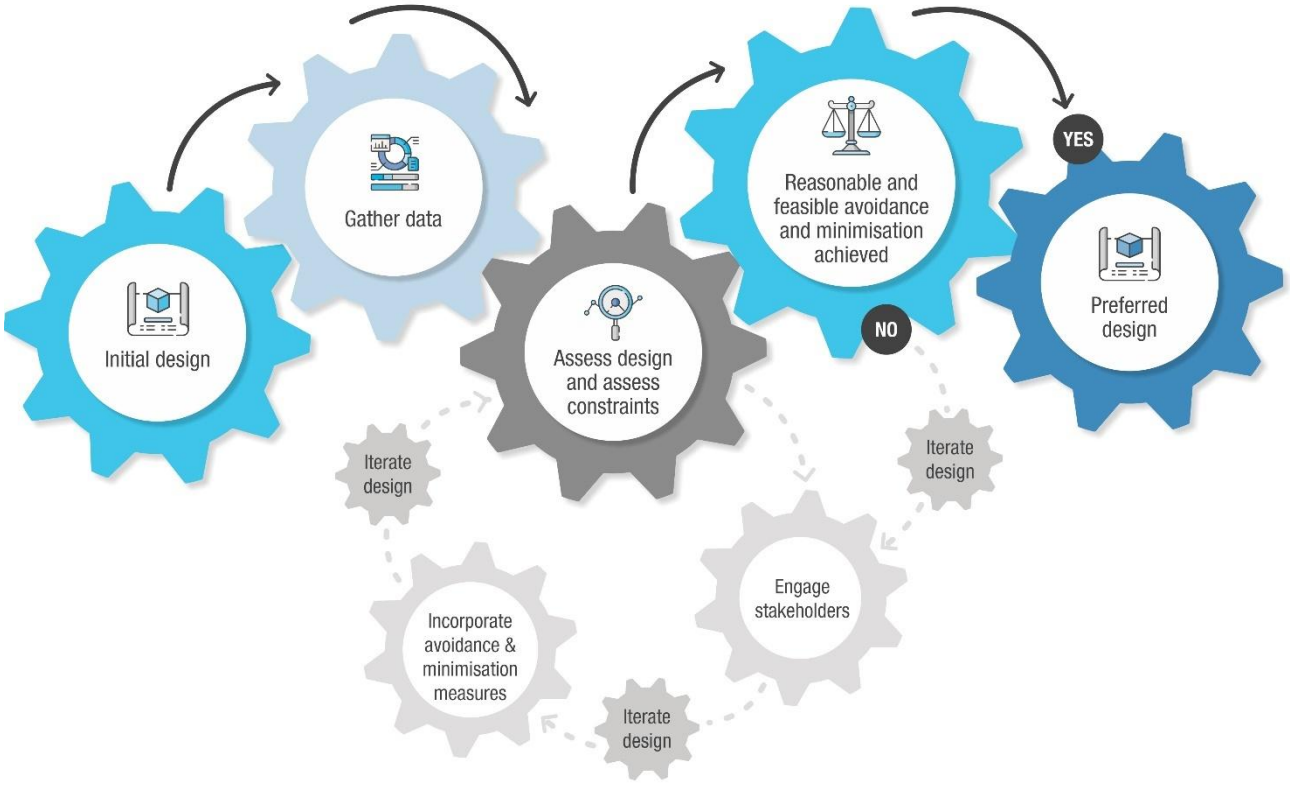

Figure 3.2 DIAA approach

3.2.2 Avoidance and minimisation

Since the project's initial inception, engagement has been carried out with the local community, local, State and Commonwealth governments, and environmental studies have been progressed (as part of this EIS). These activities have informed the concept design developed for the project to ensure it has incorporated measures to avoid and minimise impacts as much as practical.

Key environmental and social constraints identified early on in project design where no development will occur are:

- Marrangaroo National Park – project will avoid direct impacts and minimise indirect impacts
- Farmers Creek – project will avoid impacts to the natural system of Farmers Creek
- Lithgow – project will avoid or reduce visibility from Lithgow and surrounding residential areas.

Avoidance and minimisation measures adopted by the concept design include:

- relocation of the upper reservoir from the Mount Walker southern ridge to the west, within a gully and below the ridge. The relocation means that views of PHES infrastructure from Lithgow, Bowenfels and South Bowenfels are avoided
- selection of a rockfill embankment dam within the gully. This utilises a cut fill balance as far as possible to maximise reuse and minimise the need for disposal or transport of material off site. Reuse options considered throughout the design, including using won material for the protection of the inlet/outlet structure and excavated rocks for concrete aggregates
- using existing access roads where possible, such as for geotechnical investigations and early works
- wherever possible, aligning construction haul roads and permanent access roads within the same disturbance footprint to minimise overall clearing of native vegetation and habitat. Northern haul road and permanent roads kept outside of major visual impact areas
- switchyard area used for construction laydown area to minimise construction footprint
- powerhouse and waterways located underground to minimise impacts of flora and fauna as well as noise and visual impacts
- project northern area focused in gully area to reduce visual impacts
- switchyard located low in the least hilly site to reduce cut and fill and in doing so reducing the footprint of the pad
- construction methods for the inlet and its protection (i.e. cofferdam, floating boom) developed to avoid and minimise impacts to an Aboriginal site on northern bank of the Farmers Creek arm of Lake Lyell
- temporary accommodation camp locations are situated close to the project to minimise travel distances as well as minimise impacts and improve benefit opportunities to the community.

3.2.3 Project areas and ongoing design refinement

Aligned with the DIAA approach and to accommodate future optimisation and refinement to the design as it progresses, a 'project area', 'construction envelope', 'disturbance footprint' and 'operational footprint' approach have been defined for the project:

- The **project area** is a broader buffer around the project and represents the area that was investigated during the environmental assessments. The project area includes both the land that will be physically disturbed for the project (directly and indirectly) as well as land where no disturbance or impact will occur.

- The **construction envelope** is the boundary limits of where direct disturbance can occur and represents the maximum extent of where disturbance can occur during construction of the project. To derive the construction envelope, buffers have been applied around project infrastructure and work areas to provide a level of flexibility where required.

- The **disturbance footprint** sets the total clearing limit for the project with reference to the types of vegetation and habitat that can be impacted. It represents the physical disturbance that can be expected as part of the construction works. As the design is refined, the final siting of the disturbance footprint can move within the construction envelope, subject to the recommended environmental mitigation and management measures, and provided it does not exceed any limits defined by the construction envelope or vegetation clearing thresholds.

- The **operational footprint** represents the permanent disturbance of the land following progressive rehabilitation of any areas disturbed during construction that is no longer needed for operation.

The project is based on a concept design and therefore it is anticipated that ongoing refinements will occur as part of the detailed design, such as optimisation of the underground powerhouse arrangement. The concept design demonstrates project feasibility and provides sufficient detail to inform the preparation of the EIS and seek approval. It is anticipated any optimisation or refinement of the design could occur within the design parameters and construction envelope provided by the concept as assessed in the EIS. This approach is shown in Figure 3.3.

Pre-construction and enabling work activities will form part of an early works package and are a subset of the total disturbance needed to construct the project. Early works are described in Section 3.4.

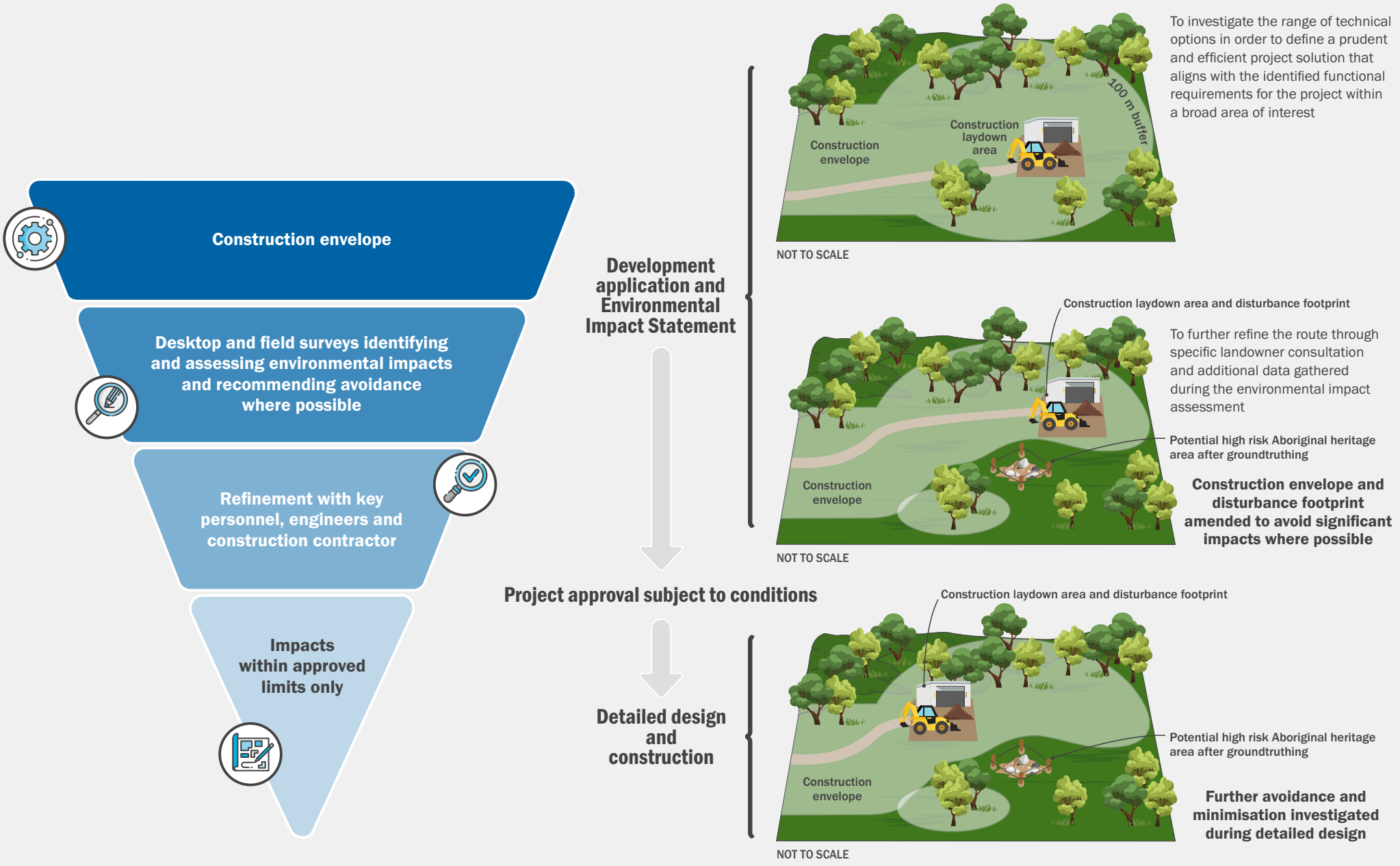

Figure 3.3 Construction envelope approach to project limits

3.3 Design and layout of permanent infrastructure

Key project components of the concept design can be broadly categorised as:

- pumped hydro generation components
- transmission connection components
- site access and ancillary facilities
- other construction components or works.

All detailed drawings and plans for the concept design are provided separately in Appendix B of this EIS.

3.3.1 Pumped hydro generation

The pumped hydro generation components of the project include both above ground and below ground infrastructure. A summary of these elements is provided in Table 3.2 and shown in Figure 3.4, with further specification provided in Appendix B.1.

Table 3.2 Summary of pumped hydro generation design elements

Design element	Purpose	Description	Construction method	Final land use
Upper reservoir	to hold and store water for energy generation	The upper reservoir includes a rockfill embankment, channel spillway and other supporting infrastructure and instrumentation (such as monitoring equipment and lightning protection rods). A PVC geomembrane liner will be installed across the upstream face of the dam, to provide a waterproof barrier and maintain the storage volume.	excavation via cut and fill, with excavated rock being re-used to build the rockfill dam	permanent infrastructure
Lower reservoir (Lake Lyell)		Lake Lyell will act as the lower reservoir; hence no new lower reservoir or dam will need to be constructed. The existing reservoir has an operating range of 24.2 m from 785.5 m Australian Height Datum (AHD) (Full Supply Level, FSL) to 761.3 m AHD (Minimum Operating Level, MOL). The operation of the PHES will only occur within the top 5.5 m of this range (PHES MOL of 780 m AHD to existing reservoir FSL of 785.5 m AHD).	none, reservoir is existing infrastructure	existing permanent infrastructure
Powerhouse and tunnels	power generation and conveyance of water between upper and lower reservoir	The powerhouse for the project is located approximately 172 m below the existing surface. The upper and lower reservoirs will be connected to the powerhouse by a dual waterway arrangement, which will pass water through turbines located within the machine hall. The powerhouse concept arrangement includes: • powerhouse cavern, which houses the two turbine and generation units • transformer cavern, which houses the two transformers • main inlet valves (MIV) cavern, located upstream of the powerhouse with the functionality to restrict hydraulic flow to turbines when required • tailrace gate cavern, located downstream of the powerhouse housing hydraulic gates allowing to isolate hydraulic flows to turbines when not required. The powerhouse cavern will be connected directly via access tunnels to the MIV cavern, emergency, cable and ventilation tunnel (ECVT), transformer cavern, and tailrace gate cavern.	drill and blast excavation, raised bore excavation	permanent infrastructure

Design element	Purpose	Description	Construction method	Final land use
Inlet/outlet structures	to draw water in to, and release from, the power waterways	The upper reservoir inlet / outlet includes a removable steel cap to provide access to the shaft for maintenance operation and includes trash racks which are designed to ensure debris isn't transferred into the power waterways. The lower reservoir inlet / outlet includes steel screens to prevent large logs and debris from entering the waterways, and isolation valves to allow waterways maintenance. A floating boom will be designed and implemented at the lower reservoir inlet / outlet to create a physical barrier for aquatic fauna and discourages general public entry into the inlet / outlet area. It includes hanging steel mesh to allow water flows but is resilient to blockage.	Upper inlet / outlet structure - Raised bore with cast in-situ concrete structure at top of shaft (upper reservoir inlet) and drill and blast excavation within cofferdams with cast in-situ concrete structure at outlet of tailrace tunnels (lower reservoir inlet / outlet)	permanent infrastructure

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

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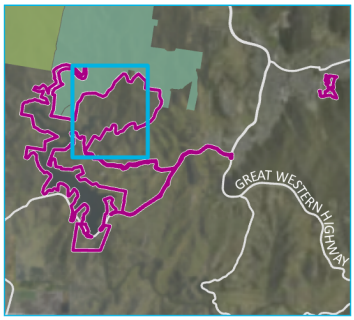


KEY

- Project area
- Project design
- Pumped hydro generation component

Existing environment

- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve

INSET KEY

- Major road
- NPWS reserve
- State forest

Pumped hydro components of the project

Lake Lyell PHES
Environmental Impact Statement
Figure 3.4

EMM
creating opportunities

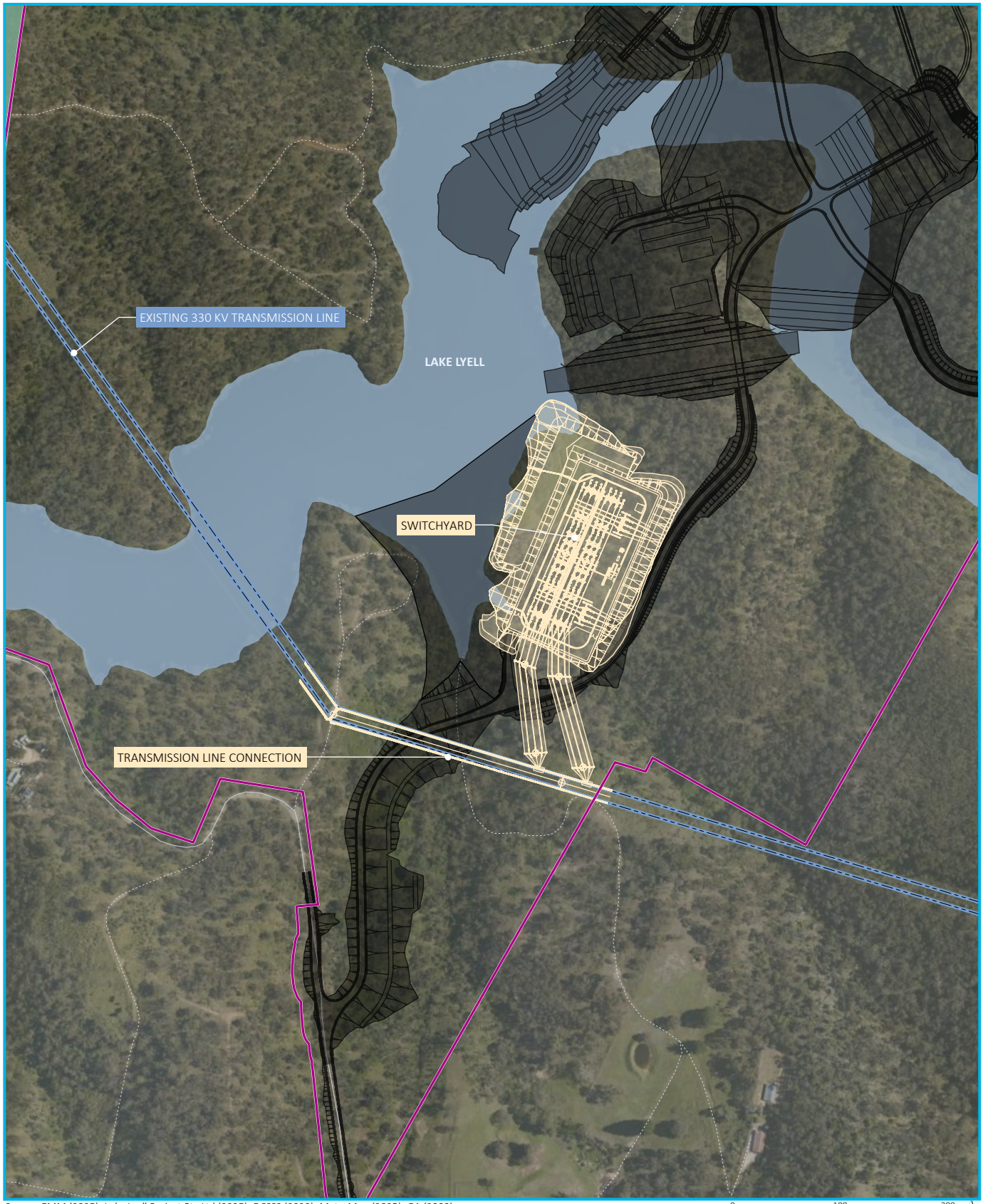
3.3.2 Transmission connection

The 330 kV switchyard pad will be built over a 130 m x 200 m area located in the west of the project site. Its primary purpose will be to house the electrical equipment necessary to connect the project to the transmission network and consequently it will be designed in accordance with Transgrid's specifications.

Key infrastructure within the site will include overhead 330 kV towers and conductors, cable bays, busbars, overhead gantries, voltage and current transformers, control building, communication systems and firefighting equipment.

From the switchyard, an approximate 220 m long (150 m from the boundary of the switchyard) single circuit transmission line will be constructed to connect with the existing 330 kV lines that pass through the project area. Due to the relatively short length of the transmission connection, up to six monopole towers are anticipated.

A cleared easement of about 60 m will be maintained along the transmission connection (i.e. ongoing vegetation maintenance). Access to the new towers will be via the main entrance road and access to the grid connection tie-in point will be via existing easements.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

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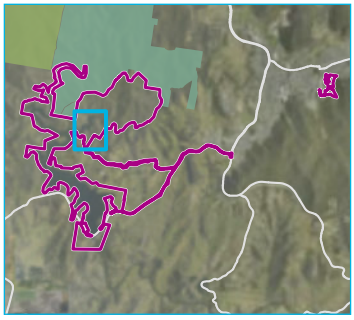

KEY

- Project area
- Project design
- Transmission connection component

Existing environment

- 330 kV transmission line
- Minor road
- Vehicular track
- Named waterbody
- NPWS reserve

INSET KEY

- Major road
- NPWS reserve
- State forest

Transmission connection components

Lake Lyell PHES
Environmental Impact Statement
Figure 3.5

EMM
creating opportunities

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3.3.3 Site access and other supporting infrastructure

i Site access

Site access for the project will include a combination of road and water access. Access will be required during both construction and operation. The design has considered the needs of both construction and operation phases, with the aim to minimise overall ground disturbance. It is intended that where possible construction site access will become permanent access for operation or otherwise rehabilitated.

Table 3.3 Site access for the project

Access type	Description
Road access	Access to the project site will be attained via Magpie Hollow Road and Sir Thomas Mitchell Drive, and the roads within the site will be constructed as part of the project. The site access and internal roads needed permanently for operation of the project include the following: • Southern access roads – joins directly with Sir Thomas Mitchell Drive and provides direct access to the project, including switchyard. • The northern access road - runs between the Farmers Creek crossing, tunnel portals, surge vent pad, upper reservoir laydown pad and upper reservoir. • The dam haul road - connects the upper reservoir laydown pad and the upper reservoir and will be used predominantly by heavy vehicles during construction, but will be permanently retained for operation. • MAT and ECVT access roads – located within the MAT and ECVT tunnels, the road connects the underground powerhouse with the surface access from the portals. All permanent roads would initially be established as construction access roads and used to build project infrastructure. Temporary haul roads will be required, in particular to support haulage of excavated material from the lake diversion and tunnel portals to stockpile and infill areas in addition to the upper reservoir construction. These roads will be rehabilitated and not retained permanently. Four temporary bridges will be required to cross the lake during construction. One of these will be made permanent for operation. Temporary bridges will be either prefabricated structures lifted in place or constructed as a causeway over culverts. The permanent crossing will be a spanned bridge structure with abutments in the lake.
Boat access	A service jetty will be installed at the switchyard location to allow marine access to Lake Lyell and provide access to deeper water. It will be used for both construction and operation. A temporary workboat launch facility will be established at the lakeside accommodation camp and will allow for launching and loading of barges. The location of the barge launch facility will not restrict the foreshore currently used for recreational purposes and access by the public. It is currently intended the boat launch facility will be temporary and used for the duration of construction of the project.
Public access	During construction, the entire construction envelope will be an active construction site and no public access will be permitted. Appropriate barrier fencing and signage will be established. Access along Mount Walker Road will not be restricted and will remain open during construction for existing use. Key water-based public recreation activities will continue, subject to the following: • During construction, access to Farmers Creek arm of Lake Lyell (east of existing powerlines) will be restricted. Appropriate signage and safety buoys will be installed in consultation with Transport for NSW (NSW Maritime). • During operation, access to the inlet/outlet structure will be restricted by a floating boom placed across the waterway. No power watercraft or public access will be allowed beyond this boom. The remaining areas of Lake Lyell and Farmers Creek will stay open to the public, and existing laws and regulations for public waterways will continue to be implemented by NSW Maritime. Public access requirements for the project are shown on Figure 3.6.

ii Administration and utilities

An administration building will be located near the switchyard and site entry opposite the diversion and will act as the control centre, visitor centre, and provide office space and parking. It will be used during construction and operation.

The project will be serviced by utility connections including:

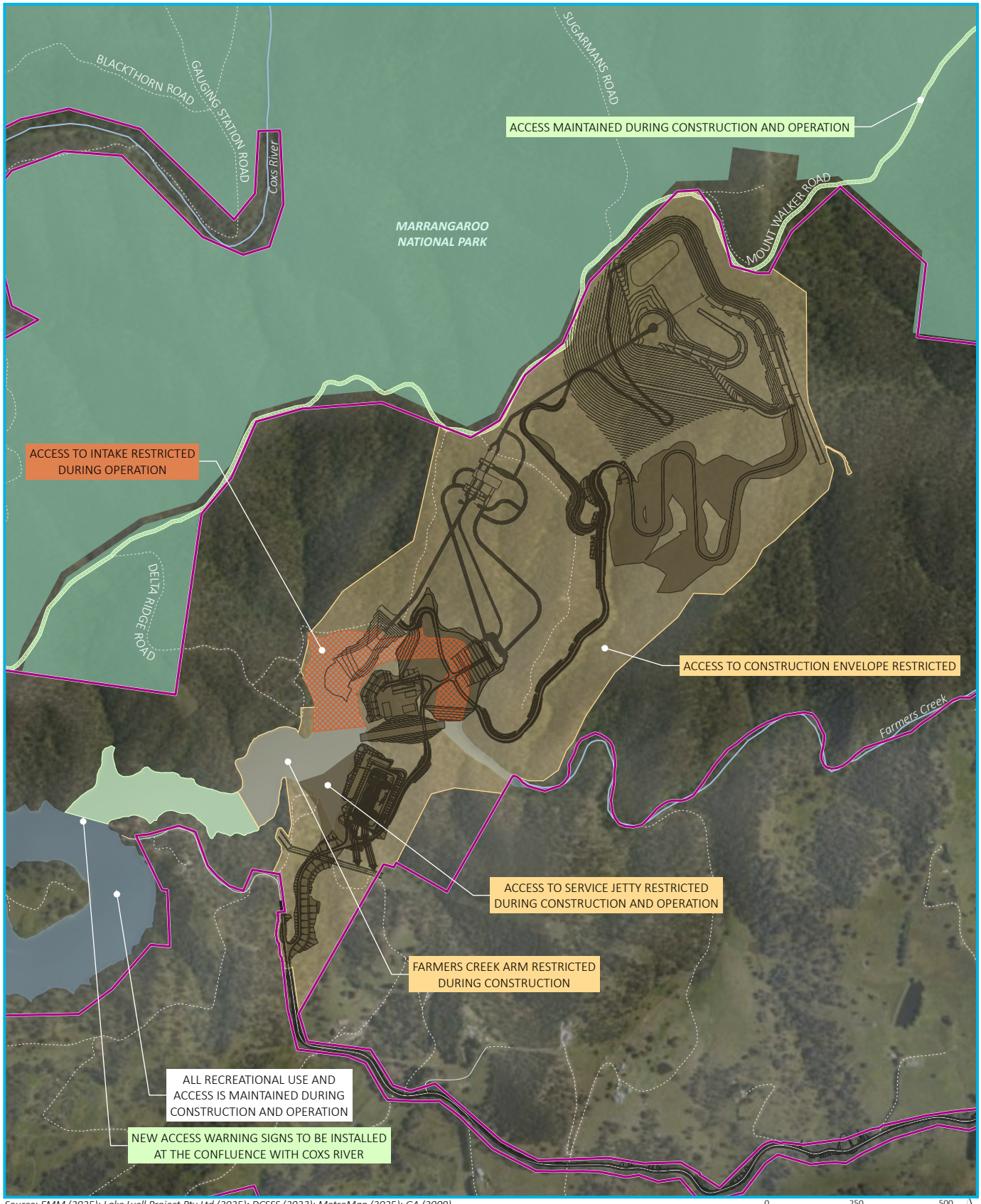
- the transmission network to power operation of the generating infrastructure
- a communications connection to the administration building
- potable water supply from the existing Lithgow City Council water supply network or from the onsite treatment of bore water supply.

The project will not be connecting to wastewater utilities except the Town camp, if this option proceeds.

iii Lake diversion

A lake diversion is needed and designed to protect the inlet / outlet from flood events and create distance from the main channel to reduce risk of fish entrainment.

To minimise the impacts of sedimentation and debris on the operation of the lower inlet / outlet structure, as well as to improve the constructability of the lower inlet / outlet structure and tailrace tunnel, the Farmers Creek arm of Lake Lyell will be diverted before its junction with the natural extent of Farmers Creek. The diverted path of the Farmers Creek arm will comprise a waterway with a width of around 40 m with sides with berms and overall slope of 70 degrees. An open waterway between the Lake Lyell and Farmers Creek intends to allow aquatic passage and the location / orientation of the channel provides a pathway for flood debris to enter the lake downstream of the inlet / outlet structures. It also allows separation between the project inlet / outlet area and the Farmers Creek.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

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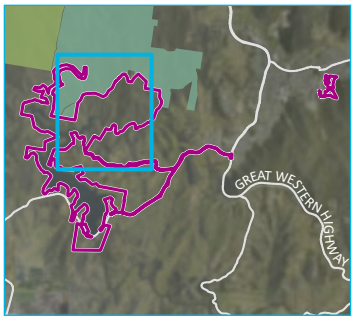


KEY

- Project area
- Site layout

Restriction

- Minimal restriction
- Restriction during operation
- Access restriction

Existing environment

- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve

INSET KEY

- Major road
- NPWS reserve
- State forest

Access restrictions during construction and operation

Lake Lyell PHES
Environmental Impact Statement
Figure 3.6

EMM
creating opportunities

3.3.4 External road upgrades

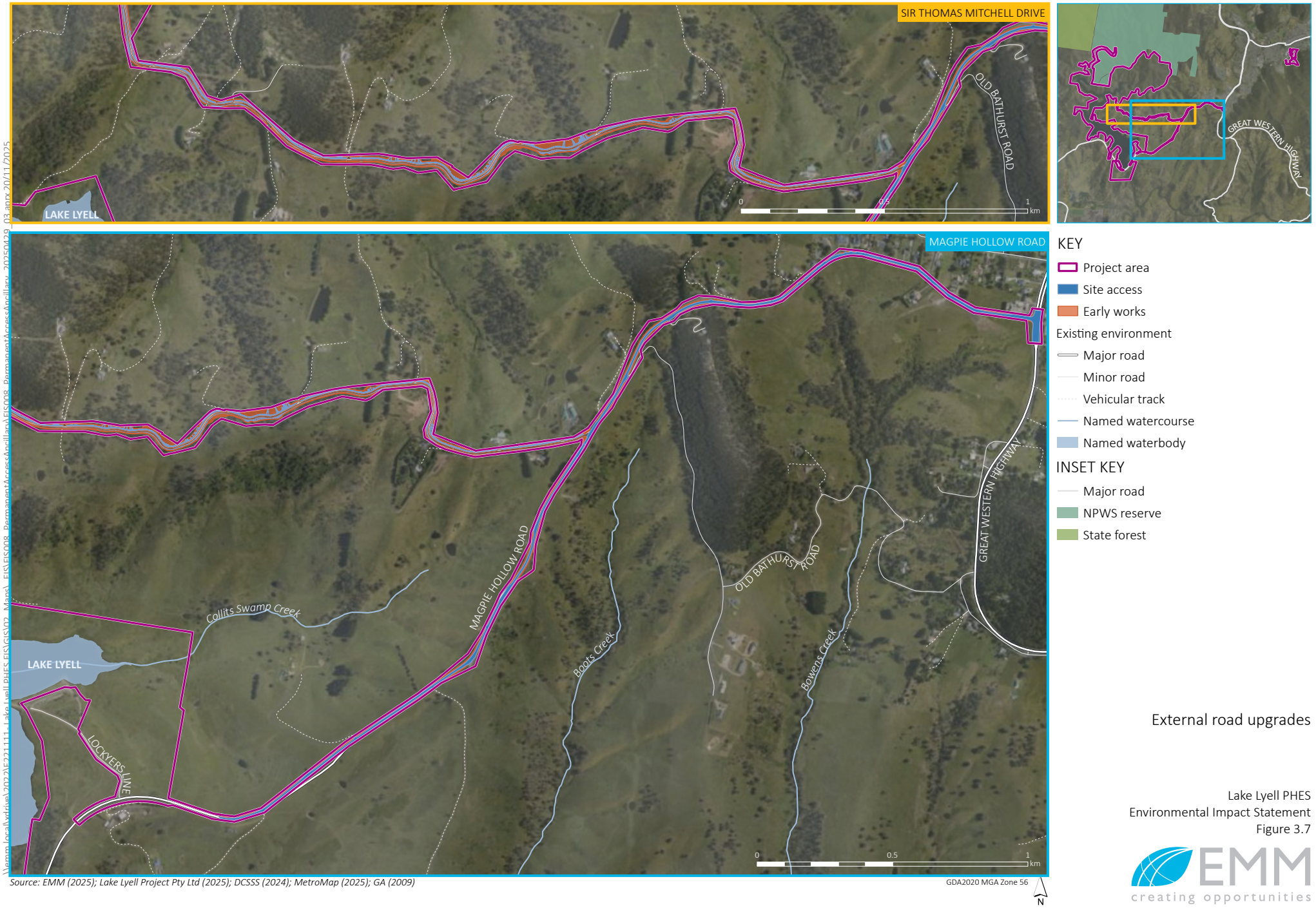
External road upgrades are required between Great Western Highway and the site entry point at Sir Thomas Mitchell Drive to ensure the roads will be able to carry the increase in traffic during construction, as well accommodate delivery of large equipment (such as the turbines and transformers). The road upgrades required are as follows:

- To allow for the required traffic numbers and allow safe passing distances Sir Thomas Mitchell Drive will need the pavement widened by approximately 1 to 2 m in each direction and the non-sealed sections to be sealed. In addition, two corners will require widening by placement of road base material to accommodate oversize loads.
- To improve safety for heavy vehicles, Magpie Hollow Road will need the pavement widened by up to 1 to 1.5 m in each direction.
- To accommodate the increased traffic volume, the intersection of Magpie Hollow Road and the Great Western Highway requires modification to allow for signalisation of turns in and out of Magpie Hollow Road.

The external road upgrades required are shown in Figure 3.7.

Photograph 3.1 Current intersection at Magpie Hollow Road and Sir Thomas Mitchell Drive

This EIS has assumed the Lakeside accommodation camp as the preferred option and has included all external road and intersection upgrades that would be required to construct and operate the camp. Should the Town camp be selected instead of the Lakeside camp, additional external road and intersection upgrades would be required to facilitate access to and from the camp to the Great Western Highway. These upgrades will need to be determined through further consultation with Lithgow City Council and Transport for NSW.



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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); MetroMap (2025); GA (2009)

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External road upgrades

Lake Lyell PHES
Environmental Impact Statement
Figure 3.7

EMM
creating opportunities

3.4 Construction of the project

3.4.1 Timing and staging

i Overview

An overview of the projects timing and key stages is shown in Figure 3.8.

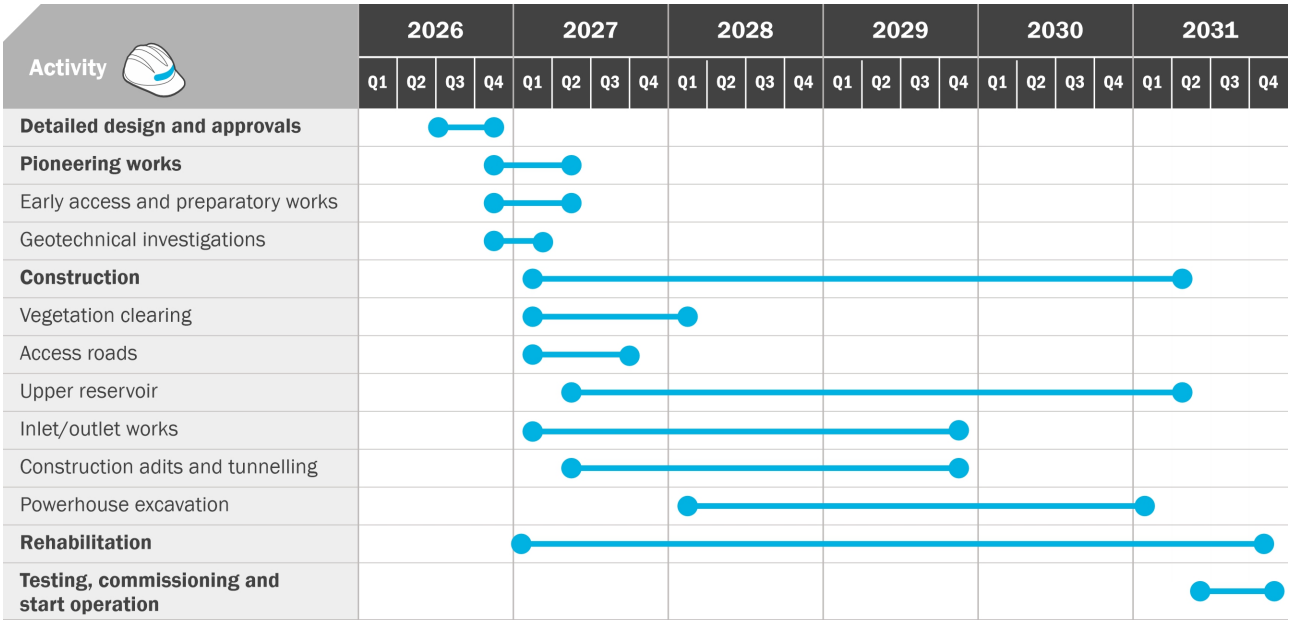


Figure 3.8 Project timing and staging

ii Early works

Early access establishment is needed to inform finalisation of the design and construction methodologies, as well as enabling works to prepare the site for construction and including implementing any early environmental management measures. These activities occur before the main construction work and are critical to the overall construction timeframe. It is anticipated this phase will involve:

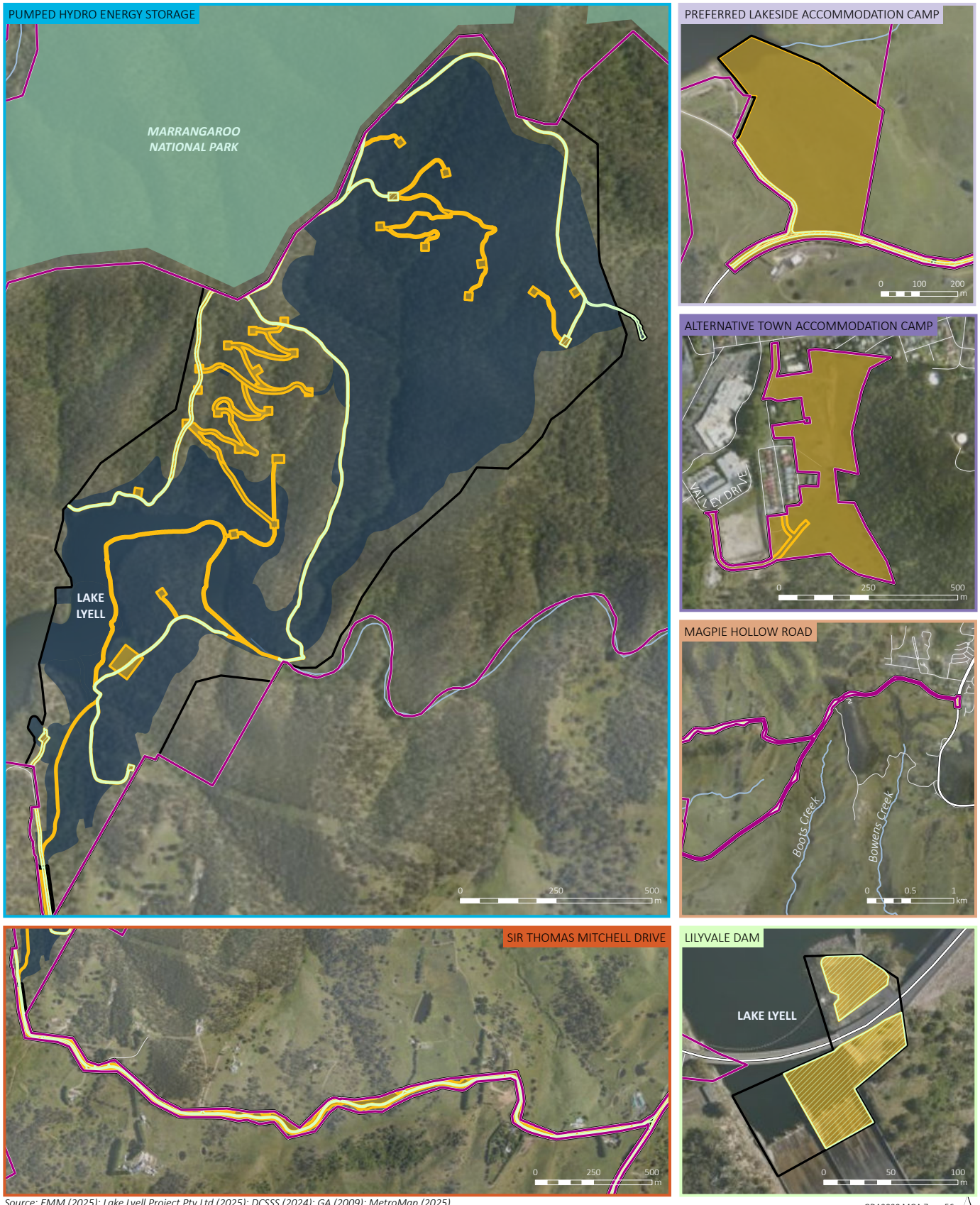
- geotechnical drilling and geophysical survey, including utilising existing access tracks (no clearing required) and clearing new access tracks and drill pads, and barge launch and access where needed
- establishing temporary power supply to an early works staging area and commencing the application for Endeavour Energy 11 kV connection for main construction works
- external road upgrades (Magpie Hollow Road and Sir Thomas Mitchell Drive, and respective intersection works) to facilitate heavy vehicle access
- establish early works compounds, including a storage area off Sir Thomas Mitchell Drive within existing cleared areas, and a compound at the proposed switchyard location
- establishment of the workers accommodation camp
- securing the site using fencing and gates, as required
- temporarily lowering existing Lake Lyell reservoir by up to 3.2 m through concurrent maintenance works on the fuse gates (required as part of existing operations) at Lilyvale Dam.

The early works activities were selected and developed based on those critical activities needed but also have considered works that would result in only minor environmental and community impacts. In some instances, clearing of vegetation is unable to be avoided and appropriate offsets for this stage of the project will be secured. All disturbance activities occur within the overall disturbance footprint for the project, as shown in Figure 3.9 and would be subject to an Early Works Environmental Management Plan.

iii Construction activities

The key operational infrastructure is outlined in Section 3.3. The project will require supporting ancillary facilities and activities to enable the construction of this infrastructure, including haul roads and temporary bridges, site compounds, batch plant, laydown and stockpile areas, coffer dams, stormwater basins, etc. Key construction activities will involve vegetation clearing, grubbing, excavation, tunnelling, boring, lining, and the installation of plant and machinery. The construction layout and facilities needed for the project are shown in Figure 3.10 and have informed the definition of the disturbance footprint.

Following construction, any construction ancillary facilities not needed for operation will be decommissioned and rehabilitated.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); MetroMap (2025)

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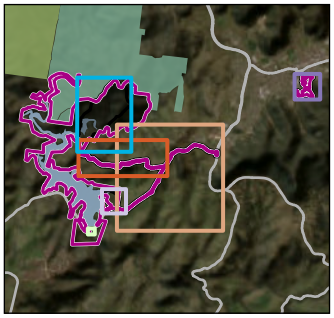


KEY

- Project area
- Construction envelope (offset for clarity)
- Existing disturbance
- Early works disturbance footprint
- Main works disturbance footprint

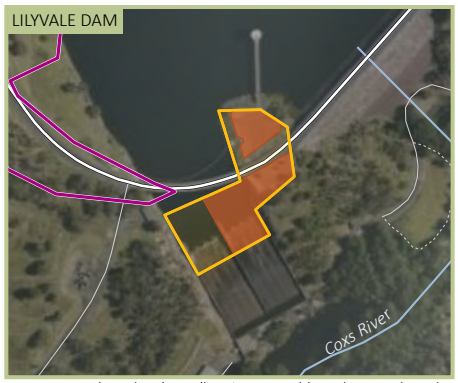
Existing environment

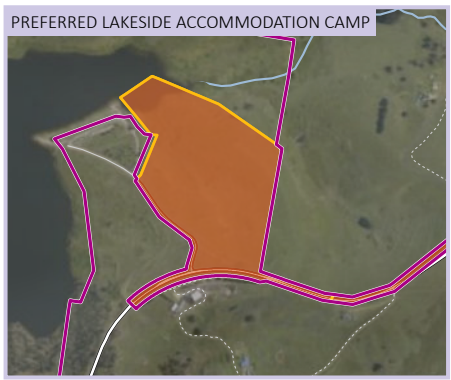
- Major road
- Minor road
- Named watercourse
- NPWS reserve

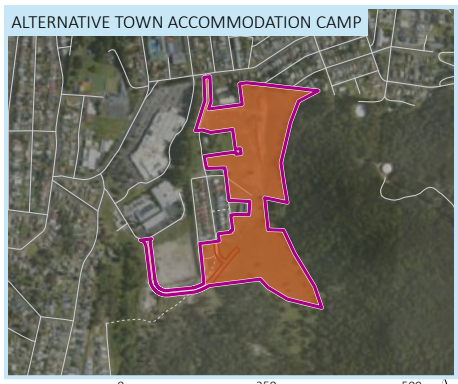
Early works

Lake Lyell PHES
Environmental Impact Statement
Figure 3.9

EMM
creating opportunities







Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

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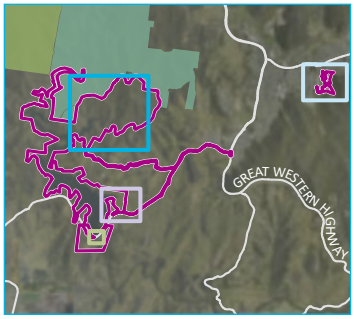

KEY

- Project area
- Contruction envelope
- Construction component
- Indicative cofferdam
- Permanent bridge crossing
- Temporary bridge crossing
- Background project design
- Building pad
- Explosives storage
- Sediment basin
- Early works

Existing environment

- Minor road
- Vehicular track
- Named watercourse
- NPWS reserve

INSET KEY

- Major road
- NPWS reserve
- State forest

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Indicative construction layout and facilities

Lake Lyell PHES
Environmental Impact Statement
Figure 3.10

EMM
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3.4.2 Workforce management

The project's peak workforce is expected to be approximately 600 full-time equivalent workers, 80% of which are expected to require temporary accommodation. For this reason, temporary accommodation for approximately 500 workers will be provided near the site. Currently, two locations are being considered (refer to Figure 3.1):

- A preferred site along Magpie Hollow Road and adjacent to Lake Lyell, referred to as the Lakeside camp. The indicative layout and artist impression is shown in Figure 3.11.
- An alternative site off Silcock Street in Lithgow (the former Pottery Estate), referred to as the Town camp. The indicative layout and artist impression is shown in Figure 3.11.

Buses will be provided to transport workers to and from the accommodation camp to the work site.

Artist impression: Preferred lakeside camp

Artist impression: Alternative town camp

Figure 3.11 Workforce accommodation camp options

3.4.3 Construction management

i Hours of work

Construction works would generally be conducted within the hours outlined in Table 3.4. As some activities would be undertaken 24 hours a day, seven days a week, the project construction environmental management plan (CEMP) would include out-of-hours mitigation measures to reduce potential impacts of these construction activities at nearby receptors during these periods.

Table 3.4 Construction hours

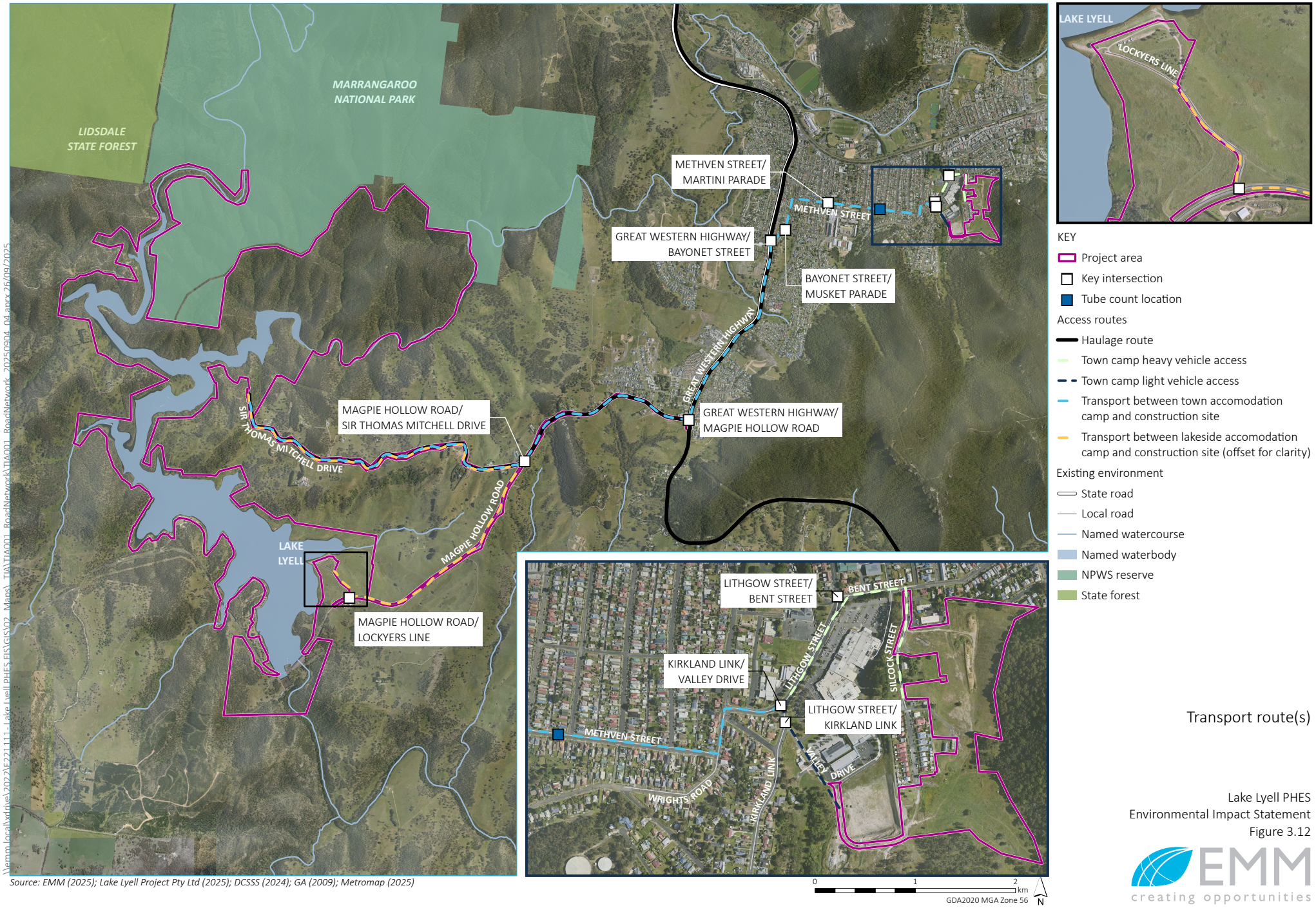
Work type	Hours of work
Normal construction	Monday to Saturday 6.00 am to 6.00 pm
	Sundays or public holidays 9:00 am to 5:00 pm (low noise work only)
Deliveries	Monday to Saturday 6.00 am to 10.00 pm
	No work on Sundays or public holidays
Blasting (at surface)	Monday to Saturday 9.00 am to 6.00 pm
	No work on Sundays or public holidays
Underground excavation and tunnelling (including blasting)	Monday to Saturday 24 hours
	Sundays or public holidays 24 hours
Camp operation	Monday to Saturday 24 hours
	Sundays or public holidays 24 hours

Utilising a 24/7 construction schedule for key activities (i.e. tunnelling) will significantly reduce the duration of the construction program to ensure a 2031 operation target is met, thereby reducing the project's potential impacts to the local community and demands on local infrastructure.

ii Transport and traffic

The primary transport route for construction vehicles is shown on Figure 3.12. The Great Western Highway is an approved B-double route and is in close proximity to the site. From the Great Western Highway, vehicles will turn on to Magpie Hollow Road and continue to Sir Thomas Mitchell Drive and the main site entrance.

Roads within Marrangaroo National Park will not be used by project construction vehicles, except for emergency egress to be agreed with NSW National Parks and Wildlife Service (NPWS) as part of the project's Emergency Evacuation and Response Plan.



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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); Metromap (2025)

Transport route(s)

Lake Lyell PHES
Environmental Impact Statement
Figure 3.12

EMM
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Light and heavy vehicles needed for construction will access the project site via the main site entrance. This includes delivery of construction machinery, equipment and materials, transport of spoil offsite, and transport of personnel. The majority of project traffic generation is expected to be light vehicles associated with local workers driving to site. Non-local workers staying at the accommodation camp will primarily be transported via bus to and from site (with buses considered in heavy vehicle estimates). The estimated average daily traffic movements during construction are shown in Figure 3.13.

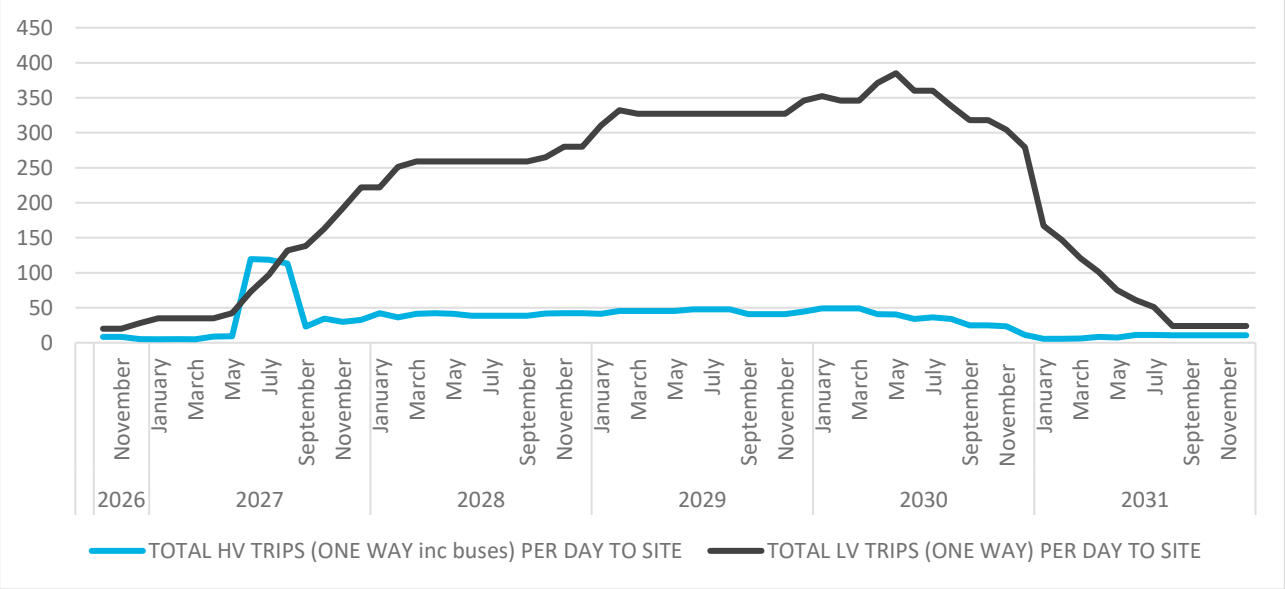


Figure 3.13 Estimated project traffic movements

iii Utilities and supply

During construction, power would initially be sourced from diesel generators until a connection to the existing 11 kV network is established. During construction, potable water will be transported to site by tanker trucks and stored onsite in water tanks or produced on site by a treatment plant supplied by bore water rather than a connection into the water supply network.

Wastewater for the main construction site will either be pumped out and removed offsite or treated onsite and used for dust suppression. All sewage from the accommodation camp will be trucked offsite.

3.5 Rehabilitation and final landform

Temporary infrastructure and disturbance areas required during construction, and no longer needed for operation, will need to be decommissioned and progressively rehabilitated. The operational footprint of the project will therefore have a significantly smaller area than the overall disturbance footprint during construction.

The overall strategy of rehabilitation works undertaken will be to enable the project to co-exist within its existing setting and maintain values of its setting as far as practicable. Rehabilitation will occur progressively over the four to five year construction period. A total of approximately 74 ha of the disturbance footprint would be progressively rehabilitated following construction.

Rehabilitation objectives for the project are as follows:

- Preserve the Construction Envelopes natural assets and values and ecological connectivity to Marrangaroo National Park.
- Agreement on future land use and consider long-term site management.

- Establish processes prior to construction works to source seeds, tubestock, topsoils, organic matter and landscape items such as rock and logs to be used in revegetation and progressive, ongoing rehabilitation during the construction works phase.
- Establish appropriate treatments for minimisation of runoff into waterways.
- Protect existing native fauna and their habitats including (e.g. trunks, logs, large rocks, etc.) in construction adjacent areas.
- Where practicable, rehabilitate disturbed areas to a pre-existing or improved state at completion of construction activity.
- Minimise the visual impact of construction works from significant public viewpoints and sensitive receptors.

Several pads will be established during construction of the project, re-using excavated material to reduce the need to transport spoil offsite. These pads primarily include a flat surface and stabilised batters. It is intended that these pads are revegetated at the end of construction, and opportunities to ensure the final landform integrates with the surrounding environment are considered during detailed design.

The indicative final landform design topography following completion of all construction activities associated with the project is presented in Figure 3.14. A rehabilitation strategy has been prepared for the project, including identifying completion criteria for the final landform. The strategy is provided in Appendix T.

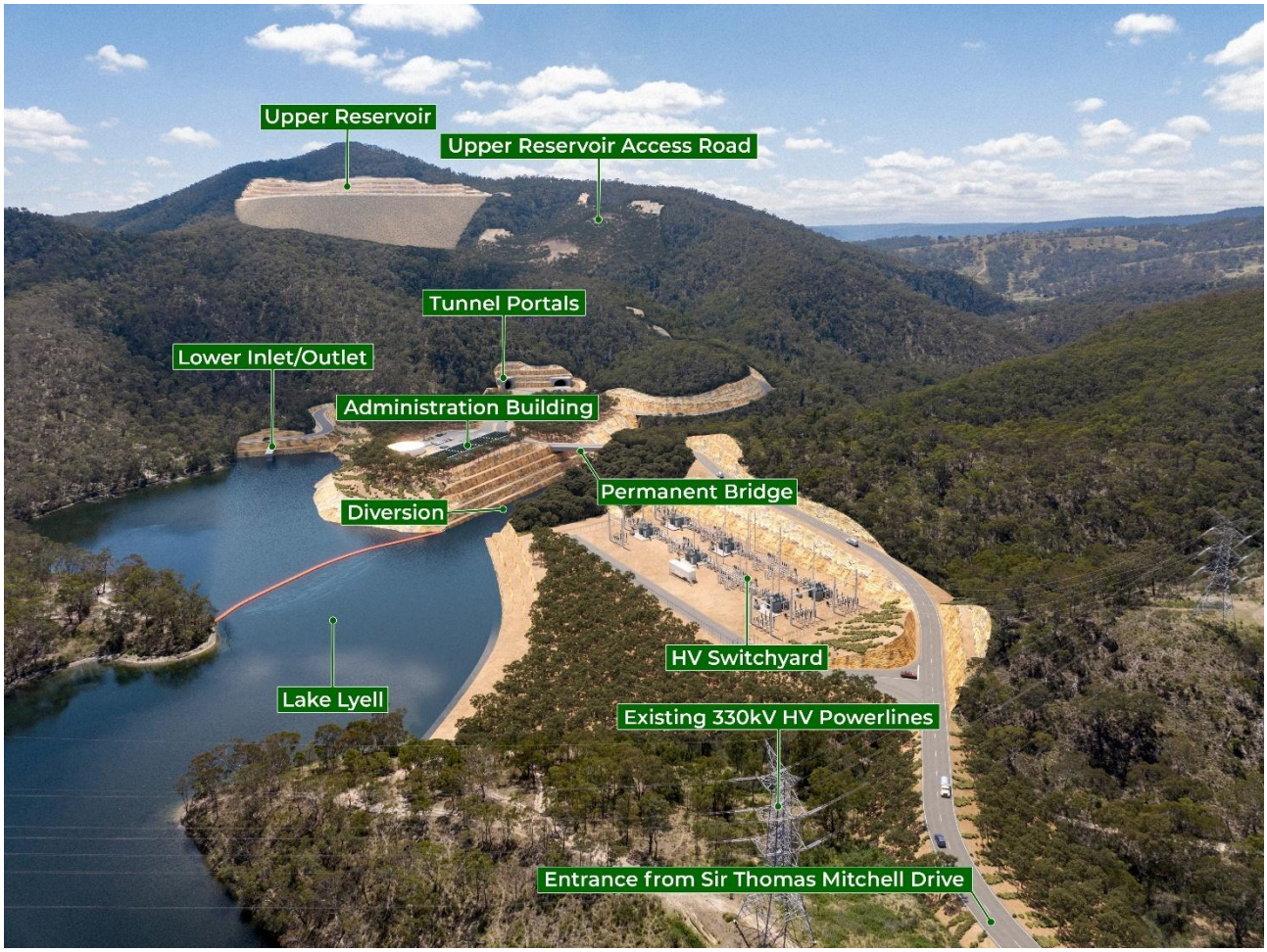


Figure 3.14 Artist's impression of final landform of project

3.6 Operating principles and activities

Lake Lyell operates under a regional water scheme including Thompsons Creek Reservoir and Lake Wallace, which currently provide the cooling water to Mount Piper Power Station (and previously to the former Wallerawang Power Station). Lake Lyell also serves as a recreational reservoir for fishing, boating, water-skiing, kayaking, camping, and swimming on land and waters that are leased from EnergyAustralia to Lithgow City Council.

Lake Lyell has a MOL of 761.3 m AHD and FSL of 785.5 m AHD. Water levels within the lake fluctuate due to the drawing of water for use in Mount Piper Power Station, natural evaporation and in events of drought.

Previously, when both Mount Piper and Wallerawang power stations were operating, drought conditions have seen the lake as low as 765 m AHD (2007). However, during the most recent drought event (2018-2020) and as a result of Wallerawang power station no longer operating, the water level in Lake Lyell was able to be maintained above 780 m AHD.

The project will operate within the existing Lake Lyell system as shown in Figure 3.15. The minimum operating level for the project is 780 m AHD. During recent drought events, water levels have been sustained above this level, with only extreme drought events resulting in lower water levels.

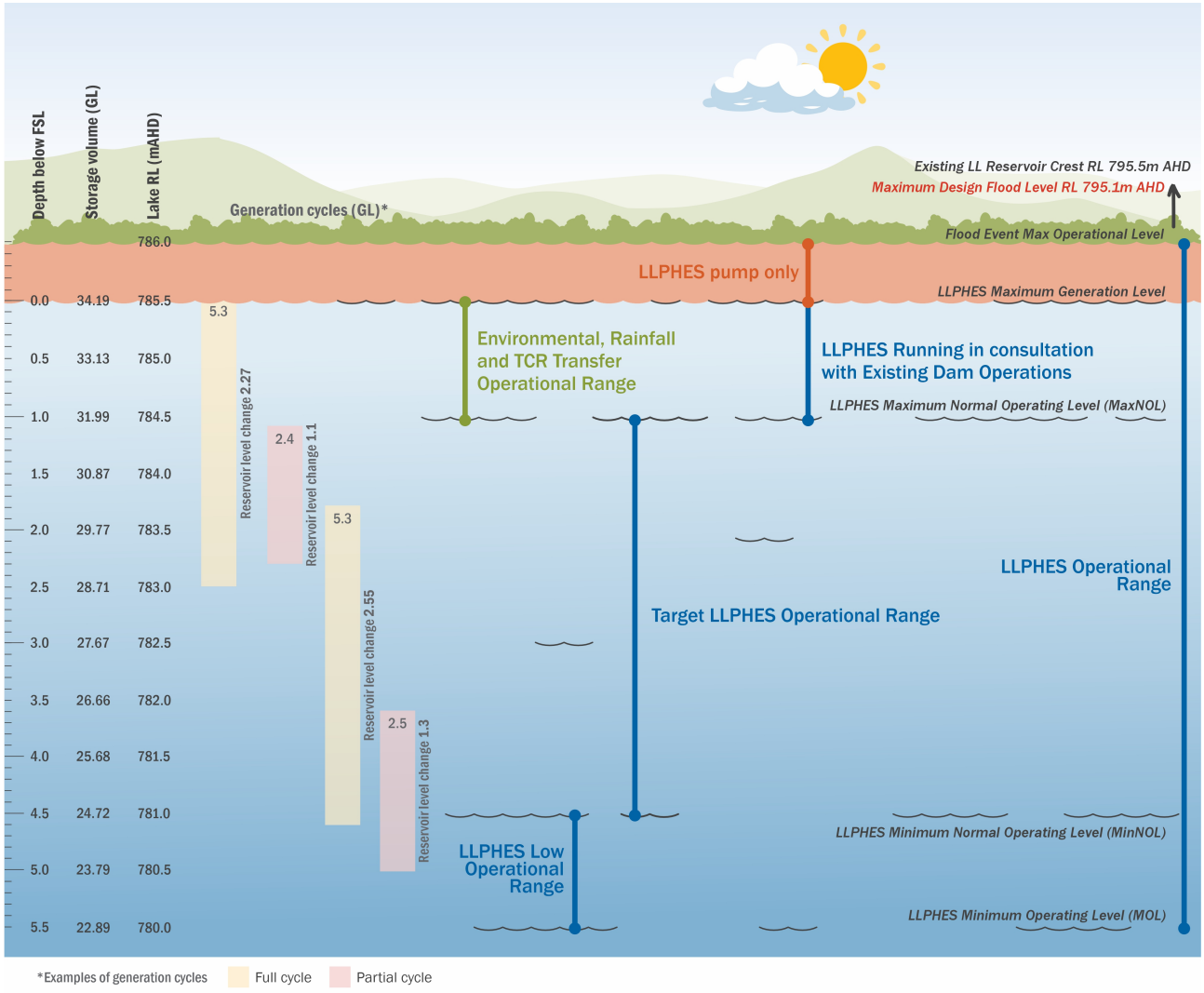


Figure 3.15 Lake Lyell PHES operational philosophy

Chapter 4

Statutory context

Environmental Impact Statement | Lake Lyell PHES Project

4 Statutory context

This chapter summarises the statutory requirements relevant to the project and is supported by a detailed breakdown of the project's statutory compliance in Appendix C. Relevant policies, plans, and guidance are also identified and considered throughout this EIS as they relate to the discussion and assessment of specific issues.

4.1 Overview of approval pathway

The Minister for Planning and Public Spaces (Minister) declared the Lake Lyell PHES as SSI and CSSI on 19 June 2024, in accordance with sections 5.12(4) and 5.13 of the EP&A Act. The project's status as CSSI means "it is of a category that, in the opinion of the Minister, is essential for the State for economic, environmental and social reasons". The declaration came into effect on 27 June 2024 and is specified in section 37 of Schedule 5 of *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP).

As CSSI, the project requires assessment and approval under Part 5, Division 5.2 of the EP&A Act. The Minister is the relevant consent authority.

The project is also a controlled action under the Commonwealth EPBC Act and therefore requires assessment and approval under that Act. The Minister for the Environment is the relevant approval authority for the EPBC Act. The project will be assessed under the Bilateral agreement between the Commonwealth and NSW Governments, meaning the assessment process under the EP&A Act is accredited for the purposes of assessment under the EPBC Act.

An overview of the approvals process is shown in Figure 4.1. A single EIS has been prepared to address both the State and Commonwealth requirements for the project, as discussed further in the following sections.

4.2 Power to grant approval

The Minister has the power to make an order that specified development on specified land can be declared SSI and CSSI if it meets the threshold requirements in the EP&A Act. The Minister has exercised that power for the project as noted in Section 4.1.

The project is specified CSSI in section 37 of Schedule 5 of the Planning Systems SEPP. The legal approval pathway for the project is therefore under Part 5, Division 5.2 of the EP&A Act. To obtain approval, the proponent and DPHI have taken the following steps in accordance with Part 5, Division 5.2 of the EP&A Act and relevant sections of the EP&A Regulation:

- the proponent lodged an application and Scoping Report to request SEARs with DPHI on 4 September 2024
- the Planning Secretary issued SEARs and supplementary SEARs on 17 November 2025.

The proponent has prepared and submitted this EIS for assessment in accordance with the requirements of the SEARs, section 5.17 of the EP&A Act and Part 8 of the EP&A Regulation.

The EIS will be placed on public exhibition and the proponent will lodge a Submissions Report in response to any submissions that are made with respect to the project. DPHI will prepare an assessment report for the Minister's consideration, in accordance with the EP&A Act. The project requires approval from the Minister in accordance with section 5.14 of the EP&A Act and this cannot be delegated (see section 2.4(3)(b) of the EP&A Act).

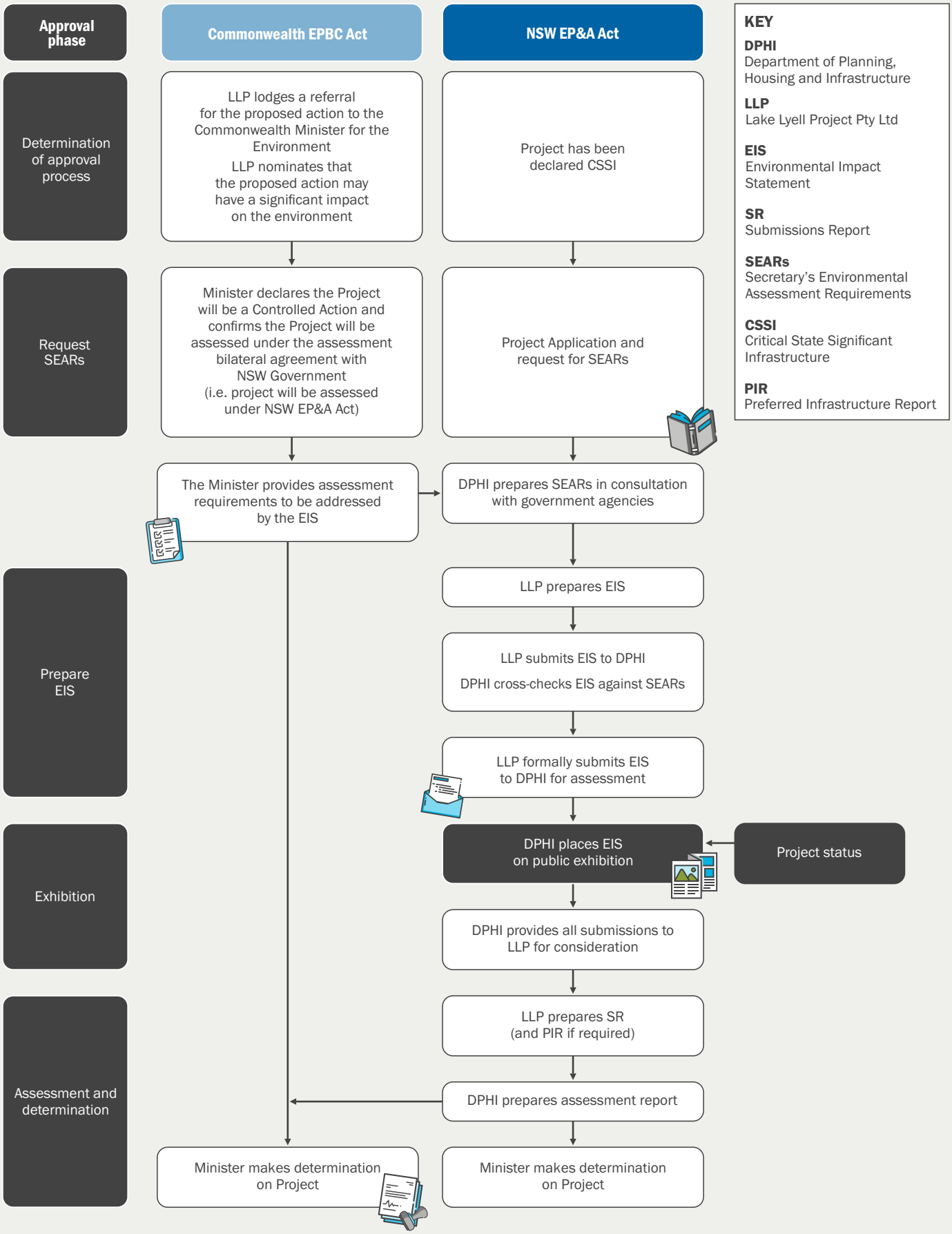


Figure 4.1 Approvals process

4.3 Permissibility

In accordance with section 2.15 of the Planning Systems SEPP, development specified in Schedule 5 of the Planning Systems SEPP may be carried out without development consent under Part 4 of the EP&A Act, and is declared to be SSI and CSSI for the purposes of the EP&A Act.

The project is for the purpose of a pumped hydro energy storage project and is development of the kind specified in Section 37 of Schedule 5 of the Planning Systems SEPP.

The project area is located within the Lithgow LGA.

Due to the project being declared CSSI, the project requires assessment under Part 5, Division 5.2 of the EP&A Act and is permissible only with the Minister's approval under section 5.19 of the EP&A Act.

The land in the project area is zoned SP2 Electricity Generating Works, RU2 Rural Landscape and RU1 Primary Production. Under Chapter 2, Part 2.3, Division 4 of the Transport and Infrastructure SEPP, development for the purpose of 'electricity generating works' is permitted with consent on any land in a prescribed rural, industrial or special use zone. Therefore, if the project was not declared CSSI, it would be development permissible with consent in this zone.

However, the land zoning under the LEP does not affect the permissibility of the project. This is because section 5.22 of the EP&A Act provides that Part 3 of the EP&A Act and environmental planning instruments, including the LEP and the Transport and Infrastructure SEPP, do not apply to CSSI, except to the extent that they apply to the declaration of infrastructure as CSSI and to enabling development to be carried out in accordance with an approval granted under Part 5, Division 5.2 of the EP&A Act.

4.4 Other approvals

This section identifies other approvals that are required to carry out the project and have been grouped into the following categories:

- Approvals that do not apply, which are approvals that may otherwise be required if the project was not SSI and CSSI as per section 5.23 of the EP&A Act (refer to Section 4.4.1).
- Consistent approvals, which are approvals under section 5.24 of the EP&A Act that may be necessary for the project and cannot be refused if the project is approved and must be substantially consistent with the Minister's approval (refer to Section 4.4.1).
- Other approvals, which are approvals that are not expressly integrated into the CSSI assessment process (refer to Section 4.4.2).
- EPBC Act approval (refer to Section 4.4.3).

4.4.1 Approvals that do not apply, or must be applied consistently

Under sections 5.23 and 5.24 of the EP&A Act, certain separate environmental approvals are not required for the project or could not be refused if necessary for carrying out an approved SSI project. The relevance to the project is discussed in Table 4.1.

Table 4.1 Approvals that do not apply or must be applied consistently

Approval requirement	Relevance to the project
Approvals not required under section 5.23 of the EP&A Act	
Fisheries Management Act 1994: A permit under sections 201, 205 or 219	Relevant to these provisions, the project involves earthworks, excavation and emplacement of rock and material around the proposed inlet within and adjacent to Lake Lyell, a diversion of the Farmers Creek arm of Lake Lyell, and temporary and permanent bridge crossing of the Farmers Creek arm of Lake Lyell. The impacts associated with these works has been assessed as part of the CSSI process. Relevant permits for dredging and land reclamation under section 201 would otherwise be required. The project area does not contain marine vegetation (mangroves or seagrass) therefore section 205 is not relevant. Works will be designed in a manner that avoids blocking fish passage per section 219.
Heritage Act 1977: An approval under Part 4 or an excavation permit under section 139	The alternative Town camp is located on the State heritage listed Lithgow Valley Colliery and Pottery Site (SHR#00078). Research and survey of the construction envelope at the Town camp identified archaeological items associated with the historical site. The Statement of Heritage Impact prepared for the project (refer to Appendix M) recommends avoidance of the site and/or the areas of high archaeological significance, and where avoidance is not possible then further archaeological research and design is required in consultation with Heritage NSW. No historical sites or relics were identified from research or survey across the remainder of the construction envelope.
National Parks and Wildlife Act 1979: An Aboriginal heritage impact permit under section 90	Aboriginal heritage items are known to occur within the construction envelope. If not for CSSI, an Aboriginal heritage impact permit would otherwise be required for harm to Aboriginal objects, items or places. Impacts on Aboriginal heritage has been assessed and consultation with registered Aboriginal parties has occurred as part of the CSSI process.
Rural Fires Act 1997: A bushfire safety authority under section 100B	The construction envelope is located on bushfire prone land. The project has been designed with consideration of the RFS Planning for Bushfire Protection (PBP) 2019.
Water Management Act 2000: A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than a groundwater interference approval) under section 91	The project involves the use of a water resource to generate electricity. Construction of the project involves the take of surface and groundwater and will be undertaken within and adjacent to a waterbody. Impacts on water resources has been assessed as part of the CSSI process. Relevant approvals under the *Water Management Act 2000* (WM Act) would otherwise apply.
Approvals that must be applied consistently (section 5.24 of EP&A Act)	
Protection of the Environment Operations Act 1997: Environment Protection Licence	An environment protection licence (EPL) under Chapter 3 of the NSW *Protection of the Environment Operations Act 1997* (POEO Act) will be required as follows: • For construction, an EPL to authorise the carrying out of scheduled development work for "electricity generation". A number of ancillary activities may also be regulated under the EPL, including chemical storage, concrete batching, process water treatment, extractive activities and sewage treatment. • For operation, an EPL to authorise the carrying out of the scheduled activity of "electricity generation".
Roads Act 1993: section 138	A consent under section 138 of the *NSW Roads Act 1993* will be required because the project involves works within public road reserves. Therefore prior to those works being carried out, consent will be obtained from the relevant roads authority.

4.4.2 Other approvals not expressly integrated into the CSSI assessment

Approvals that are required for the Project but are not expressly integrated into the SSI and CSSI assessment are identified in Table 4.2.

Table 4.2 Other approvals required or applicable legislation

<table>
<tr><th>Statute</th><th>Requirement</th></tr>
<tr><td>Biosecurity Act 2015</td><td>There are no biosecurity control orders relevant to the project. However, the general duties under the Biosecurity Act 2015 apply.</td></tr>
<tr><td>Conveyancing Act 1919</td><td>An easement granted under section 88B is likely to be required for the transmission line connection to the Transgrid network.</td></tr>
<tr><td>Crown Land Management Act 2016</td><td>There are no Crown roads within the construction envelope. Farmers Creek is Crown waters and is adjacent to the construction envelope. Any work on Crown land would require appropriate licence or land interest in favour of LLP for LLP to have rights to use these areas during construction and operation of the Project.</td></tr>
<tr><td>Dams Safety Act 2015</td><td>The dam to be constructed and operated as part of the project, will likely be “declared” as a dam under the NSW Dams Safety Act 2015 (DS Act) because the dam walls meet the prescribed criteria in the regulation, being higher than 15 m (section 5 of the DS Act and section 4(1)(a) of the NSW Dams Safety Regulation 2019. Once declared, LLP will need to comply with the DS Act and regulations with respect to ongoing safety management, in particular by implementing a dam safety management system, and preparing an operations and maintenance plan, and an emergency plan, for the dams.</td></tr>
<tr><td>Electricity Supply Act 1995</td><td>The project will both use electricity from the network and generate electricity that will be supplied into the network. During construction and operations, the project will be regulated under the NSW Electricity Supply Act 1995.</td></tr>
<tr><td>Environmental Planning and Assessment Regulation 2021</td><td>Construction and occupation certificates: In accordance with section 188(3)(b) of the EP&A Regulation, these certificates may be required prior to commencing construction and occupation, if the Minister determines to make the requirement for these certificates a condition of approval, if granted.</td></tr>
<tr><td>Heavy Vehicle (Adoption of National Law) Act 2013</td><td>An oversize over mass (OSOM) permit will be required under the Heavy Vehicle (Adoption of National Law) Act 2013 as some deliveries to the project area will exceed the use of legally laden vehicles.</td></tr>
<tr><td>Water Management Act 2000</td><td>Water access licenses are required for surface water and groundwater take. The water access licences required under the WM Act for each stage of the project are identified below.
<table>
<tr><th>Project phase</th><th>Water source</th><th>Water requirement</th><th>Licensing pathway</th></tr>
<tr><td rowspan="2">Construction and initial fill</td><td>Surface water</td><td>311 megalitres per year (ML/yr) construction water supply
6,300 ML initial fill</td><td>Temporary use of EnergyAustralia’s SPAL 27428 (subject to regulatory change) or new SPAL</td></tr>
<tr><td>Groundwater</td><td>87 ML/yr</td><td>Exemption until 2029, then WAL 45574</td></tr>
<tr><td rowspan="2">Operation</td><td>Surface water</td><td>107 ML/yr</td><td>Temporary use of EnergyAustralia’s SPAL 27428 (subject to regulatory change) or acquire re-allocated entitlement</td></tr>
<tr><td>Groundwater</td><td>35 ML/yr</td><td>WAL 45574</td></tr>
</table></td></tr>
</table>

Statute	Requirement
Work Health and Safety Act 2011	Licences under the NSW *Work Health and Safety Act 2011* will be required to transport dangerous goods such as explosives.

4.4.3 Environment Protection and Biodiversity Conservation Act 1999

The project was referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for potential impacts on Matters of National Environmental Significance (MNES), namely threatened species and migratory species. The project is not located on Commonwealth land and is not being carried out by a Commonwealth Government agency. On 3 April 2023, the Minister determined the project under section 75 of the EPBC Act to be a controlled action, with the following controlling provisions:

- Listed threatened species and communities (sections 18 and 18A).
- Listed migratory species (sections 20 and 20A).

The bilateral agreement between the Commonwealth of Australia and the State of NSW relating to environmental assessment (the assessment bilateral agreement), allows the Commonwealth Minister for the Environment to rely on specified environmental impact assessment processes of the State of NSW in assessing actions under the EPBC Act. The Minister has determined the project will be assessed using the assessment bilateral agreement. As highlighted in Section 4.1, approval from the Commonwealth Minister for the Environment and Water is required. However, a single EIS has been prepared to address both the State and Commonwealth requirements for the project.

4.5 Pre-conditions to exercising the power to grant approval

The pre-conditions to the Minister exercising the power to grant approval to the Project are as follows:

- An application for the approval of the Minister under Part 5, Division 5.2 of the EP&A Act to carry out CSSI must be made (section 5.19(1)(a) of the EP&A Act). An application for the project was lodged in the required form.
- Landowner consent is not required to lodge the application because the project is CSSI (section 181(5)(b) of the EP&A Regulation), however notice of the application is required to be given in accordance with section 181(6) of the EP&A Regulation. Notice was given in accordance with section 181(6)(b) of the EP&A Regulation as follows:
  - notice of the application has been published on the NSW Planning Portal
  - notice of the application has been published in the local newspaper.
- If the EIS is considered to the meet the SEARs, the DPHI will place it on public exhibition (for at least 28 days) (section 5.26(2) of the EP&A Act).
- Following the exhibition period, the Planning Secretary will prepare an assessment report on the CSSI project for the purpose of the Minister's consideration of the application for approval (section 5.19(1)(b) of the EP&A Act).

To ensure the above pre-conditions are met, section 5.18 of the EP&A Act specifies what must be included in the Planning Secretary's report, as follows:

- A copy of the proponent's EIS and any preferred infrastructure report.
- Any advice provided by public authorities on the CSSI.
- A copy of any report or advice of the NSW Independent Planning Commission in respect of the CSSI.
- Any environmental assessment undertaken by the Planning Secretary or other matter the Planning Secretary considers appropriate.

4.6 Mandatory matters for consideration

The mandatory matters that the consent authority is required to consider before granting approval are listed in Table 4.3. These considerations have been addressed in the EIS. While not mandatory, relevant environmental planning instruments have also been considered throughout the EIS and are detailed in Appendix C.

Table 4.3 Mandatory considerations for the project

Statutory document	Section reference	Mandatory consideration
Considerations under the EP&A Act and Regulation		
Environmental Planning and Assessment Act 1979	Section 1.3	Relevant objects of the Act. These are listed and discussed in Appendix C.
	4.15(1)	In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application— a) the provisions of— (i) any environmental planning instrument, and (ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and (iii) any development control plan, and (iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), (v) (Repealed) that apply to the land to which the development application relates, b) the significant likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality, c) the suitability of the site for the development, d) any submissions made in accordance with this Act or the regulations, e) the public interest.
	Section 5.19(2)	a) the Planning Secretary's report on the infrastructure and the reports, advice and recommendations contained in the report; and b) any advice provided by the Minister having portfolio responsibility for the proponent. The Minister with portfolio responsibility for the proponent is the Minister for Energy and Environment; and

Statutory document	Section reference	Mandatory consideration
		c) any findings or recommendations of the NSW Independent Planning Commission following a review in respect of the SSI.
Environmental Planning and Assessment Regulation 2021	Section 193	When determining the project, the Minister must have regard to the objects of the EP&A Act, which includes the principles of ecologically sustainable development (ESD) as specified at section 193 of the EP&A Regulation. This EIS (refer to Chapter 20) has considered and addressed the principles of ESD as follows: a) the precautionary principle b) inter-generational equity c) conservation of biological diversity and ecological integrity d) improved valuation, pricing and incentive mechanisms.
Considerations under other legislation		
Biodiversity Conservation Act 2016	Section 7.14	The EP&A Act has effect subject to the provisions of Part 7 of the NSW *Biodiversity Conservation Act 2016* (BC Act) (section 1.7 of the EP&A Act). Section 7.14 of the BC Act requires that the Minister, when determining an application for CSSI that is required to be accompanied by a Biodiversity Development Assessment Report (BDAR) (which is the case for this project), must consider the likely impact of the project on biodiversity values as assessed in the BDAR. The Minister may (but is not required to) further consider under the EP&A Act, the likely impact of the project on biodiversity values. A BDAR for the project has been completed and is attached at Appendix J.
Biodiversity Conservation Act 2016	Section 7.16	If the Minister is of the opinion that the proposed project is likely to have serious and irreversible impacts on biodiversity values, the Minister is required to take those impacts into consideration, and is required to determine whether there are any additional and appropriate measures that will minimise those impacts if approval is granted (section 7.16(3) of the *Biodiversity Conservation Act 2016*).

Chapter

5

Community engagement

Environmental Impact Statement |
Lake Lyell PHES Project

5 Community and stakeholder engagement

An Engagement and Consultation Report has been prepared and is provided at Appendix D of this EIS. This chapter provides a summary of the report, specifically the engagement activities which have been carried out to inform communities about the project, the key stakeholder and community views expressed during the engagement activities and how they have informed the project and EIS, and future engagement plans should the project proceed. These activities have been guided by the SEARs and the requirements set out in the *Undertaking Engagement Guidelines for State Significant Projects* (Engagement Guidelines 2024) (DPHI 2024).

5.1 Engagement context

EnergyAustralia and EDFA (referred to as LLP, as trustee), are developing the project. EnergyAustralia has been a longstanding operator in the local area due to its ownership of the nearby Mount Piper power station and has been actively undertaking community engagement since acquisition of both Mount Piper and Wallerawang power stations in July 2013. EDFA is an indirect wholly owned subsidiary of EDF, one of the world's largest, diversified low-carbon energy producers. The partnership between EnergyAustralia and EDFA, as LLP, provides extensive local and international experience across the project life cycle.

The project team began engaging and consulting with community members and other stakeholders across the Lithgow LGA in 2021. An Engagement and Consultation Report has been prepared (refer to Appendix D) that documents the engagement activities completed to date and also sets out the plans for future engagement, and is accompanied by:

- Shared Benefit Program Summary – an outline of the decision-making principles, funding streams and allocations, and the key functions of the Shared Benefit Program
- Information Summary – provides a comprehensive overview of all project information and communication materials distributed to the community since project inception.
- Neighbour Agreement Guide – provides guidance on the negotiation of agreements with impacted neighbours.

These documents have been considered as part of the EIS, where relevant to specific technical assessments or to inform mitigation of impacts.

5.2 Community engagement framework

The engagement framework adopted for the project is informed by the Engagement Guidelines and the Engagement Institute Spectrum, including the development of the project's communication and engagement objectives which align to specific engagement phases (refer to Figure 5.1).

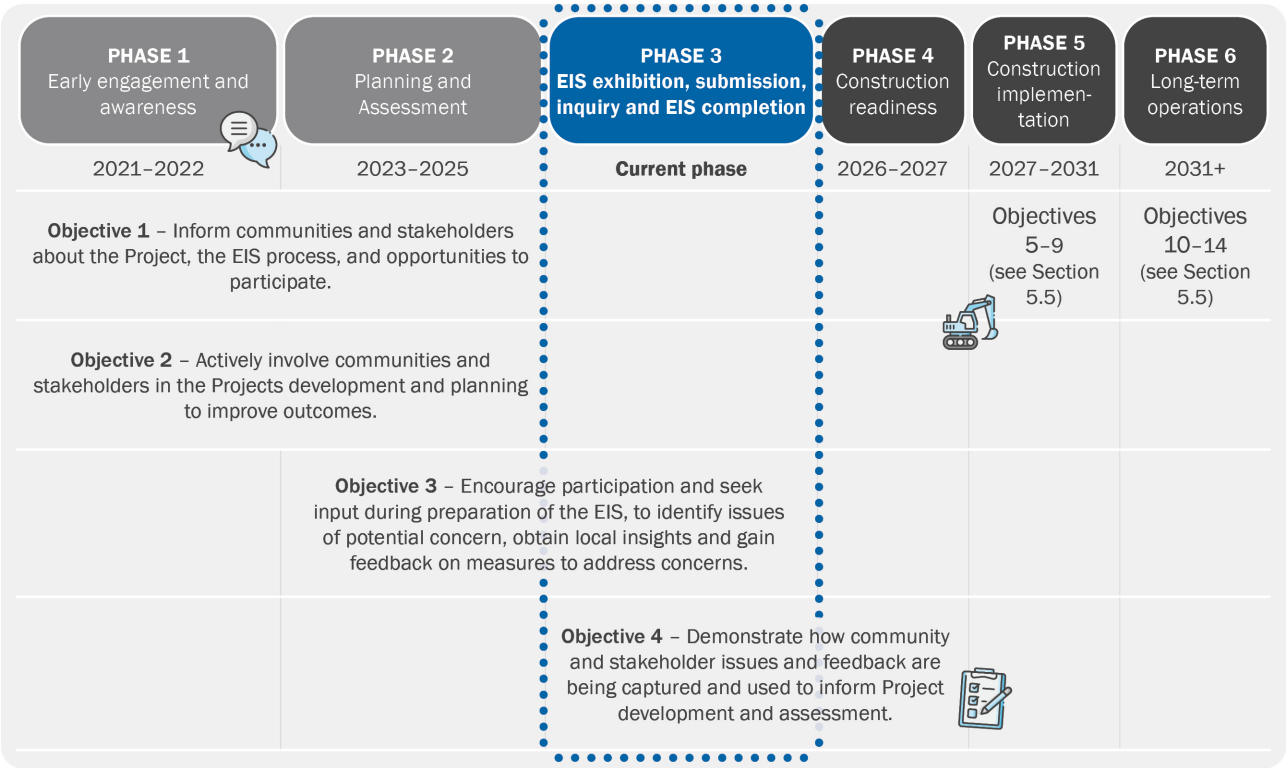


Figure 5.1 Engagement phases and objectives

Phase 1 and 2 have been completed and were focused on the planning and assessment of the project (2021 to 2025), with the engagement carried out further described in the following section (Section 0). Phase 3 is focused on the EIS exhibition through to determination of the CSSI application by the Minister for Planning, Housing and Infrastructure (current phase). Phase 4, 5 and 6 are future engagement phases (2026 onward) focused on construction readiness, implementation and long-term operations (and are described in Section 5.5).

5.3 Key stakeholders

The project team identified a diverse range of stakeholders including individuals and stakeholders directly affected by the project, as well as people, groups and organisations within the broader community who have local or specialised knowledge and feedback to share.

Table 5.1 Summary of project stakeholders

Stakeholder category	Stakeholder	Project interests
Commonwealth Government	• Australian Energy Infrastructure Commissioner • Commonwealth Treasury • Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) • Regional Development Australia	• Understanding project rationale and benefits • Impacts and sentiment of constituents • Community consultation process
NSW Government NSW Statutory authorities	• NSW Department of Planning, Housing and Infrastructure (DPHI) • NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) | Conservation Programs, Heritage and Regulation (CPHR) • NSW National Parks and Wildlife Service (NPWS) • NSW DCCEEW | Water • NSW DCCEEW | Heritage NSW • NSW Department of Primary Industries (DPI) | Agriculture • NSW DPI | Fisheries • NSW Environment Protection Authority (EPA) • NSW Crown Lands • Fire and Rescue NSW • NSW Rural Fire Service • Department of Regional NSW | Mining, Exploration and Geoscience • Transport for NSW (TfNSW) • Transgrid • WaterNSW • Dams Safety NSW	• Understanding project rationale and benefits • Impacts and sentiment of constituents • Community consultation process • Planning process complies with applicable legislation and requirements • Involvement in project development and assessment • Optimal outcomes for environment and community • Preparation of EIS and conformance with SEARs • Broader regulatory requirements
Local Government	• Councillors, executive and officers of Lithgow City Council	• Understanding project rationale and benefits • Understanding and avoiding / minimising adverse impacts on Lithgow City Council land and assets, local residents, businesses, and the environment • Opportunities to provide input to project planning and delivery • Opportunities to regenerate or transition local industries, businesses and the economy • Community consultation process • Infrastructure benefiting local communities

Stakeholder category	Stakeholder	Project interests
Registered Aboriginal Parties and Traditional Owners	• Registered Aboriginal Parties: – Didge Ngunawal Aboriginal Corporation – Kamilaroi Yankuntjatjara Working Group – Wingarra Wilay Aboriginal Corporation – North East Wiradjuri Corporation – Konanggo Aboriginal Cultural Heritage Services – Girragirra Murun Aboriginal Corporation – Gallanggabang Aboriginal Corporation – Booral Maliyan – Wellington Valley Wiradjuri Aboriginal Corporation – Warrabinga Native Title Claimants Aboriginal Corporation – Yurwang Gundana Consultancy Cultural Heritage Services – Thomas Dahlstrom Cultural Heritage Consult – Tim Stubbs – Yulay Cultural Services – Mingaan Lithgow Aboriginal Corporation – Murrabidgee Mullangari – Bathurst LALC – One Mob – Wiradyuri Traditional Owners Central West Aboriginal Corporation – Bill Allen – Barrinang Aboriginal Corporation – One party registered but did not want to be named in publicly available reports	• Understanding cultural values of Mount Walker, Lake Lyell and surrounds • Understanding project rationale and benefits • Understanding and avoiding / minimising potential adverse impacts • Water resource use. Opportunities to provide input to project planning, delivery, and land use • Minimising impacts to Native Title land • Development and implementation of Cultural Heritage Management Plan for the management of artefacts and areas of significance, if required • Optimal outcomes for Country including natural environment • Opportunities for First Peoples businesses and employment
Energy market operators and regulators	• Australian Energy Market Commission • Australian Energy Market Operator • Clean Energy Regulator • Energy Security Board	• Understanding project scope, capacity and operations • Grid connection • Safety • National Electricity Market operations
Industry groups, peak bodies and NGOs	• Clean Energy Council • Unions NSW	• Understanding project rationale, benefits and impacts • Opportunities to provide input to project planning and delivery • Opportunities to regenerate or transition local industries, businesses and the economy • Opportunities for local businesses and job seekers

Stakeholder category	Stakeholder	Project interests
Local community, business and tourism	• EnergyAustralia's Community Consultative Committee • Mount Piper power station employees • Lithgow Business Association • Lithgow District Chamber of Commerce • Cullen Bullen Progress Association • Concerned Lithgow Community Group • Hartley District Progress Association • Capertee and District Progress Association • Centennial Coal – Springvale Mine • Lake Lyell Community Group Lake Lyell recreational users and businesses • Rydal Village Association • Wallerawang Lidsdale Progress Association • Local residents • Rydal community • Lithgow community • Portland community • Lidsdale community • Wallerawang community • Cullen Bullen community • Accommodation and service providers	• Understanding project rationale and benefits • Understanding potential cumulative impacts from other projects in local area • Ability to provide local knowledge to enhance the project and delivery and to help avoid/minimise impacts • Opportunities to provide input to the project • Clear information and updates about the project • Maximising local benefits from the project • Opportunities for local businesses and employment
Environmental groups and NGO's	• National Conservation Council (NSW) • Australian Foundation for Wilderness • Lithgow Environment Group Inc • Blue Mountains Conservation Society • Bathurst Community Climate Action Network • Lithgow -Oberon Landcare Association	• Understanding project rationale, benefits and impacts • Understanding and avoiding/minimising adverse impacts • Opportunities to provide input to project planning and delivery
Education institutions	• Local primary and secondary schools • TAFE NSW – Lithgow • NSW Skills Commission • Western Sydney University • Charles Sturt University • University of New South Wales	• Clear information and updates about the project • Future workforce needs and opportunities
Media	• Lithgow media (print, TV, radio, online) • NSW and Australian media (print, TV, radio, online) • Specialist media	• Clear information and updates about the project • Involvement in key milestone media opportunities • Access to project team for interviews and public comment

5.4 Engagement carried out during the preparation of this EIS

5.4.1 Engagement activities

A detailed timeline of engagement activities is provided at Attachment A of the Engagement and Consultation Report (refer to Appendix D). A summary of engagement to date is shown in Figure 5.2. The purpose of engagement activities carried out was to raise project awareness, keep community and stakeholders informed, and collect feedback and insights through meaningful conversations.

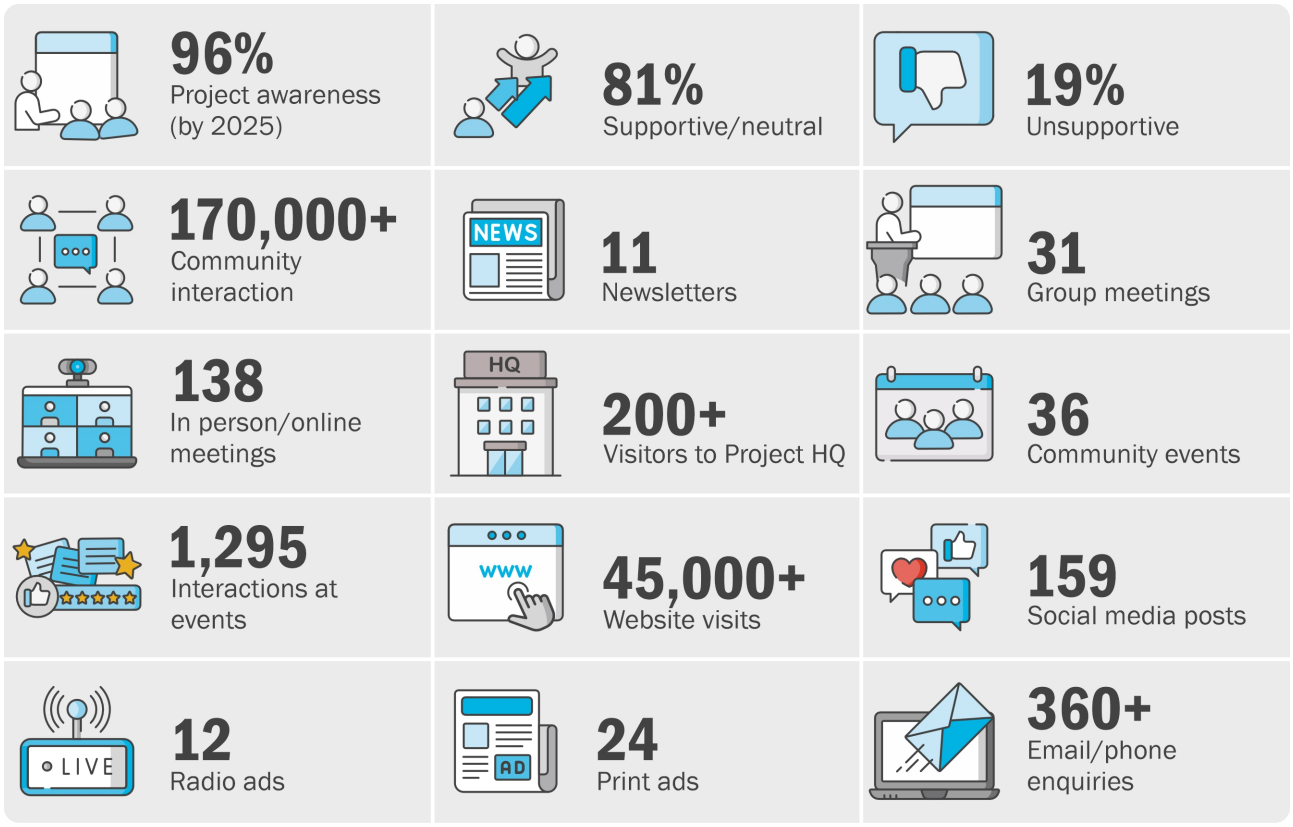


Figure 5.2 Summary engagement and consultation completed 2021 to 2025

The methods used for engagement included:

- project team briefings and presentations
- EnergyAustralia Lithgow Region Community Consultative Committee meetings
- community pop-up/drop-in engagement sessions
- Project HQ – a physical shopfront located in Lithgow's Main Street, open for enquiries and information
- a dedicated project email and phone number for email and phone enquiries
- a dedicated project website (lakelyellpumpedhydro.com.au) – the website hosts project information including fact sheets, explanatory videos, community newsletters and responses to frequently asked questions (FAQs)
- media announcements, including social media posts, radio advertisements and printed news
- fact sheets, available online (project website) or in-person (Project HQ)

- community newsletters providing updates on the project
- mailouts and letterbox drops – used for notification of investigative works, obtaining feedback, or providing updates on the project (e.g. distribution of community newsletters).

Awareness and promotion of engagement activities, inviting attendance and feedback, was primarily conducted via advertising – print (newspaper), radio and mailout distribution (via the opt-in project mailing list).

Detailed consultation and engagement was also carried out with the Aboriginal community as part of the preparation of the Aboriginal cultural heritage assessment (ACHA), including conducting field surveys and review of the assessment and management recommendations. A summary of this consultation is provided at Appendix L. Engagement was also carried out separate to the ACHA and included knowledge sharing workshops run by Traditional Owners.

Lithgow City Council is a key stakeholder and have been engaged with since 2021. A wide range of presentations, briefings, site tours and workshops have underpinned sustained and continuous engagement with the Lithgow City Council Executive and Councillors. Project engagement has also included specific requirements in relation to development applications to undertake geotechnical and feasibility studies, and in relation to the traffic impact assessment for the EIS.

Engagement with government agencies was carried out to inform the preparation of technical assessments. This includes clarification of survey requirements, discussion of project impacts and mitigation, and offsetting proposals where relevant. Engagement was conducted primarily via online meetings and email correspondence.

5.4.2 Application of feedback

Throughout each engagement and consultation phase, feedback and input are received from the community and stakeholders which is used to inform aspects of the project from the project design to mitigations, to the construction methodology. All community and stakeholder interactions are recorded and documented by LLP using consultation management software, or in specific consultation outcome reports. This data is used for input and analysis at the end of each phase of consultation.

The EIS process provides a formal mechanism to assess, quantify, and respond to these concerns through project design, detailed technical studies prepared in accordance with NSW Government guidelines, and/or development of appropriate mitigation measures and minimisation strategies. Detailed consideration of all feedback is documented in the Consultation and Engagement Report (refer to Appendix D) and summarised in Section 5.5.

5.4.3 Alignment with engagement objectives

Project engagement has been consistent with the community participation objectives in the *Undertaking Engagement Guidelines for State Significant Projects* and the requirements of the SEARs (shown in Figure 5.3). Alignment with these objectives is provided in Table 5.2.

Figure 5.3 Engagement guidelines for State significant projects

Table 5.2 Alignment with engagement guidelines

Guideline objective	How the project has aligned with the objective
Plan early	• identifying the people and groups who may have an interest in or be affected by the project • considering the level of influence participants can have on elements of the project • considering the kinds of activities that will be appropriate, proportionate, effective and practical to support robust and rigorous engagement
Engage early	• by being transparent with intentions and proposed project • scoping and understanding community views from the outset
Engage effectively	• continuing to tailor engagement to enable people to participate • reflecting what was heard, how feedback was considered and how it has influenced the project • listening to direct and indirect stakeholder and community representatives about the project
Engage proportionate to scale and impact	• continuing to find ways to minimise consultation fatigue • delivering information and regular updates to all residents • continuing to ensure each engagement activity has a clear purpose for participants
Be innovative	• using multiple engagement channels including traditional print, in person and digital • adapting our multiple engagement channels to better meet the information needs of the community • continuing to use multiple engagement methods and developing shorter video content
Be open and transparent about what can be influenced	• being clear about the positioning and likely engineering requirements for a pumped hydro • continuing to seek input on the proposed mitigations • using feedback to change the design and site position of the upper reservoir • seeking input to identify the types of mitigations available to neighbours • co-designing shared benefits arising from the construction and operation of the project
Implement community participation objectives	• open and inclusive engagement activities • easy to access information • relevant information that is proactive or which responds to information needs • timely engagement activities that are aligned to project activities • meaningful so that the time and effort invested by participants is valued and evidenced • relevant information that is proactive or which responds to information needs

5.5 Stakeholder feedback and community views

This section summarises the stakeholder feedback and community views received during the preparation of the EIS. Detailed feedback and how this feedback has been addressed is provided in the Consultation and Engagement Report (refer to Appendix D).

5.5.1 Government and agency feedback

Engagement with government departments and regulatory agencies has been a critical part of the project's development. These stakeholders provide the technical, policy, and statutory oversight that ensures the project aligns with environmental, social, and planning requirements under relevant legislation and guidelines.

Feedback from agencies has been gathered through briefings, written submissions, and formal review processes. This feedback has informed design refinements, environmental investigations, and the preparation of detailed management plans within the EIS. A summary of feedback obtained during the EIS is provided in Table 5.3.

Table 5.3 Summary of government and agency feedback

Government Department / Agency	Key issues or topics raised	Where addressed in EIS
Commonwealth Government DCCEEW | Environment	• Potential impacts to MNES, particularly relating to vegetation removal, habitat fragmentation, and indirect effects on threatened and migratory species. • Threatened flora and fauna species to be included in the biodiversity survey program • Confirmed that the project was a controlled action under section 75 of the EPBC Act • Changes to the referred project within the project area can be made by varying the action	Biodiversity Development Assessment Report (BDAR) (Appendix J) and Aquatic Ecology Assessment (AEA) (Appendix K) assess potential impacts to MNES
Australian Government | Australian Energy Infrastructure Commissioner	• How the project is managing the interests and impacts experienced by neighbours • Concerns raised by the broader community • Clarity on the process, support mechanisms, and ongoing engagement with those living closest to the proposed infrastructure	Consultation and Engagement Report (Appendix D) provides details on the consultation tools for the project and how near neighbours have and will be engaged
DPHI	• Key issues as advised by the SEARs • Community and stakeholder engagement activities and progress • Near neighbour engagement and agreement for associated impacts • Visual impact assessment and mitigation • Aboriginal heritage engagement, impacts and management	Consultation and Engagement Report (Appendix D) provides details on the consultation tools for the project and how near neighbours have and will be engaged Aboriginal Cultural Heritage Assessment (ACHA) (Appendix L) Landscape and Visual Impact Assessment (LVIA) (Appendix N)

Government Department / Agency	Key issues or topics raised	Where addressed in EIS
NSW DCCEEW | CPHR	• Impacts to threatened species and native habitat • Application of survey and assessment guidelines, including guidance on specific threatened species and application of SAII guidelines	BDAR (Appendix J) has been prepared in accordance with the Biodiversity Assessment Method and supplementary guidance provided by CPHR
NSW DCCEEW | NPWS	• Potential impacts to land managed by NPWS • Project footprint, temporary works areas and construction access routes to remain entirely outside the boundary of Marangaroo National Park • Access through NPWS land subject to agreement for geotechnical investigations	BDAR (Appendix J) Soils, Land and Rehabilitation Assessment (SLRA) (Appendix T) assess the project against NPWS guidelines
NSW DCCEEW | Water	• Requirements for both surface water and groundwater during construction and operation • Water licensing pathway • Interaction with Coxs River Scheme and Fish River	Water Licensing Strategy (Appendix H)
NSW DCCEEW | Heritage NSW	• Adequate engagement with RAPs • Avoidance of the State heritage item #00078 Lithgow Valley Colliery and Pottery Site (located in the disturbance footprint for the alternative accommodation camp option) as a preferred strategy, or avoidance of areas of high archaeological sensitivity if the Town camp is chosen through design • Further engagement with Heritage NSW if Town camp is selected. Not required if Lakeside camp is selected	ACHA (Appendix L) Statement of Heritage Impact (SOHI) (Appendix M)
NSW DPI Fisheries	• Requested information pertaining to the diversion of Farmers Creek arm of Lake Lyell, the design of the inlet structure, and other relevant construction and operational management details • Recommended deep pools are included in diversion design • Approach to offsetting the loss of key fish habitat	AEA (Appendix K)
NSW EPA	• Water management and discharges to the environment • Information on how the project would manage potential blasting / nitrate impacts from spoil • Air quality and greenhouse gas assessment considerations, such as decomposition of vegetation	Surface Water Assessment (SWA) (Appendix F) Excavated Rock Management Strategy (ERMS) (Appendix I) Air Quality Impact Assessment (AQIA) and Greenhouse Gas Assessment (GHG assessment) (Appendix S.1 and S.2)
NSW Crown Lands	• Crown land and Crown waterways and whether approvals or licences are required	Detailed maps and plans (Appendix B.2). No Crown land or waterways are within the construction envelope.

Government Department / Agency	Key issues or topics raised	Where addressed in EIS
TfNSW	• Traffic impact assessment and OSOM assessment • Requested detailed justification for the proposed signalisation of the Magpie Hollow Road and Great Western Highway intersection, and sought assurance that all alternative options had been explored • TfNSW indicated they would not support posted speed limit reductions on Magpie Hollow Road • Requested regular meetings to discuss emerging design, traffic impacts, and the strategic justification for intersection upgrades	Traffic Impact Assessment (TIA) (Appendix Q)
Transgrid	• Connection request to 330 kV line is required • Design of connection must meet Transgrid standards	Detailed maps and plan (Appendix B.2)
WaterNSW	• Project is within Sydney's water drinking catchment an requires a NorBE assessment • Inclusion as a key stakeholder in reviewing the EIS	SWA (Appendix F)
Dams Safety NSW	• Compliance with Dams Safety NSW standards, incorporate appropriate engineering and monitoring systems, and develop robust emergency planning in coordination with emergency services and local authorities	Consultation and Engagement Report (Appendix D) outlines proposed engagement

5.5.2 Lithgow City Council

The summary provided below captures feedback recorded since 2021, including from both the previous and current Councils. It is important to note that the views expressed over this period may not fully represent the current position or sentiment of Lithgow City Council in 2025, given the change in elected representatives since 2021 and evolving political context. The feedback includes views of elected representatives as well as Lithgow City Council administrators.

Table 5.4 Summary of Lithgow City Council feedback

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
Strategic context	Regional energy transition and local governance position	• Elected Council expressed concern about the strategic justification of the project within the broader regional and state energy transition • In January 2025 Lithgow City Council moved a motion opposing the project	Chapter 2
Project design	Roads, access and traffic safety	• Lithgow City Council's Administration provided detailed feedback on road and traffic matters associated with the project and expressed strong support for the proposed upgrades to local road infrastructure • Clarity on how the project will manage temporary impacts to property access and ensure appropriate biosecurity controls are in place • Lithgow City Council requested further detail on road rehabilitation and decommissioning requirements • Lithgow City Council requested consideration of a Voluntary Planning Agreement; however, noted this was ultimately at the discretion of the proponent	TIA (Appendix Q)
	Waste management and utilities provision	• Concerns about the capacity of local waste management services and utilities infrastructure to support the project should it proceed • Clarity on the nature and volume of waste streams generated during construction and operation, how these would be managed to avoid burdening local services, and what utilities infrastructure (water, sewer, power, telecommunications) the project would require	Waste Management Assessment (Appendix Y)
Community engagement	Public understanding of EIS	• Provide communication materials explaining the EIS for community	Community and Engagement Report (Appendix D)
Environmental, social and economic impacts	Aquatic ecology and species protection	• Impacts and management of the Lake Lyell platypus population	AEA (Appendix K)

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
	Recreation, tourism and public access	• Recreational assets, lake access and foreshore management • Note high value the community places on swimming, boating, fishing and foreshore recreation at Lake Lyell and sought reassurance that the project would not permanently reduce access or diminish the recreational experience • How safety, water levels, public access, and new recreational facilities would be communicated and managed	Community and Engagement Report (Appendix D) Social Impact Assessment (SIA) (Appendix O)
	Worker's accommodation, community interface and legacy considerations	• Worker's accommodation – visual impacts, traffic interface and long-term reuse • Potential impacts of the workers' accommodation facility • Accommodation facility should minimise visual intrusion • Potential long-term community benefit if retained or repurposed after construction	LVIA (Appendix N)
	Local economic benefits, workforce and regional development	• Information on economic contribution, local jobs and support for local contractors • Clarity on long-term employment opportunities for Lithgow residents and the role the project could play in diversifying the local economy as the region • How economic benefits would be distributed across the construction and operational phases and mitigations for any potential negative economic pressure	Economic Assessment (Appendix P) Community and Engagement Report (Appendix D)
	Investment profile and regional economic significance	• Overall project value and contribution to regional investment	Economic Assessment (Appendix P)
	Community benefit and long-term regional legacy	• Operation, governance and community outcomes of the Shared Benefit Program	Attachment C of Consultation and Engagement Report (Appendix D)
	Construction program and delivery timeline	• Information about the anticipated construction timeline • Clarity on the duration of construction, sequencing of major works, and how the overall program would interface with local planning	Detailed Project Description (Appendix B.1)
Project justification	Land ownership, need for project and Lithgow City Council position	• Appropriateness of the site and Lithgow City Council's position on the project • Clarity on why this site was chosen, whether alternative locations were considered, and how the project aligns with local planning priorities	Chapter 2 Chapter 20

5.5.3 Local and regional community views, including special interest groups and organisations

Community feedback has highlighted a wide range of issues directly related to the project's design, construction and operation. The feedback captured considers community members in the local area of Lithgow and surrounding suburbs, but also broader community members from the Blue Mountains or visitors from elsewhere across the region.

Table 5.5 Summary of local and regional community views

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
Strategic context	Regional transition and energy transformation	• Views ranged from supporting traditional coal-based economy to supporting a more diversified energy future • Renewable energy could provide jobs, investment and industry diversification • Uncertainty on why pumped hydro is needed • Uncertainty on why Lake Lyell was chosen as the location for pumped hydro • The project could alter the character, environmental values, and tourism appeal of the area • Project benefits may not outweigh project impacts	Chapter 2 Chapter 20
	Understanding of alternative pumped hydro sites	• References to (Blakers) Pumped Hydro Energy Storage Atlas noting that Lake Lyell does not appear in the list of sites, questioning whether the project is feasible	Chapter 2
Project design	Project design and operations	• Understanding the technology of how pumped hydro works and the scenarios for its operation	Detailed Project Description (Appendix B.1) Attachment D of Consultation and Engagement Report (Appendix D)
Community engagement	Ongoing engagement and complaint handling	• How complaints will be received, managed, and resolved during the construction phase • Regular reporting on complaints trends and responses, to demonstrate that issues are being taken seriously and that corrective actions are implemented • The need for consistent, transparent and responsive engagement throughout the life of the project, including clear feedback loops for how community input has shaped project decisions • Concern and loss of trust from the process without adequate engagement	Attachment B of Consultation and Engagement Report (Appendix D)

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
Environmental, social and economic impacts	Biodiversity – terrestrial ecology and offsets	• Concern about potential impacts on local flora and fauna, particularly threatened species and their habitats • Sought confidence that disturbed areas would be properly rehabilitated, and that biodiversity offsets would be meaningful, well-managed, and local • Whether biodiversity offsets can genuinely compensate for the loss of high-quality habitat and the displacement of threatened species • The project could disrupt existing fauna movement corridors, particularly along forested ridgelines, riparian zones, and drainage lines connecting to Lake Lyell • Preference for project design and rehabilitation works to retain and restore vegetated linkages, incorporate fauna-friendly crossings or underpasses where access roads are required, and ensure revegetation uses native species that support habitat continuity • Concerned that construction activity could introduce or spread weeds and pests	BDAR (Appendix J)
	Biodiversity – aquatic ecology	• Strong concern about how the project could affect platypus populations • Sought reassurance that construction (especially tunnelling, blasting, and water releases) and operational drawdown of the reservoir would not cause injury, strand animals, or destroy burrows • Partnering with local wildlife experts or universities to monitor platypus health and population trends before, during, and after construction, and to publicly report findings • Impacts to fish movement and aquatic connectivity • Potential impacts on water quality	AEA (Appendix K)
	Visual and landscape	• Potential changes to the landscape character, scenic outlooks, and the visual amenity of properties and public viewpoints • Concerns about light spills, glare, and reduced night-sky visibility during both construction and operation of the project. In particular, concern about night-time glow from operational facilities such as the powerhouse and lower reservoir area • Requested the use of natural screening and vegetation buffers to help blend project infrastructure into the surrounding landscape, in particular using native species	LVIA (Appendix N)

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
	Cultural heritage and first nations values	• Protection of cultural heritage places, artefacts, and landscapes across the project area • Concern that construction activities could disturb undiscovered artefacts or sites of spiritual or cultural significance • Storylines, intangible heritage, access to Country • Reassurance that the project would ensure ongoing consultation, early involvement in surveys, and transparent decision-making about any artefact finds or management measures • How cultural heritage knowledge would be respected and protected, and whether Aboriginal people would be involved in rehabilitation, cultural interpretation, and naming of project features	ACHA (Appendix L)
	Construction impacts	• Clarity on how long construction would take, when different stages would occur, and how impacts such as noise, dust, and traffic would be managed over that period	
	Water use and recreation	• Concerns about how project operations could affect Lake Lyell's water levels and public access for recreation, including swimming, boating, and fishing • The importance of maintaining Lake Lyell as a valued community asset • Communication about any temporary restrictions, safety zones, or long-term changes to recreational use • Concern about safety during construction and operation — particularly regarding water access, recreation near project areas, and dam operation risks • Requests for improved or maintained access to recreational facilities such as jetties, picnic areas, camping sites, and walking trails	SIA (Appendix O) Attachment C of Consultation and Engagement Report (Appendix D)
	Traffic, transport and roads	• Concern about increased construction traffic, particularly the movement of heavy vehicles on local roads • Specific concerns about interactions with school buses, cyclists, and farm machinery on narrow rural roads • Traffic management measures, designated haulage routes, and scheduling heavy vehicle movements outside school and commuter peak periods to minimise safety risks and disruption • Concern for who is responsible for paying for road upgrades, how decisions about road improvements are made, and what commitments exist to repair damage caused by construction vehicles	TIA (Appendix Q)

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
	Noise, dust and vibration	• Concerns about increased noise, dust, and vibration from construction activities • Concerns about vibration, noise, and dust from tunnelling and blasting activities and lack of certainty about when they would occur • Reassurance that monitoring would be in place, that mitigation measures such as dust suppression and noise barriers would be used, and that there would be clear points of contact to report issues or request respite	Noise and Vibration Impact Assessment (NVIA) (Appendix R)
	Spoil management	• Concerns about how spoil from tunnelling, excavation, and dam construction would be managed, stored, or transported • Opportunities to reuse suitable spoil for local or community benefit	ERMS (Appendix I)
	Water and soils	• Concerns that large-scale excavation, tunnelling, and earthworks could lead to soil erosion, sediment runoff, or contamination of nearby waterways • Rainfall events could wash sediment into creeks or Lake Lyell, affecting water quality, aquatic life, and recreation • Sought reassurance that strict controls, monitoring, and contingency plans would be in place to prevent any pollution	SWA (Appendix F)
	Workforce accommodation and local economy	• Mixed feedback on the proposed location of worker accommodation, with views divided between the proposed sites - the preferred camp near the lake at Magpie Hollow and the alternative option within town at the former Pottery Estate – Support for a town-based location, noting it could bring economic benefits to local businesses and reduce potential environmental and visual impacts near Lake Lyell – Support for a lakeside location, citing proximity to the work site and reduced daily traffic movements – Workforce camp at either location would need to be well-managed, with appropriate visual design and clear expectations around behaviour, noise, and traffic movements • Local businesses expressed strong interest in participating in the project and benefiting from the economic opportunities • Inflationary pressures (rent, groceries, fuel) caused by influx of workers	SIA (Appendix O)
	Workforce management	• Pedestrian and school-bus safety • Concerns about potential workforce behaviour and social impacts associated with a large influx of non-local workers • Concern that an influx of construction workers could place additional pressure on local services, particularly healthcare, hospitals, and emergency response capacity	SIA (Appendix O)

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
	Economic impact	• Importance of local employment and training as one of the most meaningful ways the Lake Lyell Project can deliver long-term benefits for the Lithgow region • Strong support for opportunities that create local jobs, apprenticeships, and partnerships with schools and training providers • Lithgow should receive meaningful and sustained benefits from the project, with strong interest in grants, sponsorships, and co-funded partnerships that would support local facilities, services, and community-led initiatives • Concerns about how the project may affect tourism and the local visitor economy during construction and operation	Attachment C of Consultation and Engagement Report (Appendix D) SIA (Appendix O) Economic Assessment (Appendix P)
	Construction impacts	• Concern that parts of the construction may operate 24 hours a day • Noise, lighting, and vibration impacts during the night, as well as sleep disturbance and general loss of amenity • Information on what activities would occur outside standard hours, how often, and what measures would be in place to minimise disruption or provide respite	NVIA (Appendix R) Consultation and Engagement Report (Appendix D)
	Land, property and access	• Concerns about how construction activities and workforce movements could increase ignition or fire risk in the area • Emergency vehicle access during bushfire and whether construction activities could interfere with local RFS operations or evacuation routes.	Bushfire Risk Assessment (Appendix U)
	Social, community and benefit sharing	• Structure, fairness and eligibility of community benefit programs	Refer to Attachment C of Appendix D – Community Engagement
Project justification	Need for the project	• Why the project is needed, how it fits into the broader electricity system, and whether the benefits justify the scale of construction and potential local impacts • Whether the project is justified at this location, and whether the benefits to NSW and the National energy system translate into meaningful benefits for Lithgow • Concerns about timing, policy alignment, long-term energy demand, and whether the project could become stranded or redundant as technology evolves	Chapter 2 Chapter 20
Beyond the scope of the project	Ownership and corporate structure	• Concern about the project being foreign-owned	N/A

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
	Energy policy	• NSW should continue operating coal-fired power stations rather than investing in renewable energy infrastructure • Why nuclear energy is not being considered as an alternative to pumped hydro	N/A
	Government and regulation	• Concerns that the project may influence electricity prices or that renewable energy is increasing household energy bills	N/A
	Regional economic strategy	• Concerns about Lithgow's long-term economic direction, population decline, or the perceived lack of government investment in alternative industries outside the energy sector	N/A
	Broader regional land use decision	• Concerns about other unrelated projects such as transmission lines, other mining proposals, or urban expansion	N/A
	State or Federal Decisions	• Some community members did not support NSW renewable energy targets or government transition policies	N/A

5.5.4 Near neighbours

Near neighbours are those living or operating businesses in closest proximity to the proposed infrastructure that are likely to experience the most tangible day-to-day impacts during construction and operation. For this reason, the near neighbour views have been considered separately to capture the individualised effects, sensitivities, and adaptation needs of those most directly affected.

Table 5.6 Summary of near neighbour views

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
Strategic context	Local character, identity and future of plan	• Concerns about how the project fits into the future of the valley, their neighbourhoods, and the landscape in which they live and work	LVIA (Appendix N) SIA (Appendix O)
Project design	Local workforce accommodation and social cohesion – Lakeside camp	• Neighbours near the Magpie Hollow area raised concerns about noise, lighting, and visual impacts, particularly at night, and the potential for the camp to detract from the lake's recreational and tourism appeal • Concern for effects on Airbnb and wedding businesses, visitor perception, and the sense of tranquillity associated with the area • Environmental concerns	LVIA (Appendix N) SIA (Appendix O) NVIA (Appendix R)

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
	Local workforce accommodation and social cohesion – Town camp	• Participants of a 2024 workshop sought to have the workers accommodation camp be located in town to maximise the economic benefit of workers • Residents living near the Pottery Estate site were concerned about increased traffic, noise, and parking demand in a residential area, and potential pressure on local services such as shops, schools, and healthcare	TIA (Appendix Q) NVIA (Appendix R)
Community engagement	Communication of impacts	• The importance of clear, timely and personalised communication throughout the life of the project • Early notice of major works, traffic changes or blasting events and clear explanations of what to expect — rather than technical updates after decisions had been made • Requested a single, consistent point of contact who understands their individual circumstances and can help resolve issues quickly • A strong call for transparency and accountability, including regular reporting of monitoring result	SIA (Appendix O) Attachment B of Consultation and Engagement Report (Appendix D)
Environmental, social and economic impacts	Noise	• Concern about how construction noise may affect their daily lives and amenity • Sought further information about noise modelling results, predicted levels, and how noise may travel through the valley and across Lake Lyell • A range of possible mitigation options that could be tailored to individual needs	NVIA (Appendix R)
	Visual and amenity impacts for neighbours	• Concern about changes to their outlook, property amenity, and night-time environment, and particularly sensitive to potential loss of scenic views, lighting from construction areas, and the long-term visibility of project infrastructure	LVIA (Appendix N)
	Dust, air quality and vibration	• Concern about dust, air quality, and vibration impacts during construction • Information on how air quality would be monitored and what actions would be taken if limits were exceeded • Concerns about vibration from tunnelling and blasting	NVIA (Appendix R) AQIA (Appendix S.1)
	Blasting, vibration and structural assurance	• Concern about blasting, vibration, and potential structural impacts to homes, water tanks, sheds, and farm infrastructure • Requested clear information on the blast schedule, notification process, and how vibration levels would be monitored and reported • Asked for baseline property condition surveys and a transparent process for assessing and addressing any future damage claims • Blasting should be controlled, infrequent, and managed to minimise disruption to livestock, pets, and local amenity	NVIA (Appendix R) Attachment B of Consultation and Engagement Report (Appendix D)

Issue category	Subcategory	Issue or topic raised	Where addressed in EIS
	Water supply, groundwater and tank integrity for neighbours	• Concerns about how tunnelling, excavation and dewatering activities could affect local groundwater levels, bores, springs, and household water tanks • Clarity on how the project would manage surface runoff and sediment to prevent contamination of roof-fed tanks, creeks, and dams on rural properties	SWA (Appendix F) Groundwater impact assessment (GIA) (Appendix G)
	Maintaining access and visitor amenity for tourism and hospitality businesses	• Neighbours who operate tourism, accommodation, and wellness businesses — including short-stay accommodation, wedding venues, and bathhouse facilities — expressed concern about how construction activities could affect their operations, guest experience, and reputation • Noted that the natural landscape, quiet setting, and lake views are central to their business appeal, and were worried that noise, dust, traffic, or visual disturbance during construction could deter visitors or reduce bookings • Information about construction schedules, road closures, and potential disruptions • Opportunities for the project to work collaboratively on visitor information and tourism messaging	SIA (Appendix O) Attachment B of Consultation and Engagement Report (Appendix D)
	Property values, compensation and long-term confidence	• Concerns about how the development could affect their property values and long-term confidence in the local housing market • Clarity around eligibility for compensation or support • Desire for long-term certainty and transparency	Consultation and Engagement Report (Appendix D)
	Neighbour resilience and readiness for change	• Personal and emotional challenges associated with major change in the immediate environment, including stress and uncertainty linked to potential construction impacts, altered views, or a changing sense of place • Strong desire for practical and wellbeing-based support to help manage changes	SIA (Appendix O) Consultation and Engagement Report (Appendix D)
	Property access, safety and traffic management	• Concerns about property access, road safety, and increased traffic during construction, particularly in areas close to site entrances, haulage routes, and work compounds • Early notice of temporary road closures or changed traffic conditions, as well as clear signage and communication to ensure safety for residents, visitors, and workers	TIA (Appendix Q) Attachment B of Consultation and Engagement Report (Appendix D)
Project justification	Need for the project	• Lack of awareness that the majority of land proposed for the project is already owned or leased by EnergyAustralia, as it was assumed private properties would need to be impacted by infrastructure	Chapter 2 Chapter 20

5.6 Engagement to be carried out if the project is approved

5.6.1 Commitment to ongoing engagement

If the project is approved, LLP will continue community engagement in line with the framework and objectives developed for the project. The objectives for future engagement is provided in Figure 5.4.

PHASE 1–3 (Complete)	**PHASE 5** Construction readiness	**PHASE 6** Construction implementation	**PHASE 7** Long-term operations
2021–2026	2026–2027	2027–2031	2031+
Objectives 1–4 (see Section 5.2)	**Objective 4** – Demonstrate how community and stakeholder issues and feedback are being captured and used to inform Project development and assessment.	**Objective 5** – Maintain transparent, timely and proactive communication to support community understanding of construction activities, sequencing and potential impacts.	**Objective 10** – Maintain long-term transparency and accountability about the Project's operational profile, environmental performance and compliance commitments.
		Objective 6 – Minimise construction impacts through responsive, place-based engagement, ensuring concerns are addressed quickly and mitigation measures are clearly explained.	**Objective 11** – Sustain strong, ongoing relationships with the local community, neighbours, businesses, councils and Traditional Owners throughout the life of the asset.
		Objective 7 – Demonstrate how community and stakeholder issues and feedback are being captured and used to inform Project development and assessment.	**Objective 12** – Ensure long-term environmental stewardship through clear reporting on monitoring results, water management, biodiversity commitments and safety performance.
		Objective 8 – Support local benefits during construction, including local workforce participation, local procurement opportunities, First Nations employment pathways and community benefit initiatives	**Objective 13** – Support lasting local benefits through ongoing delivery of the Shared Benefit Program, local employment, and social and economic development initiatives.
		Objective 9 – Provide safe, accessible channels for issues, complaints and feedback, ensuring effective, respectful and fair resolution processes.	**Objective 14** – Continually improve engagement practices, evaluating feedback and adapting communication to community needs over the decades long operational period.

Figure 5.4 Engagement objectives for future phases

5.6.2 Construction readiness and implementation

The construction readiness and implementation phases of engagement will prepare the community and key stakeholders for the project to move from planning and into major construction. This means providing updated information about construction impact management as well as enabling communication pathways between the community and the contractor that will be appointed to build the project. There will also be an engagement process to ensure the community can be an active participant in the social and economic benefits that the project will generate.

The project will continue to generate issues and interest within the community and stakeholders which can be mitigated and managed through effective engagement and communication activities. The concerns and interests of the community have been identified as discussed in Section 5.5, and will inform the type and content of future engagement. To achieve this outcome, the following distinct activities are proposed:

- Targeted regional and local business engagement – conducted by industry briefings, local supplier readiness workshops, and workforce and skills alignment through discussions with TAFE, Skills NSW and universities. An online business directory would be established to identify supply chain opportunities.

- Shared Benefit Program governance and implementation – the Shared Benefit Program will be formally implemented. Community members will be invited to register through expression of interest based on the selection criteria and expectations for the group.

- Engagement for environmental impacts and management – Engagement activities will focus on ensuring construction impacts are understood, safe, and accepted by neighbours and the wider community, minimising disruption and maintaining trust. This would be achieved by conducting advanced notification for high impact work (through notification letters, SMS or doorknocking), providing updated maps and information about the work being carried out, providing a clear process for complaints and incident reporting including a 24-hour hotline for after-hours concerns. Coordination with relevant agencies and Lithgow City Council for any work affecting roads, reserves or sensitive areas. Regular briefings with NPWS and Transport for NSW.

- Development of a Construction CSEP– for construction phase communication and engagement, identifying construction communication protocols and notification systems. It will include workforce behaviour expectations and code of conduct, incident and issue response pathways, pre-construction neighbour engagement requirements and interact with other programs such as the Shared Benefit Program and ongoing social performance reporting. It is proposed that a website is developed to provide up to date information for the community during construction.

- Ongoing local government engagement – regular strategic briefings and/or meetings are proposed to strengthen constructive relations with Lithgow City Council. Other activities include technical working groups where required (e.g. to coordinate traffic and road upgrades) and supporting Lithgow City Council's social and economic priorities where aligned.

- First Nations partnership and engagement – Ongoing engagement with Traditional Owners and RAPs will continue as the project progresses. This will include heritage mitigation coordination, business participation and partnership opportunities, cultural awareness training design and co-design components of the Shared Benefit Program as they relate to cultural heritage.

5.6.3 Operations

The future operation of the project will require an update in the focus of engagement approach that better aligns with operational activities and impacts. This includes notification processes for any planned maintenance works, as well as having a continued complaints handling process. An operational CSEP will be prepared taking into consideration feedback from neighbours during the construction phase of the project.

Chapter

6

Water

Environmental Impact Statement |
Lake Lyell PHES Project

6 Water

This chapter presents a detailed summary of the project's impacts on water resources and the water management systems proposed to mitigate or monitor those impacts. Detailed technical reports for the Surface Water Assessment (SWA) and Groundwater Impact Assessment (GIA) are provided in Appendix F and Appendix G respectively. The relevant SEARs for water and where they are addressed by the SWA and GIA are summarised in Appendix A.

6.1 Assessment approach

The assessment of project impacts on surface and ground water sources considered the relevant guidelines, including stormwater management guidelines (the Blue Book), *Neutral or Beneficial Effect on Water Quality Assessment Guideline* (WaterNSW 2022), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018), guidelines for works on waterfront land, and the requirements of the *Water Management Act 2000*, Water Sharing Plans and the NSW *Aquifer Interference Policy* (AIP).

The assessment has included review of available data, including weather and climate data, WaterNSW streamflow gauge data, EnergyAustralia's water and algae monitoring program in the upper Coxs River basin and results from the dedicated groundwater monitoring network established for the project.

Potential impacts to surface water from the project were assessed for construction and operation activities and included identifying residual construction impacts to surface water quality and streamflow regime, and changes to Lake Lyell and receiving waters during operation. Potential drawdown and quality impacts on groundwater during construction and operation were also assessed with guidance from National Water Commission's (NWC) risk framework (NWC 2010).

Consultation was carried out with DCCEEW Water group in relation to surface and groundwater take and the development of a water licensing strategy for the project. This strategy is provided at Appendix H.

6.2 Existing environment

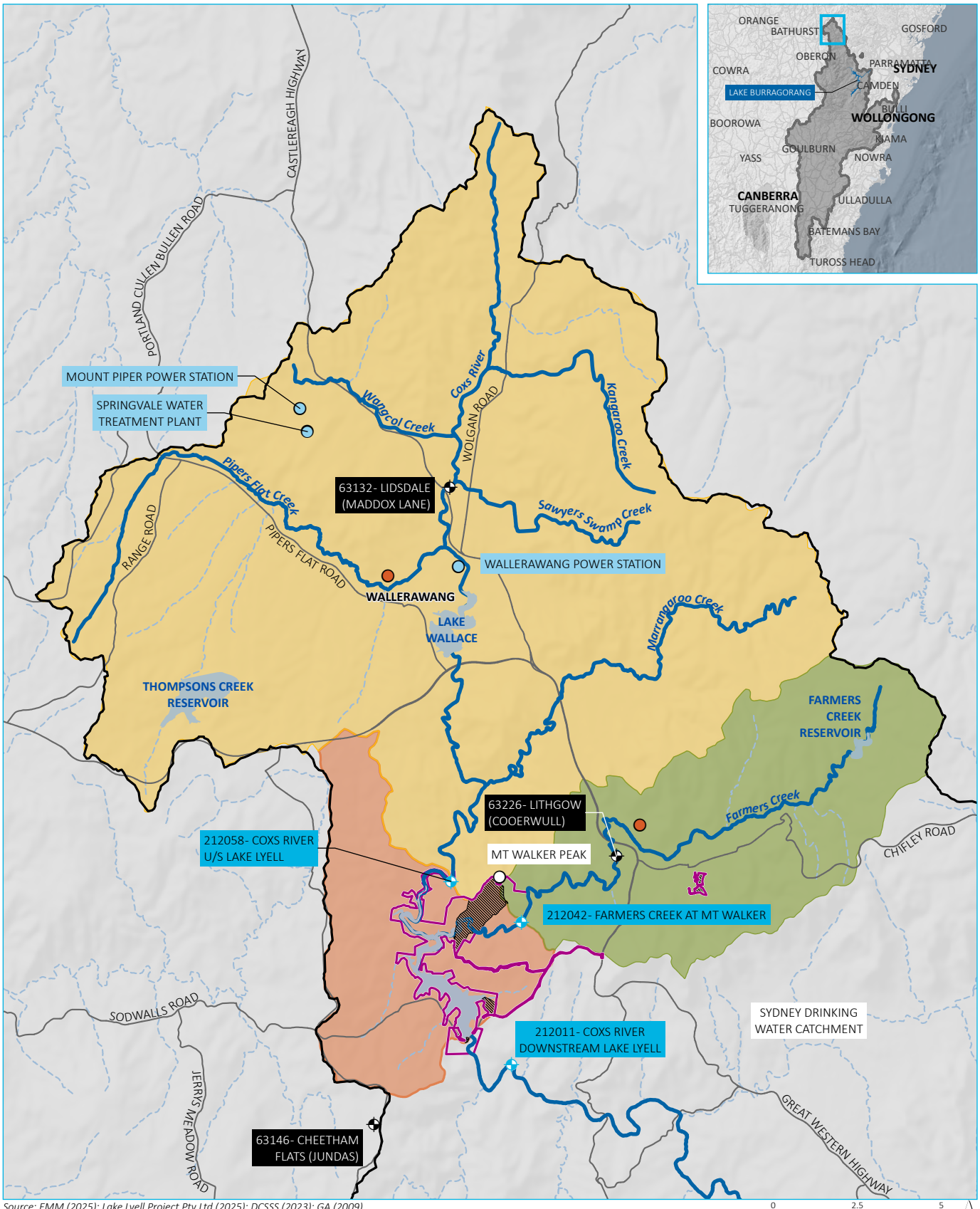
6.2.1 Overview of surface water features and infrastructure

The project is located within and near Lake Lyell, in the upper Coxs River catchment. Lake Lyell is formed by the impoundment of water by Lilyvale Dam. Figure 6.1 shows the catchment area to Lilyvale Dam with relevant features and infrastructure described in Table 6.1. These descriptions are based on the analysis of data and water cycle processes presented in more detail in Appendix F.

Table 6.1 Natural water features and infrastructure

Natural water feature / infrastructure	Description
Coxs River upstream of Lake Lyell	The Coxs River is a major tributary to the Hawkesbury-Nepean system and flows in a southerly direction, ultimately into the northern arm of Lake Burragorang (also known as Warragamba Dam) some 90 km downstream from the project. The catchment area upstream of Lake Lyell is characterised by a series of valleys that are generally bound by rugged forested escarpments and have cleared valley floors. Baseflow is known to occur year-round, even during severe droughts. The water quality in the Coxs River upstream of Lake Lyell is potentially impacted by several anthropogenic (human) influences in the catchment including runoff from urban areas and agricultural lands, and direct and diffuse discharges from several active and decommissioned collieries, coal ash dams, and the Wallerawang wastewater treatment plant (WWTP).

Natural water feature / infrastructure	Description
Farmers Creek upstream of Lake Lyell	Farmers Creek is a major tributary of the Coxs River that flows into the north-eastern portion of Lake Lyell into what is referred to in this EIS as the Farmers Creek arm of the reservoir. Farmers Creek flows through the township of Lithgow and is one of the potable water sources for the town. The water quality in Farmers Creek is potentially impacted by anthropogenic influences in its catchment including runoff from urban areas and agricultural lands, direct and diffuse discharges from several active and decommissioned collieries, legacy contamination from heavy industry, and discharges from the Lithgow WWTP. The creek water quality is characterised as having: • pH and electrical conductivity (EC) that is generally within the range of default guideline values • turbidity levels that are generally below the default guideline values but intermittently exceed them, typically after wet weather • nutrient (total nitrogen (TN) and total phosphorus (TP)) concentrations that nearly always exceed default guideline values and are elevated relative to concentrations in the Coxs River upstream of Lake Lyell. Farmers Creek inflows contribute more than 90% of the total nitrogen oxide (Nox) load and 45% of the total TN load in inflows to Lake Lyell.
Watercourses within the construction envelope	There are twelve watercourses and five drainage lines that have catchments that are either partly or fully within the construction envelope. They are 1st, 2nd and 3rd order streams and drainage lines, and receive waters from either Coxs River, Farmers Creek or Lake Lyell (including Farmers Creek arm of Lake Lyell).
Lake Lyell, including the Farmers Creek arm of the reservoir	Lake Lyell is generally maintained in a near full condition. The lake receives inflows from the Coxs River, Farmers Creek and several smaller watercourses. Outflows from the lake occur via the dam's outlet works, the dam's spillway (when the lake level exceeds FSL), and the Lilyvale Pump Station (see Coxs River Water Supply Scheme). Releases from Lake Lyell are made to maintain riparian health as part of environmental flow requirements specified by section 57H of the *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023* and the water supply work and water use approval 10CA117220 held by EnergyAustralia. There are some anthropogenic activities in the Coxs River and Farmers Creek catchments that influence streamflow and water quality. The water quality of Lake Lyell is dependent on the water quality of the inflows and the limnological processes that occur within the lake. More information on the characterisation of Lake Lyell follows in Section 6.2.2.
The Coxs River Water Supply Scheme	The Coxs River Water Supply Scheme was developed to ensure an adequate supply of water for the operation of the former Wallerawang and current Mount Piper power stations. The scheme comprises Lake Lyell and Lake Wallace on the Coxs River and Thompsons Creek Reservoir on Thompsons Creek, a tributary of the Coxs River, as well as several interconnecting pipelines and pumping stations. The interaction and supply system is shown in Figure 6.2. The future operation of the scheme is being reviewed by DCCEEW Water in consultation with EnergyAustralia and will ensure water availability for the project.
Coxs River downstream of Lake Lyell	Streamflow in the Coxs River downstream of Lake Lyell is controlled by releases from the lake which occur via controlled releases and discharges over the spillway when the water level in the lake exceeds the FSL. As such, water quality in the Coxs River downstream of Lake Lyell is governed by the quality of water released from the lake. Following analysis of the controlled release infrastructure and methods at Lilyvale Dam and analysis of water monitoring data, the following can be concluded: • the water quality in the Coxs River downstream of Lake Lyell generally has dissolved oxygen within the default guideline values range, low turbidity and algae levels that are well below levels in the reservoir • the temperature of water released from Lake Lyell is generally within the range of temperatures in Coxs River and Farmers Creek upstream of the lake which means there is no clear indication that cold water pollution is occurring.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); GA (2009)

0 2.5 5 km

GDA2020 MGA Zone 56

N

KEY

- Project area
- Construction envelope
- Sydney drinking water catchment
- BOM weather station
- Stream gauge
- Wastewater treatment plant

Key water feature

- Key feature
- Coxs River water supply scheme infrastructure
- Key river and creek
- Reservoir

Catchment area

- Local catchments and lake waterbody (40 km^2)
- US of 212058- Coxs River upstream of Lake Lyell (275 km^2)
- US of 212042- Farmers Creek at Mount Walker (67 km^2)

Existing environment

- Major road
- Named watercourse

Lake Lyell catchment overview

Lake Lyell PHES
Environmental Impact Statement
Figure 6.1

EMM creating opportunities

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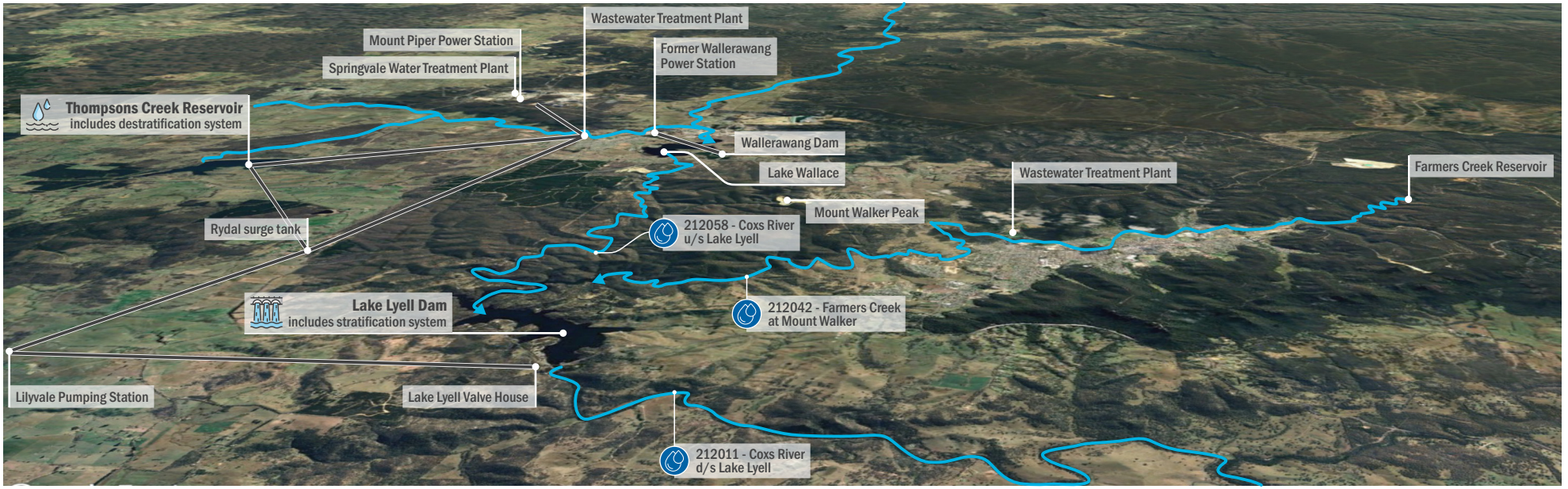
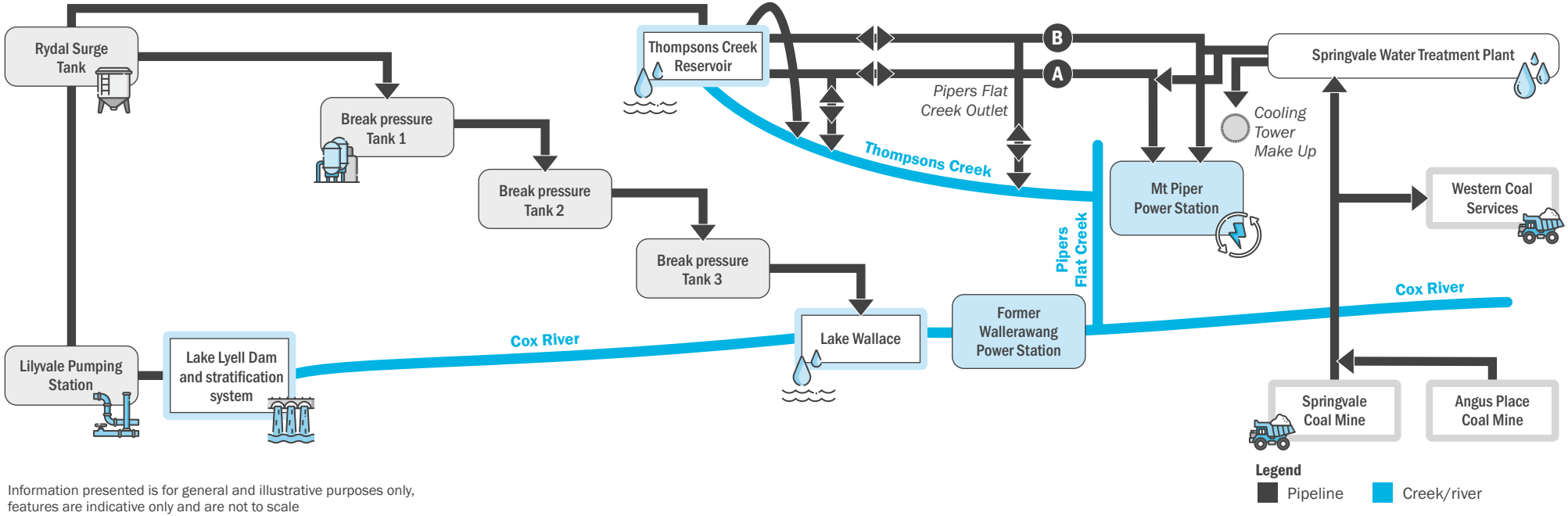




Information presented is for general and illustrative purposes only, features are indicative only and are not to scale

Figure 6.2 Coxs River Water Supply Scheme

6.2.2 Lake Lyell

i Water level and flows

Historical water levels in Lake Lyell (between 1 July 2004 and 30 June 2024) are shown in Figure 6.3. The figure identifies key points of reference, including the closure of Wallerawang Power Station, the 'recent period' relied on for assessment (1 July 2019 to 30 June 2024) and the MOL and FSL of Lake Lyell. Streamflow in the Coxs River (at gauge 212058, see Figure 6.1) is also provided for context.

The water level data shows that:

- for the period July 2004 to December 2010, Lake Lyell water levels were between 6 to 20 m below FSL, but always above MOL
- from December 2010 to the end of the recent period, water levels in the lake were maintained close to FSL. It is noted that a severe drought occurred in 2018 and 2019.

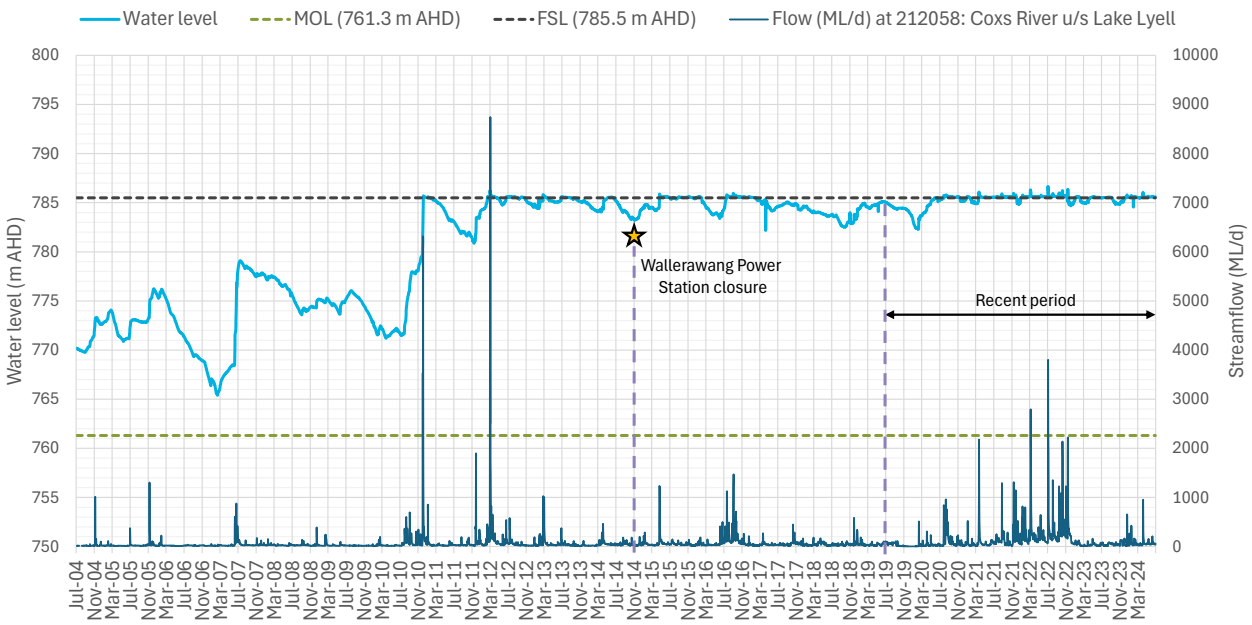


Figure 6.3 Lake Lyell water levels

Prior to the recent period, Lake Lyell levels were influenced by the following anthropogenic activities:

- Discharges from mine operations, which have artificially increased baseflows in the Coxs River, upstream of Lake Lyell.
- Water take from Lake Lyell by the Coxs River Water Supply Scheme, which was higher than during the recent period due to a range of factors including: the closure of Wallerawang Power Station in 2014, water supply from the Springvale water treatment plant (commenced in 2019) and a trend of declining power generation at Mount Piper power station.

Overall, the demand for water take from Lake Lyell has reduced over the past two decades while the supply of water has been maintained or increased. Due to the above activities, the Lake Lyell water level regime prior to the recent period is not considered to be representative of future conditions. Future conditions are more represented by the recent period, where water levels are maintained close to FSL and resilient to drought conditions (illustrated by the FSL during the 2018 and 2019 severe drought).

A conceptual water balance prepared for the project as part of the surface water assessment (Appendix F) shows that most of the inflow to Lake Lyell is from the Coxs River (58%), followed by contributions from Farmers Creek (25%), other catchments (14%) and direct rainfall (3%). Outflows downstream of Lake Lyell is almost equal to the total estimated inflows, with minor losses due to evaporation.

ii Water quality

The water quality of Lake Lyell is dependent on the water quality of the inflows and the physical, chemical, biological and geological processes that occur within the lake (discussed in the following section). Lake water quality is characterised as having:

- pH that ranges between 6.0 and 10.0, relative to the default guideline values range of 6.5 to 8.0
- EC that ranges from 100 to 850 microsiemens per centimetre (µS/cm), relative to a default guideline value of 350 µS/cm
- dissolved oxygen that is generally within or above the default guideline values range at the surface but declines to below the default guideline values range at depth when the lake is stratified
- turbidity levels that are generally below the default guideline values but intermittently exceed them, typically after wet weather
- nutrient (TN and TP) concentrations that nearly always exceed default guideline values but are similar to concentrations in the Coxs River upstream of Lake Lyell.

EnergyAustralia monitor algae within Lake Lyell and on the Coxs River, downstream of Lake Lyell, to establish algae alert levels for the lake. Algae alerts mostly occur in summer and autumn and are more likely to occur during dry conditions than wet conditions. The following are assessed as contributing to algae growth:

- high NOx (a bioavailable form of nitrogen) loads in Farmers Creek
- the seasonal destratification of the lake in March and April which supplies nutrients to upper water layer and can lead to algae growth in autumn
- runoff from bush fire affected areas in the catchment can contribute abnormally high nutrient loads to the lake, creating opportunities for significant algae growth.

However, the following additional conclusions are made from the water monitoring data and nutrient balance calculations completed in the Surface Water Assessment:

- Lake Lyell beneficially reduces turbidity levels and suspended sediment concentrations in that releases from the lake generally have low turbidity and suspended sediment even when turbid inflows occur.
- Lake Lyell beneficially removes bioavailable nitrogen (i.e. NOx) with calculated loads of NOx in lake inflows reducing by 38% in lake outflows over the recent period.

iii Conceptual water cycle processes

Relevant monitoring data was reviewed and used to prepare a conceptual water cycle processes model for Lake Lyell, which is shown in Figure 6.4. It shows the relevant inflows and outflows of Lake Lyell, its mixing regime and influences (such as wind shear, natural heating and losses).

Central to Lake Lyell's mixing regime is the natural heating and cooling cycle of the waterbody, specifically the development of thermal stratification and its subsequent breakdown into a homogeneous water column (destratification). EnergyAustralia operate a submerged diffuser located on the reservoir bed near the dam wall. Operation of the diffuser system would likely reduce the duration and magnitude of both stratification events and anoxic conditions occurring near the lakebed.

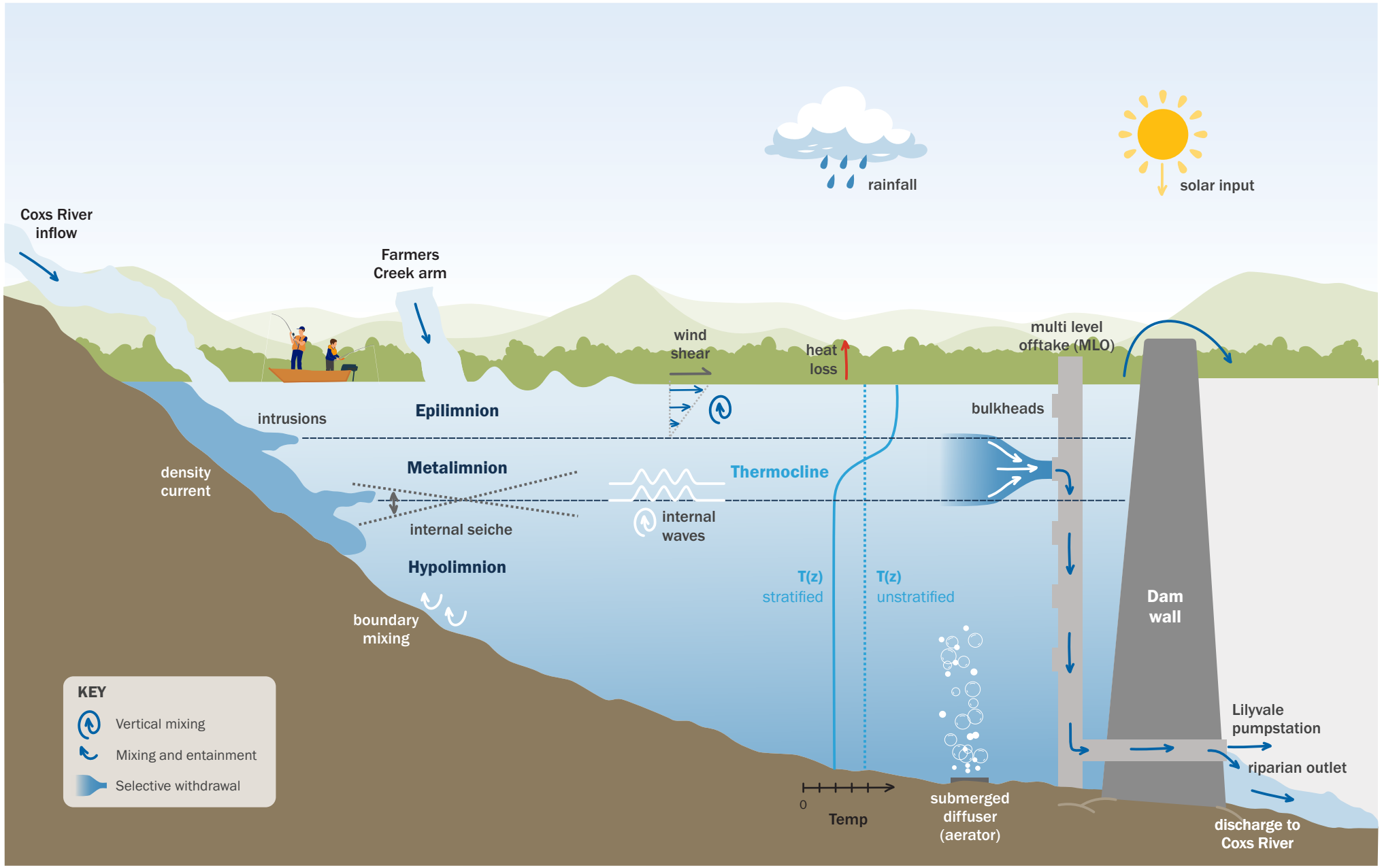


Figure 6.4 Conceptual water cycle processes model for Lake Lyell

6.2.3 Groundwater systems

The project area predominantly comprises fractured rock groundwater systems associated with the Lachlan Fold Belt and Sydney Basin geology. Minor porous rock groundwater systems likely form part of the Sydney Basin geology. Alluvial and colluvial deposits occupy valley floors near watercourses. These localised systems typically reflect the flow regimes in the associated watercourse and are not considered a regional groundwater system.

A graphical depiction of the conceptual hydrogeological understanding for the project has been prepared and is shown on Figure 6.5. A summary of the hydrogeology of the project area, determined by review of mapping, geotechnical interpretation (from the project's geotechnical investigation program) and hydrogeological monitoring data, is provided in Table 6.2.

Table 6.2 Conceptual groundwater model

Component	Description
Geology	• Study area comprises rock units associated with the: – lower permeability Lachlan Fold Belt (deformed metamorphic, volcanic and sedimentary rocks) – higher permeability Sydney Basin (sedimentary rocks). • Structures associated with synclines and anticlines forming topographic deformation near the project. • Shallow (<2 m) and generally low permeability soils overlying hard-rock units.
Hydrostratigraphic units	• Shallow fractured rock groundwater system supported in shallow (<120 m), weathered and fractured Lachlan Fold Belt and Sydney Basin rock units. • Deep fractured rock groundwater system underlying shallow fractured rock groundwater system, supported in deeper Lachlan Fold Belt and Sydney Basin rock units.
Hydraulic properties	• Relatively low hydraulic conductivity in Lachlan Fold Belt compared to Sydney Basin. • Higher hydraulic conductivity in shallow groundwater system, compared to deeper groundwater system (irrespective of geological province).
Groundwater levels and flow	• Deeper watertable near high points in topography (~46 m below ground level near Mount Walker) and shallower (near ground level) at perennial watercourses. • Regional groundwater flow direction is generally north to south. • Local flow occurs radially from high points in landscape towards watercourses.
Water quality	• Relatively fresh (<500 µs/cm) and neutral pH. • Detections of dissolved metals generally below guideline values (with the exception of iron).
Groundwater recharge	• Direct rainfall recharge to soil profile (where present) or shallow groundwater system, percolating downward to deeper groundwater systems. • In-direct recharge via leakage at losing watercourses. • Recharge volumes dependant on rainfall duration and magnitude, increasing during wet periods. • Generally low infiltration across elevated areas and high infiltration within valleys and foothills.
Groundwater discharge	• Receiving perennial watercourses including Farmers Creek, Sandalls Creek, Coxs River, Bowens Creek, Jocks Creek, Lowther Creek, Whites Creek, Marangaroo Creek and Solitary Creek. • Ephemeral watercourses during wet periods. • Evapotranspiration where the watertable is sufficiently shallow to be intercepted by vegetation.
Groundwater and surface water interaction	• Continuous hydraulic connection to perennial watercourses, with alternating gaining and losing relationship along streamline. • Intermittent hydraulic connection to ephemeral watercourses during periods of high rainfall and elevated groundwater levels.

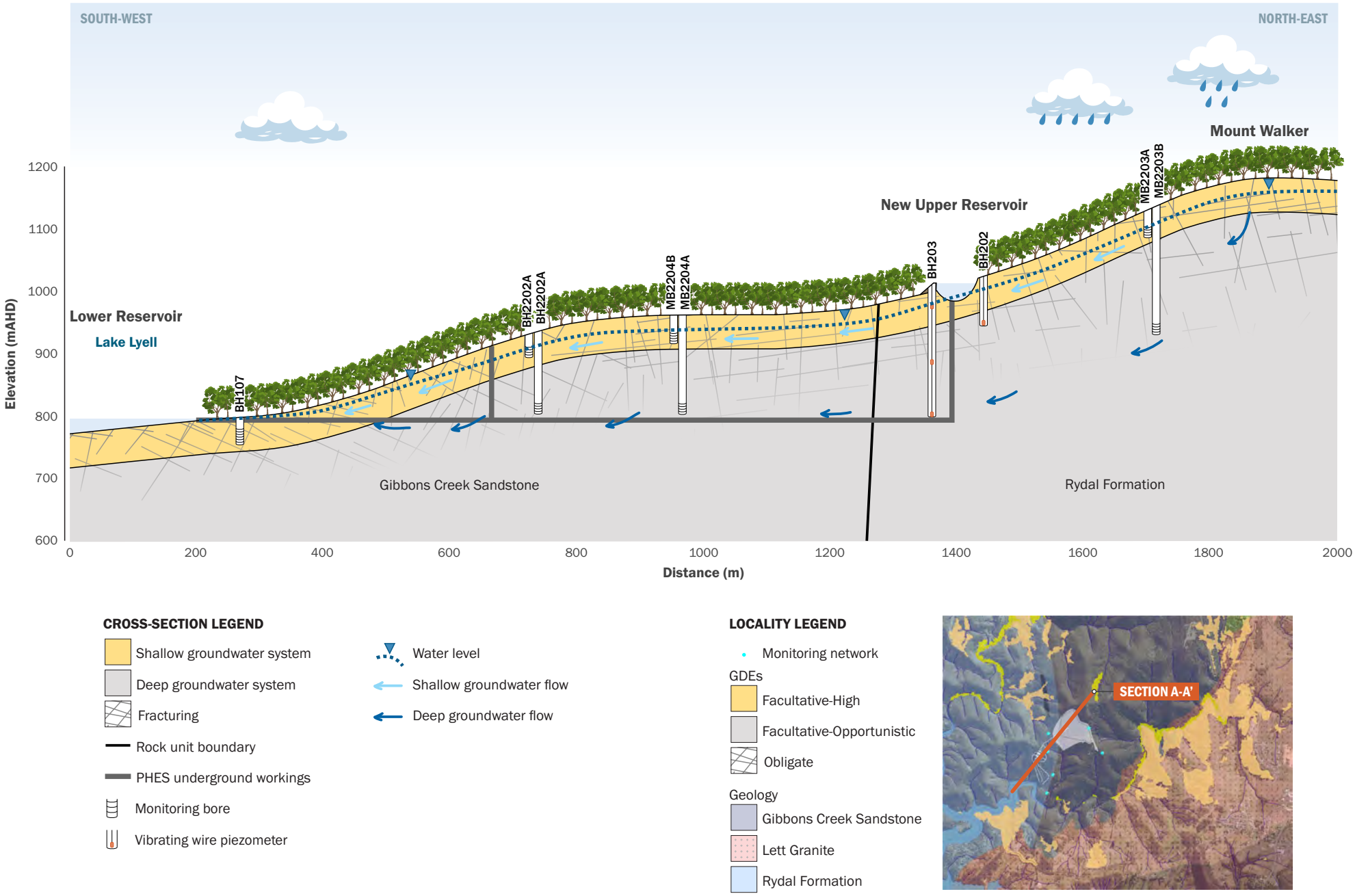


Figure 6.5 Lake Lyell hydrogeological conceptualisation

6.2.4 Water users and downstream receivers

Local downstream receivers including other dependent water industries are described in Table 6.3.

Table 6.3 Water receptors and users

Receptor	Description
Private groundwater users	Based on a search of the National Groundwater Information System (BoM 2013), private groundwater users within the project area include landholders and commercial entities with registered water bores. Private groundwater users typically target HGLs supported by the Sydney Basin geology (i.e. Hassan's Wall HGL and Angus Place HGL).
Groundwater dependent ecosystems (GDEs)	The following GDEs are identified as relevant for the project: • Aquatic GDEs, comprising habitats associated with receiving perennial watercourses (Farmers Creek, Sandalls Creek, Coxs River, Bowens Creek, Jocks Creek, Lowther Creek, Whites Creek, Marangaroo Creek and Solitary Creek). • Terrestrial GDEs, comprising plant communities with a dependence on groundwater (plant community types (PCTs) 3483, 3948, 4063, 4064, 3303, 3367 and 3738). • Stygofauna was not recorded in any bore and it is considered unlikely that the project will impact stygofauna associated with the regional groundwater systems.
Other downstream receivers	Coxs River downstream of the project passes agricultural properties, rugged forest and ultimately flows into the northern arm of Lake Burragorang and Sydney's drinking water catchment.

A review of available water entitlements and allocation was conducted as part of the water licensing strategy (refer to Appendix H), for both the Lachlan Fold Belt Greater Metropolitan Groundwater Source and Wywandy Water Source. Available data indicates there is very little use of existing entitlements in both sources.

6.3 Potential impacts

6.3.1 Avoidance and minimisation

The following outlines key avoidance and minimisation in project design in relation to surface and groundwater:

- Lowering of the Lake Lyell water level during construction to prevent and minimise sedimentation and other impacts that would potentially otherwise arise from in-water works. The dry work environment also allows for more effective management of potential contaminated water from excavation and placement areas.
- Applying "cease to generate" rules to avoid increasing flood impacts downstream of Lake Lyell.
- Separation of stormwater and contaminated water systems to avoid cross-contamination, with targeted treatment of nitrogen-laden water and surplus contaminated water prior to discharge.

Further opportunities for avoidance and minimisation have been identified following the impact assessment and presented in the proposed mitigation measures.

During the initial construction period, lake levels will be reduced to and maintained at around 772 m AHD to enable construction of the coffer dam and other in lake works. Once these initial works are completed the lake levels will be allowed to rise to the construction phase FSL. Aside from the temporary changes to the management of lake water levels, no changes to the existing lake operating approach or environmental releases are proposed during construction.

6.3.2 Construction water management

A construction water management system will be operated to supply water to and manage water produced by construction activities (described in detail in Appendix F). It includes separate systems to manage contaminated water and stormwater. Minimal harm criteria have been established for the water management systems based on default guideline values and ambient water quality in Farmers Creek.

The stormwater system will manage runoff from areas disturbed by construction that have a low risk of producing contaminated water, such as roads and earthwork areas (excluding drill and blast), accommodation camp and construction pads. Where practical, clean water will be diverted around stormwater management areas to minimise the volume of stormwater that requires management. Stormwater will be managed in accordance with the methods described in Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004).

Potentially contaminated water will be separated from stormwater and managed. Sources of potential contaminated water will vary over the construction program and may continue post construction. The key sources are:

- runoff (during construction) and seepage (during and after construction) from permanent spoil emplacements (PSEs)
- water pumped from subsurface excavations during construction
- surface water runoff from high intensity construction areas.

It is proposed that PSE runoff (during construction) and seepage will be collected and managed in the contaminated water system until water quality monitoring demonstrates that water quality meets the minimal harm criteria. Routine monitoring of seepage quality and volume will be undertaken and ongoing treatment after the construction phase of the project may be required. The Excavated Rock Management Strategy (refer to Appendix I) describes the geochemical characteristics of excavated rock and potential water quality risks from its emplacement, such as leaching of nitrogen residue in blasted material. This has informed the design principles, concepts and management measures for each PSE.

Any groundwater that is impacted by construction activities may have concentrations of suspended sediment, nitrogen, metals and hydrocarbons that exceed the minimal harm criteria and will therefore be managed in the contaminated water system.

Surface water runoff from high intensity construction areas will also be managed in the contaminated water system. Where practical, drainage works will be implemented to divert clean water and stormwater around high intensity construction areas to minimise the volume of contaminated water that requires treatment during and after wet weather.

Treated water from the contaminated water and stormwater systems will be beneficially used to supply non-potable water for construction purposes.

The assessment of predicted discharges from the construction water management system determines that:

- stormwater system discharges (controlled discharges and overflows) may have elevated suspended solids concentrations and turbidity levels but are expected to have water quality that is similar to minimal harm criteria established for the project
- contaminated water system discharges (controlled discharge of treated water) is expected to meet the minimal harm criteria.

6.3.3 Impacts on receiving waters during construction

The project will potentially discharge water into and interact with the lower reach of Farmers Creek that is upstream of Lake Lyell, Lake Lyell and the watercourses and drainage lines that are shown in Figure 6.1. Therefore, the project has potential to change the existing water quality and water cycle regimes in these immediate receiving waters. Lake Lyell releases water into the Coxs River, therefore any changes to Lake Lyell water quality or operating regime could also affect the Coxs River, downstream of Lake Lyell.

The project will not discharge water into or interact with the Coxs River or Farmers Creek upstream of Lake Lyell.

The construction water system for the main construction area will discharge water into the upper portion of the Farmers Creek arm of Lake Lyell. Therefore, the Farmers Creek arm is the immediate receiving water. The assessment of discharges from the project into Farmers Creek arm concludes:

- no change to water quality in the Farmers Creek arm is expected during drought conditions, dry weather, minor wet weather and after material and significant wet weather as discharges from the system would be predominately limited to the controlled discharges of treated water from the contaminated water and stormwater systems which will have similar water quality to Farmers Creek inflows (i.e. the minimal harm criteria)
- during material and significant wet weather, overflows from sedimentation basins and runoff from stormwater (minor works) areas may contribute to elevated suspended sediment and turbidity in the Farmers Creek arm. No material increases in nutrient or metal loads are expected as key sources of these pollutants will be managed in the contaminated water system.

Lake Lyell and the Coxs River downstream of Lake Lyell are the other key receiving waters for the project. The assessment of potential changes to Lake Lyell due to the project's construction concludes:

- negligible change to lake inflow volumes
- no changes to the lake stratification cycle will occur during construction as the construction activities will not affect any of the processes that drive stratification and destratification
- no changes to the extent and magnitude of algae levels in Lake Lyell are expected during construction of the project
- there is potential for increased suspended sediment concentrations and turbidity levels in the Farmers Creek arm of Lake Lyell during wet weather due to sedimentation basin overflows (as described above). However, no other material changes to water quality are expected in the Farmers Creek arm or other parts of the lake.

During construction there will be minimal change to the streamflow regime or water quality in the Coxs River downstream of Lake Lyell as:

- no changes to the existing riparian outlet or environmental release requirements from Lake Lyell are proposed
- there will be a negligible change to the volume of water released from Lake Lyell due to extraction for construction water supply
- the project will not increase the flood risk downstream of Lake Lyell as the lake will only spill when the FSL is exceeded due to inflows (as per the existing arrangement)
- the construction water management system will include best practice standard controls to manage potentially contaminated water, stormwater and wastewater

- changes to water quality in Lake Lyell are limited to potential elevated suspended sediment concentrations and turbidity levels in the Farmers Creek arm during wet weather. No other material changes to water quality are expected in the Farmers Creek arm or other parts of the lake
- Lake Lyell will continue to beneficially reduce turbidity levels, suspended sediment and bioavailable nitrogen concentrations.

Due to the proposed water management measures and the water quality buffer provided by Lake Lyell, the construction phase of the project is expected to have a neutral effect on water quality in the Coxs River downstream of Lake Lyell. This means that the project will also have a neutral effect on water quality in Lake Burragorang, which is a major water supply dam for the Sydney metropolitan region that receives inflows from the Coxs River and is operated by WaterNSW.

6.3.4 Works on waterfront land

The WM Act defines waterfront land as the bed of any river, lake or estuary and any land within 40 m of a riverbank, lake shore or estuary mean high water mark. The construction of the project will unavoidably require the following works on waterfront land due to the need for temporary and permanent watercourse diversions, watercourse crossings, construction of works within Lake Lyell (the inlet and outlet structure, the lake diversion, lake infill, etc) and construction ancillary works within 40 m of watercourses and Lake Lyell.

Some of the work and disturbance on waterfront land will be temporary and rehabilitated before operation. Permanent impacts are expected however where operational infrastructure would remain on waterfront land, primarily the upper reservoir, inlet and diversion (including infill), and permanent crossing of the lake.

6.3.5 Operational changes to Lake Lyell and associated impacts

i Changes to water level regime

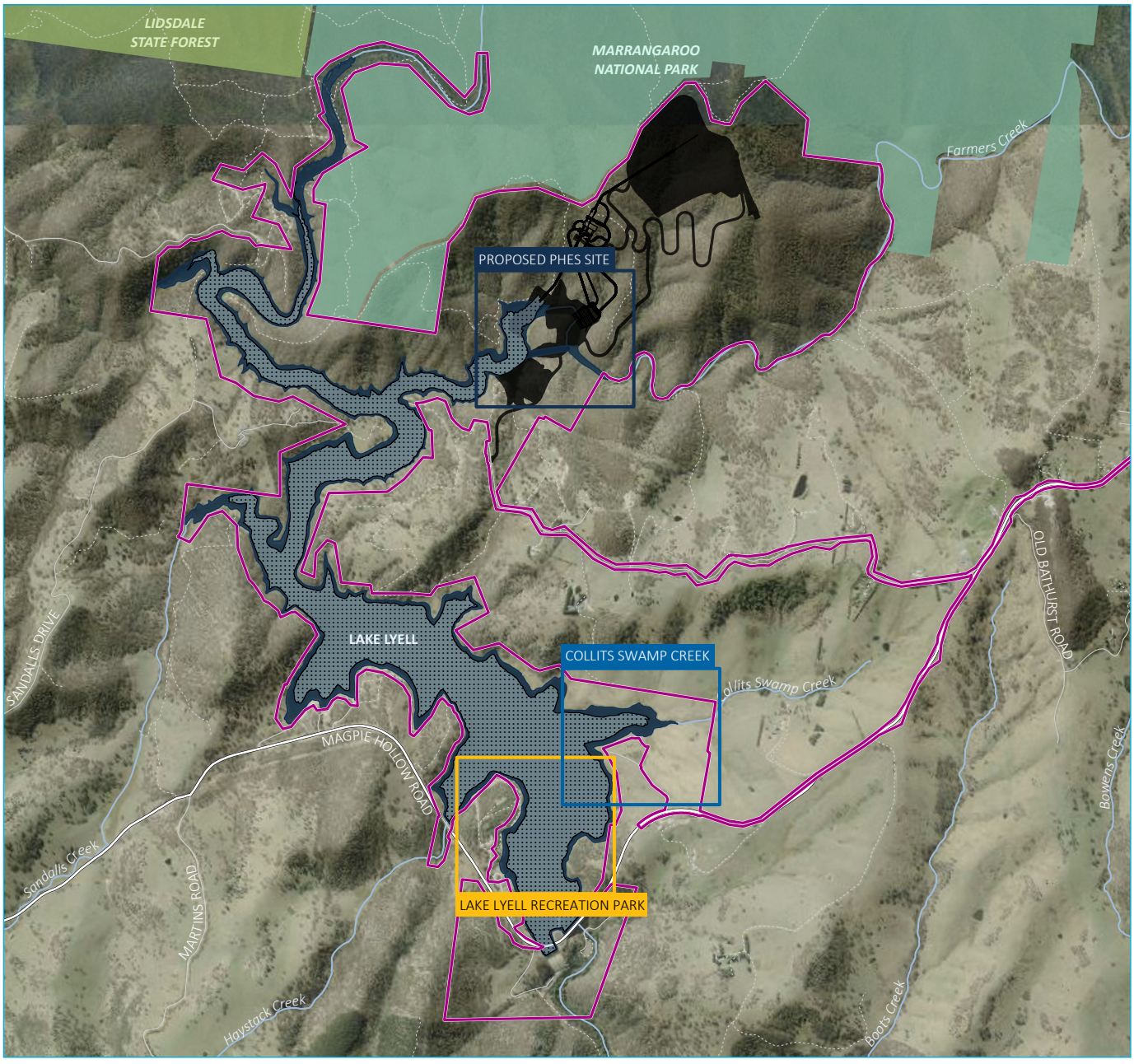
Once operational, water level within Lake Lyell will fluctuate with the PHES generation and storage cycle.

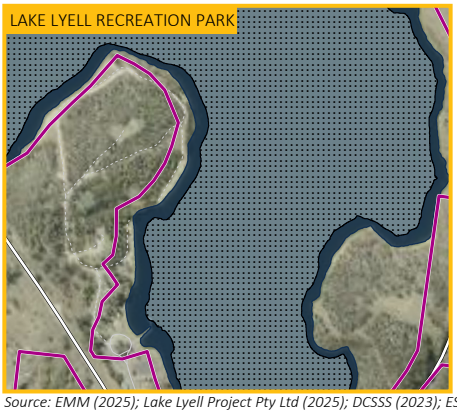
Table 6.4 provides a summary of changes to the Lake Lyell water level and spill regime due to the PHES operation.

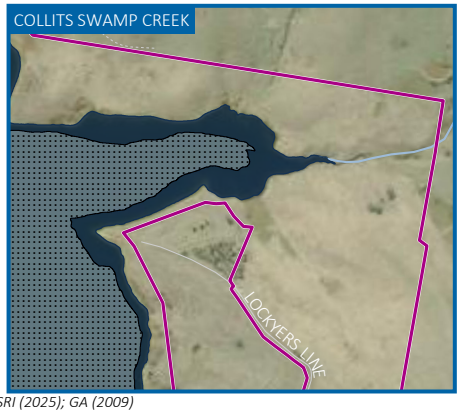
Table 6.4 Changes to Lake Lyell water level and spill regimes

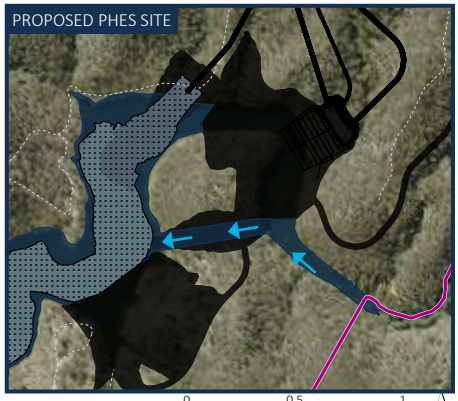
	Existing Condition	Changes due to PHES operation
Changes to lake water levels	• Lake Lyell is generally maintained in a near full condition, with water levels ranging from above FSL to 782.3 m AHD (a 4.4 m range) during the recent period. • Outside of significant wet weather events the lake water levels change slowly.	• Lake Lyell will generally be maintained within the target PHES operating range (781.0 to 784.5 m AHD and will occasionally be within the maximum PHES operating range (780.0 to 786.0 m AHD). Figure 6.6 shows areas where the lake shoreline (or ponded water extent) will fluctuate due to the PHES operation. Lake Lyell will be 78% full[1] at the minimum PHES operating level of 780.0 m AHD. • Lake water levels will fluctuate daily due to PHES operations. The maximum rate of water level change will be 0.4 m/hr and the maximum change in water level over a full cycle will be 2.8 m. • Figure 6.6 shows areas where the lake shoreline (or ponded water extent) will fluctuate due to the PHES operation.
Changes to lake spill frequencies	• During high inflow events Lake Lyell is generally allowed to fill to FSL then spill.	• The frequency of water levels exceeding the Lake Lyell FSL and spills from the lake will decrease as LLP will seek to maintain lake water levels within the target PHES operating range using riparian releases.

Notes: 1. 78% full refers to the water level between the Lake Lyell MOL (761.3 m AHD) and FSL (785.5 m AHD)









Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009)

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KEY

- Project area
- Farmers creek flow direction
- Operational footprint
- Lake inundation extent at minimum PHES operating level (780.0 m AHD)*
- PHES operating range to FSL (780.0 to 785.5 m AHD)*

*The 780 m AHD contour was derived using bathymetry data provided by Energy Australia. The 785.5 m AHD contour was derived using a 1 m DEM obtained from the ELVIS portal.

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- NPWS reserve
- State forest

Proposed PHES operation levels

Lake Lyell PHES
Environmental Impact Statement
Figure 6.6

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ii Potential scour in Farmers Creek

The inlet structure will pump and discharge water at flow rates with potential to cause scour or erosion of sediments at the lakebed and along banks in the Farmers Creek arm of Lake Lyell. If scour does occur it is expected that the extent and magnitude of scour will decline over time as the lakebed and banks will adjust to a new scour and depositional equilibrium, and most of the scoured material will be deposited in and around the western portion of the Farmers Creek arm of Lake Lyell where water flow velocities will be lower.

A qualitative assessment only has been completed for the EIS with further assessment and modelling needed to be undertaken at detailed design of the inlet and outlet structure, and to identify whether shoreline armouring would be required to mitigate impacts.

iii Potential for thermal heating

Energy losses in the system will occur at the reversible turbines and as friction losses in the tunnels and inlet and outlet works. Most of the energy loss in the system will manifest as heat and be absorbed by water moving through the turbines and tunnels. An assessment of whether the water discharged during a generation would result in heating effects within Lake Lyell was completed as part of the Surface Water Assessment (refer to Appendix F). The assessment concluded that the operation of the PHES will not result in any material heating of Lake Lyell as the increase in water temperature is negligible, in particular given the current daily water temperature changes in the lake as a result of air and solar influences.

iv Changes to Lake Lyell water cycle processes and quality

The operation of the PHES will introduce the following key changes to Lake Lyell:

- Water circulation - A full cycle will circulate 5.3 GL of water between Lake Lyell and the upper reservoir. This volume is equivalent to 16% of Lake Lyell total storage capacity (33.5 GL), up to the FSL. Water discharged from the upper reservoir into the Farmers Creek arm will be fully mixed and oxygenated which means it will have a homogeneous temperature, density and water quality and high dissolved oxygen levels.

- Increased kinetic mixing - pumping and discharging will introduce new currents and kinetic mixing in Lake Lyell. The currents will be strongest in the Farmers Creek arm of Lake Lyell and in the upper (northern) extent of Lake Lyell which is narrower and shallower than the lower (southern) extent of the lake.

Figure 6.7 shows the conceptual water cycle processes model for Lake Lyell with operation of the PHES. Overall, project induced mixing will reduce stratification and improve water quality in the Farmers Creek arm and upper reaches of the lake which historically have had higher algae levels relative to the lower part of the lake.

6.3.6 Impacts on receiving waters during operation

Due to the proposed water management measures and the beneficial effect of the PHES operation on Lake Lyell water quality, the operational phase of the project is expected to have a neutral to beneficial effect on water quality in the Coxs River downstream of Lake Lyell. This means that the project would also have a neutral to beneficial effect on water quality in Lake Burragorang, which is a major water supply dam for the Sydney metropolitan region that receives inflows from the Coxs River and is operated by WaterNSW.

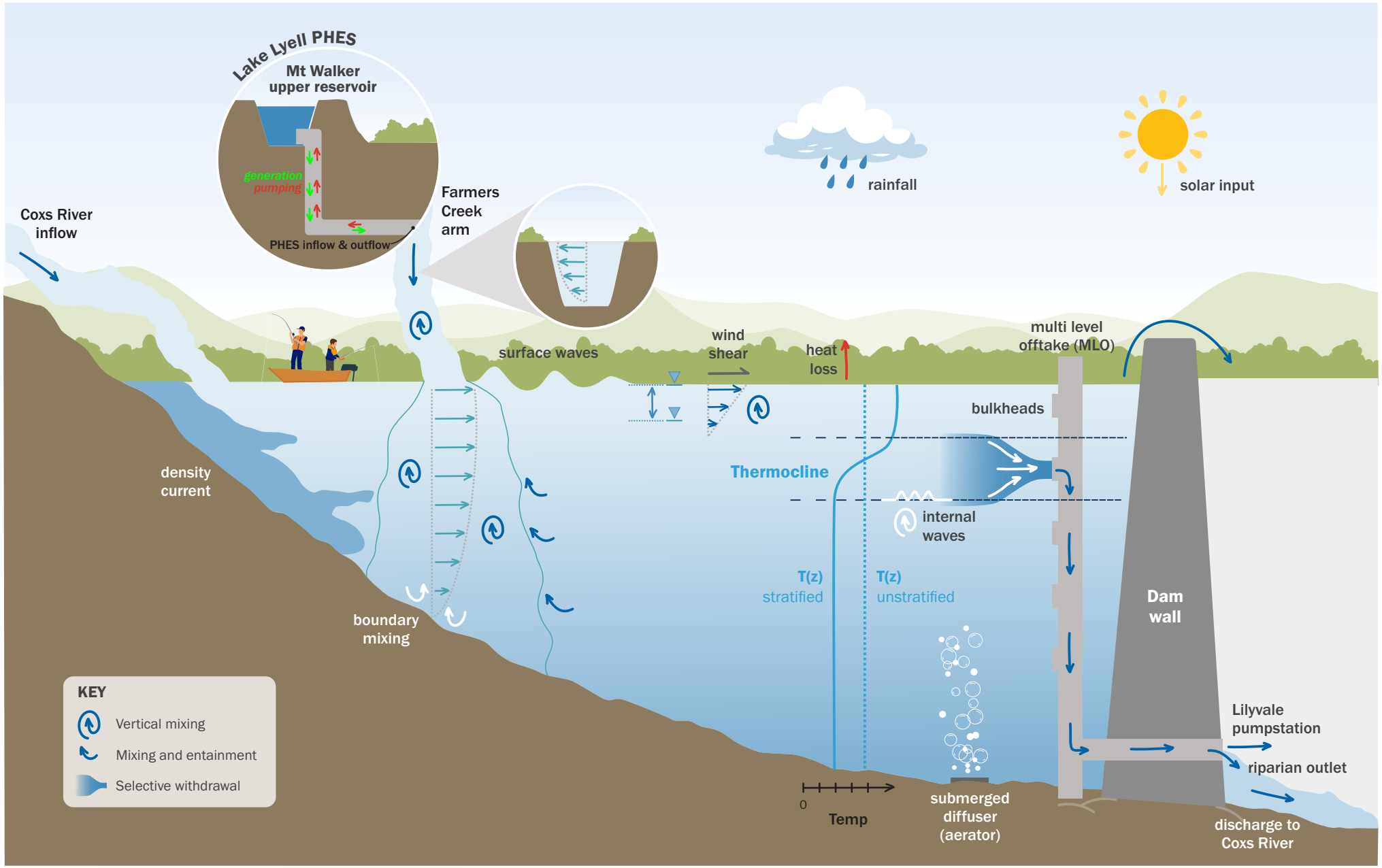


Figure 6.7 Additional water cycle processes in Lake Lyell due to PHES operation

6.3.7 Groundwater impacts

i Impact pathways

Groundwater take (i.e. inflow to excavated components) and infiltration (i.e. losses from water retained in reservoirs) will occur during the following project stages:

- During project construction, groundwater inflow will occur to project elements excavated below the watertable, prior to the installation of impermeable liners at selected project elements (i.e. the penstock shafts).
- During project operation, water losses will occur from pressurised project elements (i.e. the headrace tunnel and upper reservoir), contributing to the groundwater system.
- Following project closure, the sub-surface components of the project will reach equilibrium with the surrounding groundwater system (i.e. no net change) and the upper reservoir will receive groundwater inflow.

Groundwater level drawdown or mounding (i.e. lowering or raising of the watertable) and effects on the surrounding watercourses (i.e. reduced groundwater contributions to streams) has been predicted using an independently peer reviewed numerical groundwater model. The numerical groundwater model is based on a conceptual and simplified representation (or conceptual model) of the complex hydrogeological systems intercepted by the project, and is designed to provide conservative predictions, accounting for any potential under-prediction of impacts caused by the conceptual simplifications. As such, the model predictions are likely to be overestimating project impacts and the results of this conservative model approach need to be considered within this overall context.

Some activities during construction also have potential to impact groundwater quality. These activities include:

- stockpiling of spoil (i.e. excavated waste rock and soils)
- storage of surplus or construction water, potentially infiltrating to the groundwater system or spilling to nearby watercourses and altering water quality
- drilling and blasting for tunnel excavation, potentially introducing nutrients (typically ammonium and nitrate contained within the blasting chemicals) to the groundwater system
- machine operation, potentially introducing hydrocarbons (fuels and oils) to the groundwater system in the event of a spill.

ii Potential impacts to groundwater levels, flow and quality

Groundwater modelling predicts localised watertable drawdown in the vicinity of the project throughout construction and operation. Watertable drawdown, once the project has advanced into the final year of construction and into operations, is predicted to extend up to approximately 1.1 km from the centre of the project (near the power station complex), over approximately 173 ha. The predicted watertable drawdown during construction and operation of the project is presented in Figure 6.8 and Figure 6.9, respectively.

Based on the groundwater modelling, drawdown is not predicted at any private groundwater users and watertable drawdown is predicted to have negligible impacts on terrestrial GDEs. There will be a minor reduction in baseflow available to rivers and creeks, however impacts are predicted to discrete stream-lengths only and residual impact are predicted to be negligible.

Cumulative drawdown impacts have also been assessed and determined:

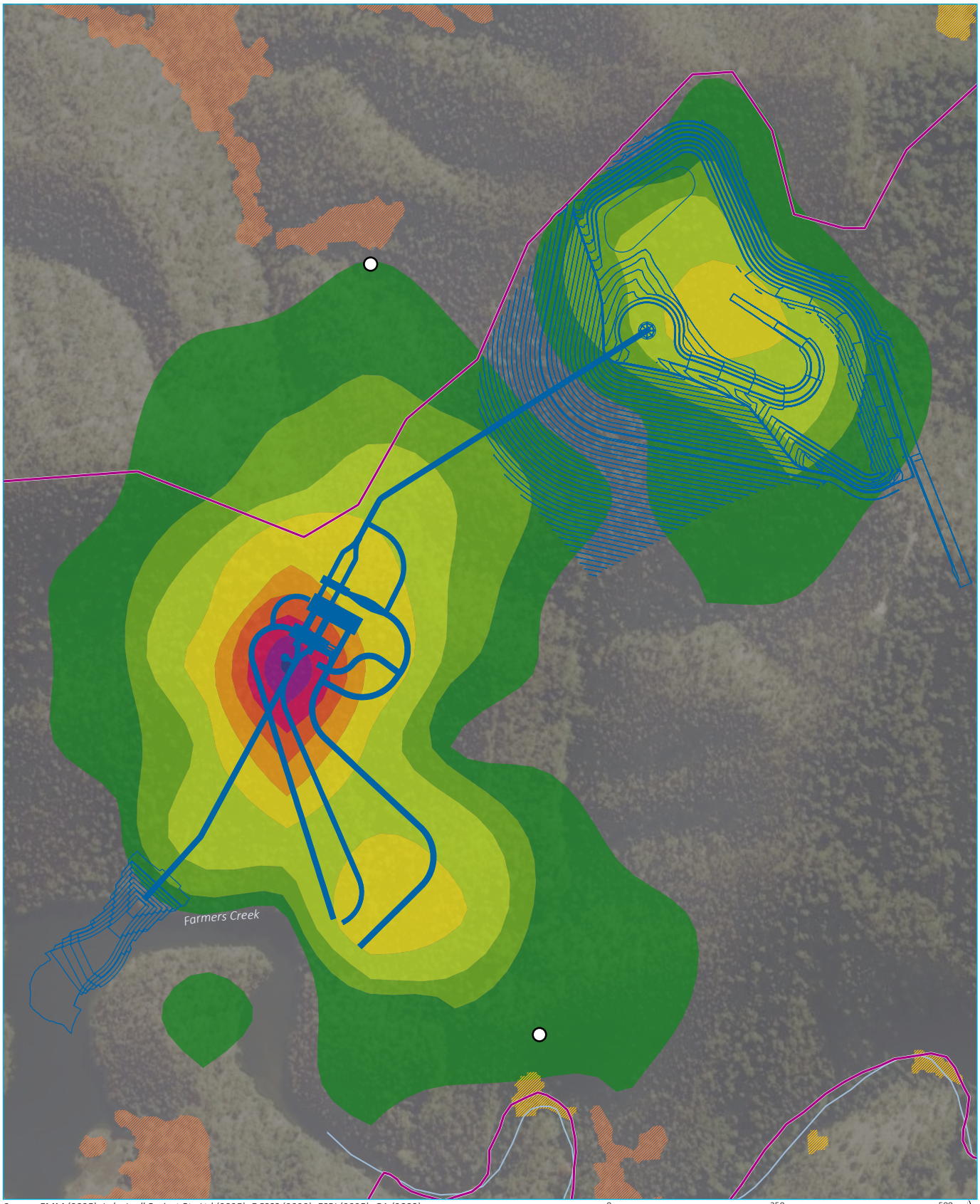
- cumulative watertable drawdown resulting from the project and the nearby Marangaroo Quarry during project construction is assessed as negligible
- enhanced drawdown impacts resulting from climate change is considered negligible.

The geological units intercepted by the project have a low potential to induce metalliferous drainage. The transport and stockpiling of material during construction would be subject to the processing and handling requirements outlined in the Excavated Rock Management Strategy (refer to Appendix I). The overall risk to the groundwater system is considered low.

Water quality objectives have been provided to develop an indicative standard for project related water quality. These objectives will be monitored throughout the construction and operation of the project to ensure discharged water is of sufficient quality to meet this standard.

iii Risk assessment

A risk assessment was completed to determine the unmitigated and mitigated risk profiles for potential changes to groundwater quantity (levels / flow) and groundwater quality. Unmitigated, potential impacts range from low (regional water quality impacts during construction and operation) to high (localised drawdown during construction and operation). Once mitigation measures are implemented (i.e. the measures presented in Section 6.4), the residual potential impacts are all reduced to low.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009)

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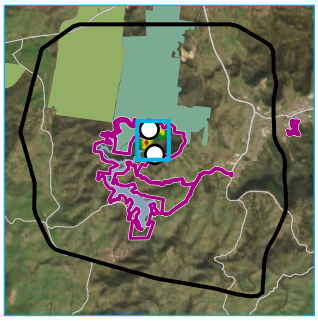

KEY

- Project area
- Study area
- Key project infrastructure
- Hydrograph location

Terrestrial GDE- study truthed

- Facultative- high
- Facultative- opportunistic

Existing environment

- Named watercourse

Maximum predicted watertable drawdown (m)

- 0.2
- 2
- 5
- 10
- 20
- 30
- 40
- 50
- 60

Maximum predicted groundwater drawdown – construction

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Environmental Impact Statement
Figure 6.8

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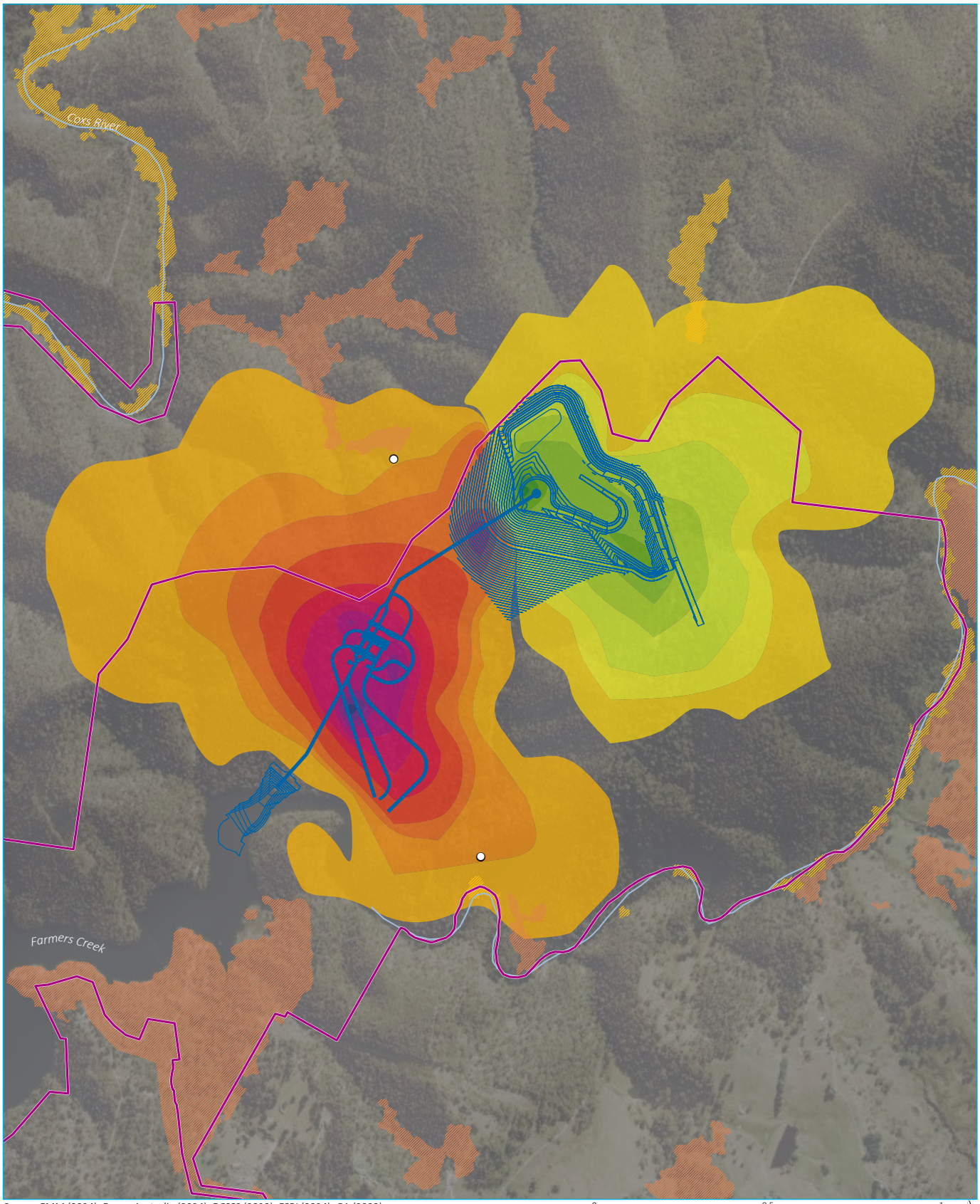

Source: EMM (2024); EnergyAustralia (2024); DCSSS (2023); ESRI (2024); GA (2009)

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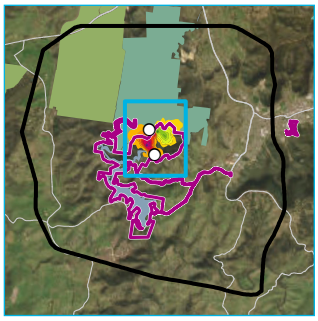

KEY

- Project area
- Study area
- Key project infrastructure
- Hydrograph location

Terrestrial GDE - study truthed

- Facultative- high
- Facultative- opportunistic

Existing environment

- Named watercourse

Maximum predicted watertable drawdown (m)

- -50
- -40
- -30
- -20
- -10
- -5
- -2
- -0.2
- 0.2
- 2
- 5
- 10
- 20
- 30
- 40
- 50
- 60
- 70

Maximum predicted groundwater drawdown – operation

Lake Lyell PHES
Environmental Impact Statement
Figure 6.9

EMM
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6.4 Management and mitigation

Potential impacts to surface and groundwater are expected to be suitably managed with the implementation of reasonable and feasible mitigation measures. Detailed safeguards and mitigation measures are provided in the respective technical assessments (refer to Appendix F and Appendix G) and in Appendix E. The key management aspects include:

- applying operating principles that avoid and minimise impacts to the downstream environment
- implementing construction methods that restrict groundwater inflow where required
- providing a framework for the management and monitoring of water related impacts during construction and operation through the preparation of water management plans in consultation with relevant agencies and stakeholders.

6.4.1 Operating principles

EnergyAustralia will continue to operate Lake Lyell to meet the environmental flow requirements specified in section 57H of the *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023* and the water supply work and water use approval 10CA117220 held by EnergyAustralia.

The following key operating principles will be applied for the PHES during operation:

- Lake Lyell will generally be maintained within the target PHES operating range (RL 781.0 to 784.5 m AHD and will occasionally be within the maximum PHES operating range (RL 780.0 to 786.0 m AHD). Lake Lyell will be 78% full (in terms of level) at the minimum PHES operating level of 780.0 m AHD.
- The PHES generation and associated discharges from the upper reservoir to Lake Lyell will cease when the lake water level reaches the maximum PHES discharge level of 785.5 m AHD, which is the same as the Lake Lyell FSL or spill level. This will avoid PHES discharges while Lake Lyell is spilling (due to inflows) and any associated downstream flood impacts.

6.4.2 Groundwater inflow restriction

Management controls that restrict groundwater inflows during construction and operation of the project will reduce impact to water resources. As such it is proposed to implement the following, when required:

- pre-grouting (i.e. grouting through pilot holes at the excavation face if inflows are un-manageable via pumping)
- post-grouting (i.e. following excavation and installation of any structural liners).

6.4.3 Water management and monitoring plans

Two water management plans (WMP) will be developed for the project to support construction and operational activities. The WMPs will be sub-plans of the construction environmental management plan (CEMP) and operational environment management plan (OEMP), respectively. The WMPs will document the proposed mitigation and management measures for the approved project, and will include the surface and groundwater monitoring program, reporting requirements, spill management and response, water quality trigger levels, corrective actions, contingencies, and responsibilities for all management measures.

The WMPs will be prepared in consultation with NSW DCCEEW, the NSW EPA and key local stakeholders.

The WMPs will include details of the surface water and groundwater monitoring program, which will incorporate and update the existing monitoring network, monitoring frequencies and water quality constituents, and physical water take and pumping volumes between water storage structures. Trigger levels for water quality parameters will be developed as part of the WMPs to assist in early identification of water quality trends. The monitoring program will be prepared in accordance with the approved project's EPL, once enacted.

6.5 Water licensing strategy

Table 6.5 summarises the water licensing requirements for the project.

Table 6.5 Summary of water licensing requirements

Project phase	Water take mechanism	Estimated peak licensing requirement	
		Lachlan Fold Belt Greater Metropolitan Groundwater Source [3]	Wywandy Water Source
Construction	Construction water supply [1]	Up to 311 ML/yr	Up to 311 ML/yr
	Groundwater inflow to excavated/tunnelled infrastructure	62 ML/yr	–
	Reduced baseflow for connected watercourses	24 ML/yr	–
	Leakage via watercourse streambed	–	1 ML/yr
	Incidental surface water interception	–	TBC [4]
	Total [2]	**335 ML/yr**	**TBC**
Initial fill	First pump cycle to fill upper reservoir	–	6,300 ML [5]
	Total	**–**	**6,300 ML**
Operation	Operational system losses	–	107 ML/yr
	Groundwater inflow to excavated/tunnelled infrastructure	26 ML/yr	–
	Reduced baseflow for connected watercourses	8 ML/yr	–
	Leakage via watercourse streambed	–	1 ML/yr
	Incidental surface water interception	–	TBC
	Total	**34 ML/yr**	**TBC**

Notes:

1. A total of 311 ML/yr of construction water will be required for the project, supplied from the Lachlan Fold Belt Greater Metropolitan Groundwater Source and/or the Wywandy Water Source
2. Incidental groundwater and surface water interception will be preferentially used as construction water supply, reducing the total licensing requirements
3. Groundwater take during the construction phase until 30 June 2029 is exempt from licensing
4. Incidental surface water interception that requires licensing will be estimated at the detailed design stage
5. Initial fill water take will occur once only

There are a number of options available to satisfy project water demands and the water licensing requirements of the project. These options have been discussed with DCCEEW Water throughout development of the project. The preferred pathway to secure water licensing for the project is as follows:

- Exercising statutory exemptions to require an access licence for groundwater taken in connection with construction of infrastructure, water taken by excluded works dams and the circulation of water between the lower and upper reservoirs.

- Use of WAL 45574 to account for up to 350 ML/yr of groundwater take from the Lachlan Fold Belt Greater Metropolitan Groundwater Source, with any additional groundwater required traded from the water market.

- For surface water take from the Wywandy Water Source:

    - temporary use of EnergyAustralia's SPAL 27428 (subject to regulatory change) for construction, initial fill and operational phases of the project

    - alternatively, apply for a new SPAL under the 'unregulated river pumped hydro-electricity generation (construction and initial storage fill) access licence' for the construction and initial fill phases of the project

    - pursue a long-term solution for surface water take during operation of the project in the Fish River-Wywandy Regional Water Strategy to allow LLP to obtain water entitlement.

6.6 Conclusion

The surface water assessment has considered the potential impacts of the project's construction and operation on existing water levels, flow regime and water quality of the receiving environment.

Construction impacts include controlled discharges and overflows of stormwater, and controlled discharge of treated contaminated water, however water quality is expected to be similar to minimal harm criteria. No changes to lake inflows or lake processes are expected during construction. Some local watercourses will be unavoidably disturbed by construction.

The project will result in changes within Lake Lyell during operation, as the PHES will fluctuate water levels and promote mixing and destratification of the water column. The pumping and dispersion of water from the inlet structure also has potential to result in some scouring of the shoreline, which could be managed by shoreline armouring, if required. Due to the proposed water management systems and proposed operating principles, impacts to the downstream environment are considered negligible.

Both the construction and operation of the project has been assessed to have a neutral or beneficial impact on water quality in the Coxs River downstream of Lake Lyell.

Groundwater modelling for the project has predicted localised watertable drawdown throughout construction and operation. The drawdown is not predicted to impact any private groundwater users and is predicted to have negligible impacts on terrestrial GDEs. There will be a minor reduction in baseflow available to rivers and creeks, however impacts are predicted to discrete stream-lengths only and residual impact are predicted to be negligible.

To mitigate impacts of the project, a combination of construction method mitigations, operating rules and construction and operational WMPs are proposed. Ongoing monitoring will be required and will be documented as part of the WMPs.

Overall water impacts of the project are expected to be manageable with the implementation of the required management, mitigation and monitoring measures.

Chapter 7

Biodiversity

Environmental Impact Statement | Lake Lyell PHES Project

7 Biodiversity

This chapter presents a detailed summary of the project's impacts on biodiversity values, including terrestrial and aquatic ecology. Detailed technical reports are provided, with the Biodiversity Development Assessment Report (BDAR) in Appendix J and Aquatic Ecology Assessment (AEA) in Appendix K, respectively. The relevant SEARs for biodiversity and where they are addressed is summarised in Appendix A.

7.1 Assessment approach

The assessment of biodiversity values and the likely biodiversity impacts of the project has been prepared in accordance with the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the Biodiversity Assessment Method (BAM). It has included desktop review, extensive field surveys, mapping and analysis over a period between March 2023 and March 2025. Consultation was undertaken with the Conservation Programs, Heritage and Regulation Group (CPHR) of DCCEEW regarding survey requirements for several species where detailed survey guidelines have not been published. Detailed responses were provided for Purple Copper Butterfly, Glossy Black Cockatoo and Gang-gang Cockatoo. These responses were considered as part of further survey and assessment as presented in the BDAR.

The assessment of the likely aquatic impacts of the project has been prepared in accordance with relevant policy and guidelines developed by NSW DPI to manage impacts under the *Fisheries Management Act 1994 (NSW)* (FM Act). Desktop and literature review, field surveys and analysis focused on the aquatic and subterranean environments in the region of the project. While not a threatened species, a targeted platypus survey program was completed to better understand the population, distribution and behaviour of the species relative to the project. Consultation was undertaken with DPI Fisheries regarding the lake diversion design principles and offsetting approach of key fish habitat.

An offset strategy has been prepared to guide offset of residual impacts of the project in accordance with the BC Act, *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act) and FM Act.

7.2 Existing environment

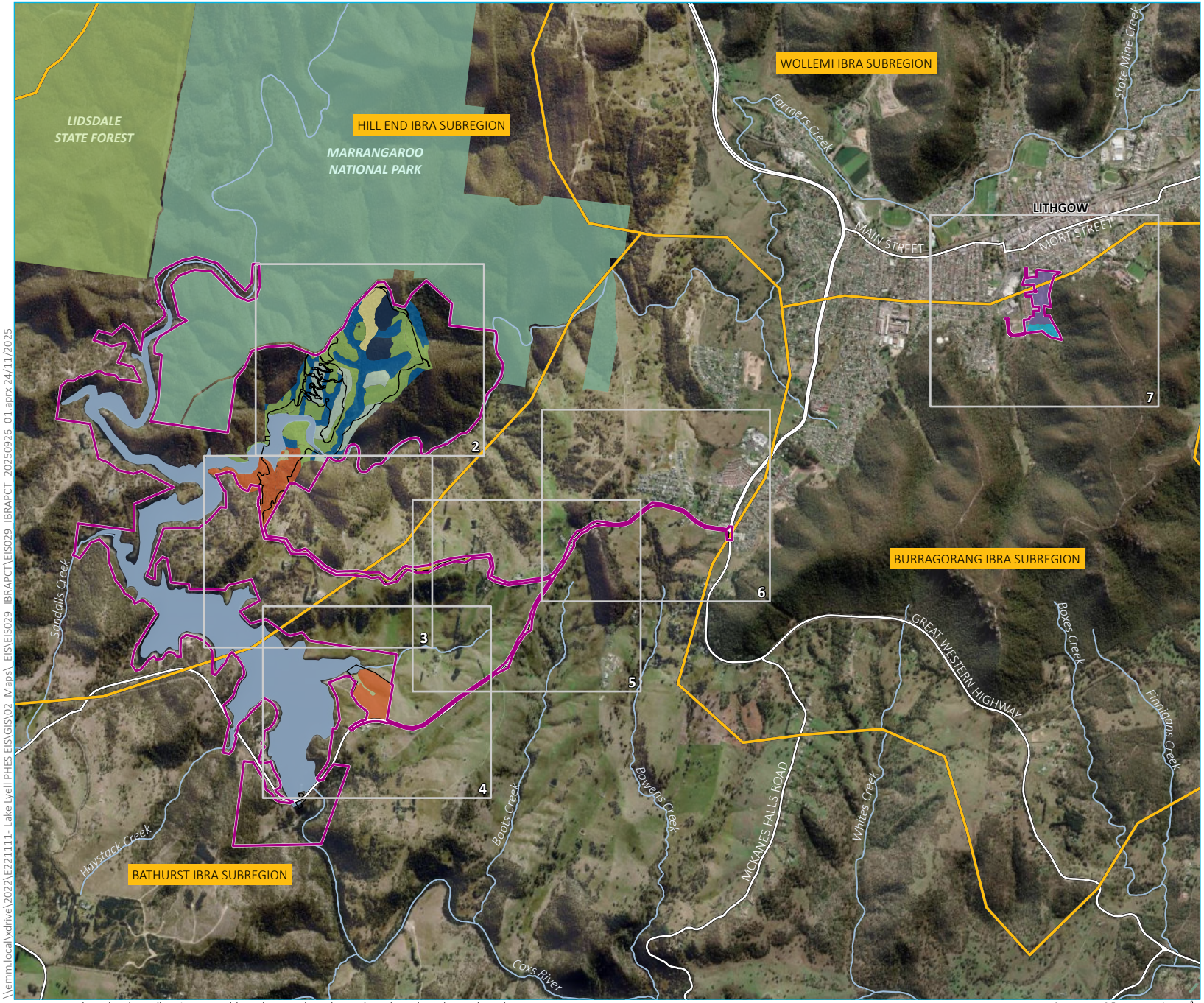
7.2.1 Landscape context

The project (with the preferred lakeside accommodation camp) is located within the NSW South Eastern Highlands Interim Biogeographic Regionalisation of Australia (IBRA) bioregion, with the PHES facility located within the Hill End IBRA subregions and the main site access road, lakeside accommodation camp and Lilyvale Dam located within the Bathurst IBRA subregion (refer to Figure 7.1). Lake Lyell crosses both subregions. The alternative town accommodation camp is located in the Sydney Basin IBRA bioregion, mostly within the Burragorang IBRA subregion and partly within the Wollemi IBRA subregion.

Within and surrounding the construction envelope, vegetation cover was estimated at approximately 73% for the Hill End IBRA subregion and 29% for the Bathurst IBRA subregion based on regional vegetation mapping and aerial imagery. The patch sizes of all vegetation zones were calculated to be greater than 100 ha due to the contiguity of vegetation in the construction envelope with nearby remnant vegetation.

While most of the project area is covered in native woodland and forest, small areas, predominantly restricted to the fringes of Lake Lyell and its access, have been cleared previously for agricultural and other purposes.

The project area is bordered by Marrangaroo National Park to the north. In this northern area, native forest is largely intact and contiguous with Marangaroo National Park. These larger areas of relatively intact native vegetation provide wildlife movement corridors. Several rock outcrops with deep crevices are found near the summit of Mount Walker (outside of the project area), however these areas are not extensive and do not contain any caves or rock overhangs. There are no cliffs, large outcrops or deep rock crevices in the project area.



KEY

- Project area
- Disturbance footprint
- IBRA subregion
- Map page extent

Existing environment

- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Plant community type

- 3211 | Central Tableland Montane Wet Forest
- 3347 | Southern Tableland Creekflat Ribbon Gum Forest
- 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
- 3367 | Central Tableland Granites Grassy Box Woodland
- 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest
- 3385 | Southern Tableland Creekflat Swamp Woodland
- 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest
- 3687 | Newnes Plateau Peppermint-Ash Tall Forest
- 3735 | Central Tableland Peppermint Shrub-Grass Forest
- 3747 | Southern Tableland Western Hills Scribbly Gum Forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); OEH (2016)

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IBRA subregions and native vegetation of the project
Map 1 of 7

Lake Lyell PHES
Environmental Impact Statement
Figure 7.1

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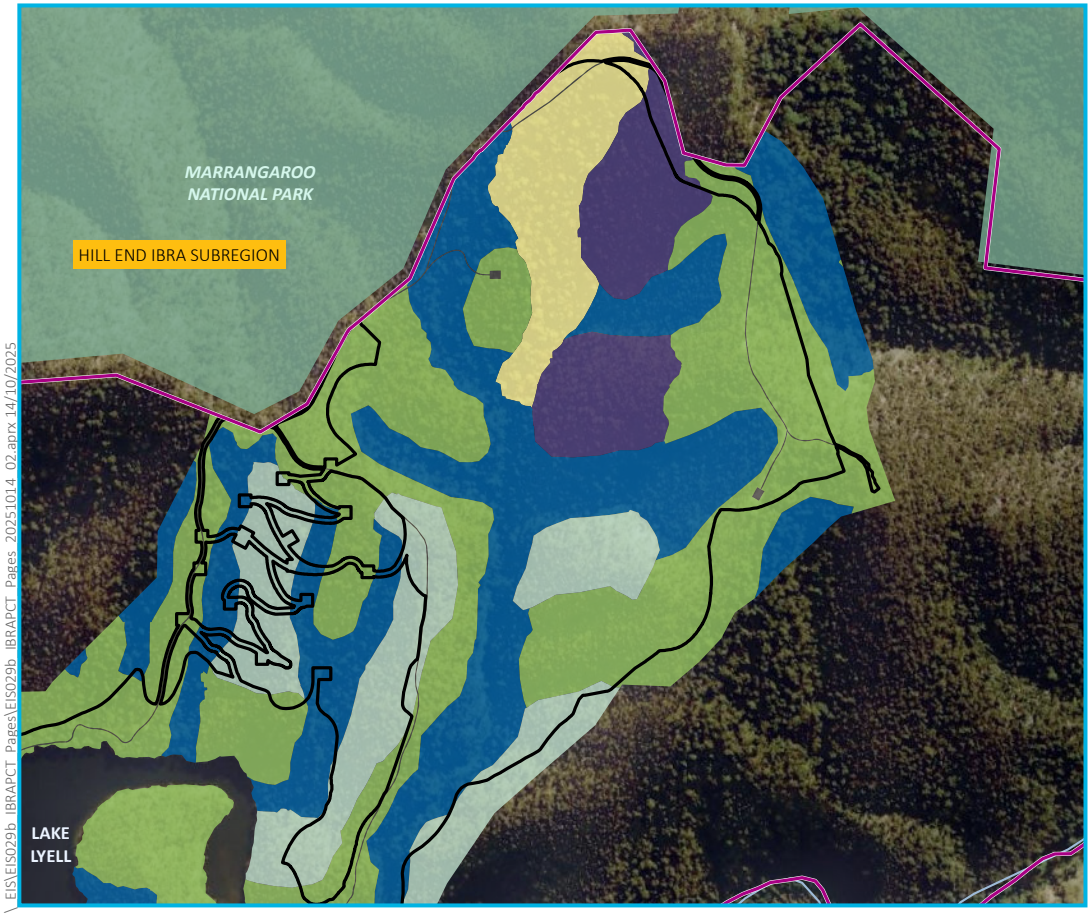

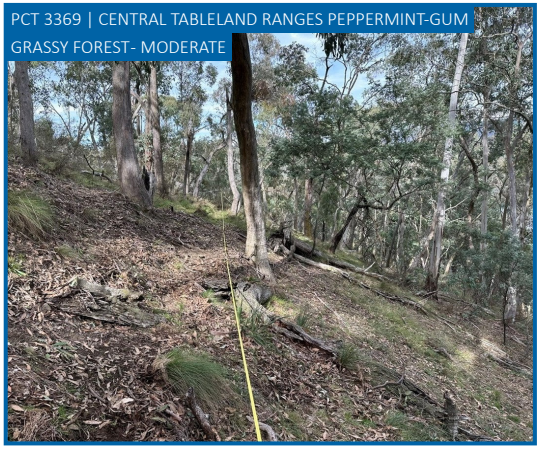

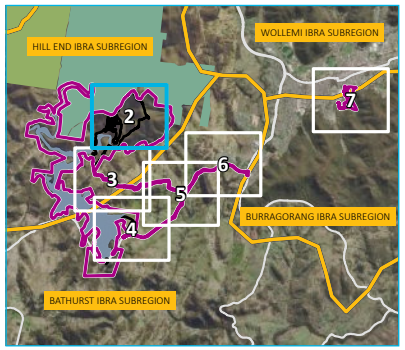

KEY

- Project area
- Disturbance footprint

Plant community type

- Unvegetated
- PCT 3211 | Central Tableland Montane Wet Forest
  - Moderate
- PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest
  - Moderate
- PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest
  - High
- PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest
  - High
- PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest
  - High

Existing environment

- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion

IBRA subregions and native vegetation of the project
Map 2 of 7

Lake Lyell PHES
Environmental Impact Statement
Figure 7.1

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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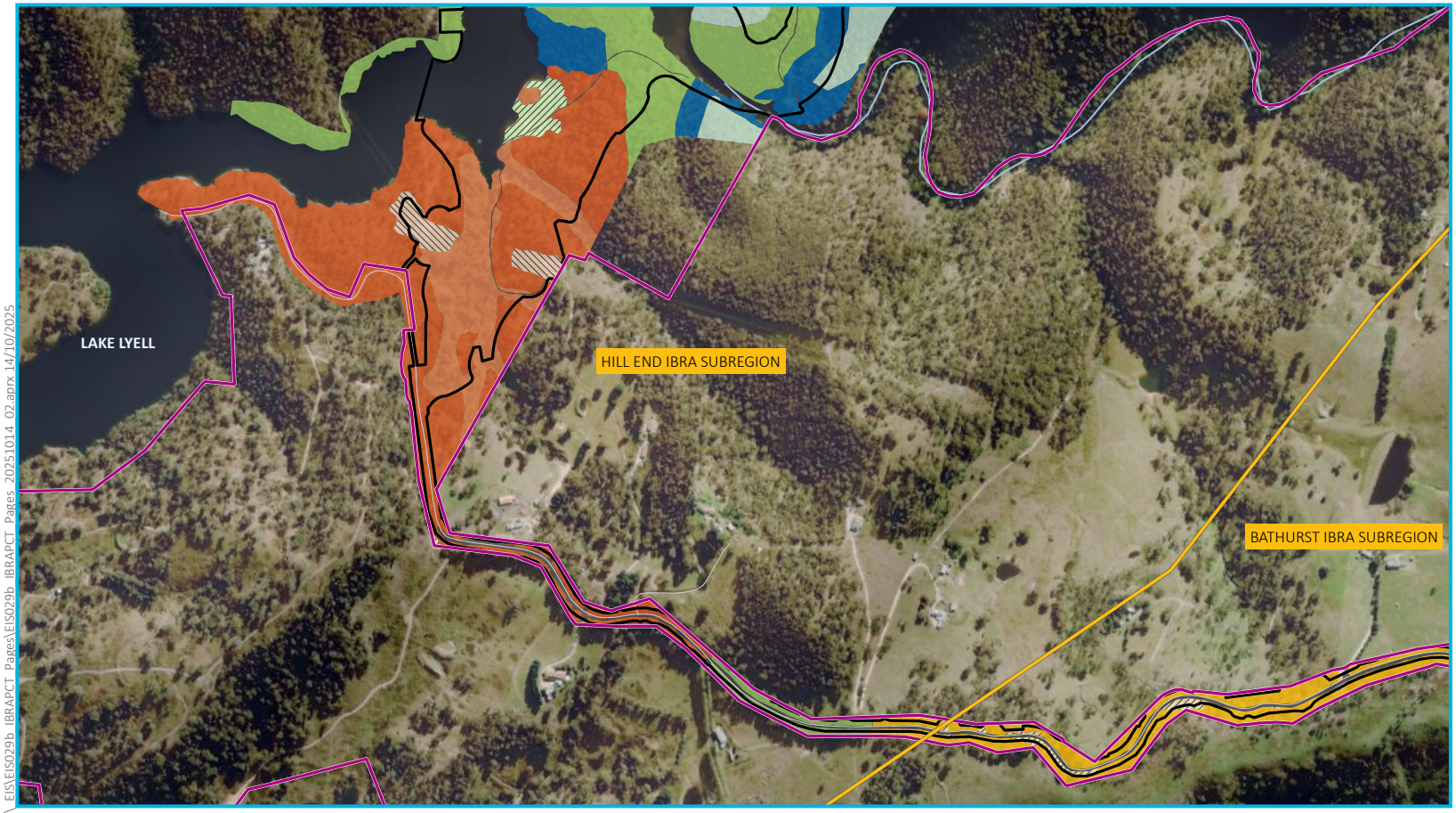

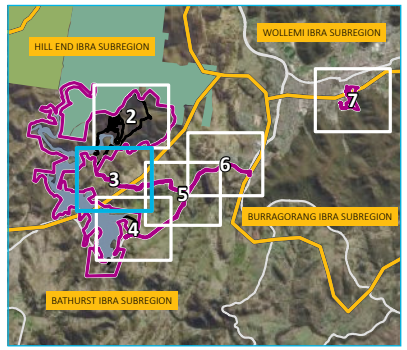

KEY

- Project area
- Disturbance footprint

Plant community type

- Unvegetated
- PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest
- Derived exotic grass or herbs
- PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
- Moderate
- Derived exotic grass or herbs
- PCT 3367 | Central Tableland Granites Grassy Box Woodland
- Moderate
- Poor
- Derived shrubland
- PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest
- Moderate
- PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest
- High
- PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest
- High

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion

PCT 3347 | SOUTHERN TABLELAND CREEKFLAT RIBBON GUM FOREST
DERIVED EXOTIC GRASS OR HERBS

PCT 3348 | SOUTHERN TABLELAND GRANITES RIBBON GUM GRASSY FOREST- MODERATE

PCT 3367 | CENTRAL TABLELAND GRANITES GRASSY BOX WOODLAND- MODERATE

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

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IBRA subregions and native vegetation of the project
Map 3 of 7

Lake Lyell PHES
Environmental Impact Statement
Figure 7.1

EMM
creating opportunities

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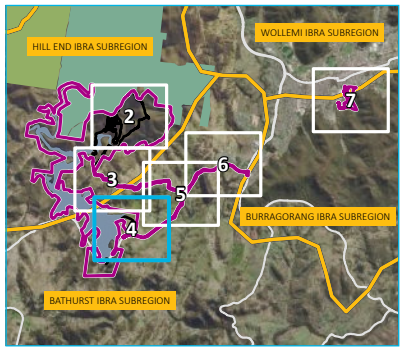

KEY

- Project area
- Disturbance footprint

Plant community type

- Unvegetated
- PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest
- Derived sedgeland
- PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
- Moderate
- Poor
- Derived exotic grass or herbs
- PCT 3367 | Central Tableland Granites Grassy Box Woodland
- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion

PCT 3347 | SOUTHERN TABLELAND CREEKFLAT RIBBON GUM FOREST
DERIVED SEDGELAND

PCT 3367 | CENTRAL TABLELAND GRANITES GRASSY BOX WOODLAND
POOR DERIVED NATIVE GRASSLAND

PCT 3367 | CENTRAL TABLELAND GRANITES GRASSY BOX WOODLAND- DERIVED EXOTIC GRASS OR HERBS

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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IBRA subregions and native vegetation of the project
Map 4 of 7

Lake Lyell PHES
Environmental Impact Statement
Figure 7.1

EMM
creating opportunities

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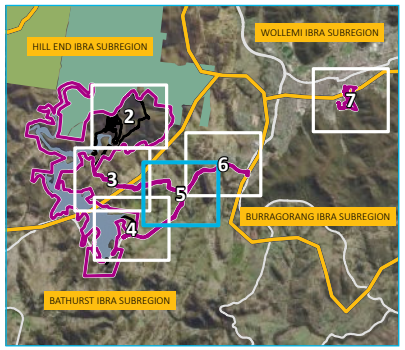

KEY

- Project area
- Disturbance footprint

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs
- Exotic woody vegetation

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Exotic woody vegetation

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- Moderate

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion

IBRA subregions and native vegetation of the project
Map 5 of 7

Lake Lyell PHES
Environmental Impact Statement
Figure 7.1

EMM
creating opportunities

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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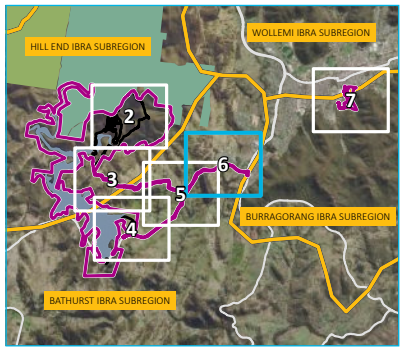

KEY

- Project area
- Disturbance footprint

Plant community type

- Planted non-indigenous native plants
- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs
- Exotic woody vegetation

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Exotic woody vegetation

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- Moderate

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion

IBRA subregions and native vegetation of the project
Map 6 of 7

Lake Lyell PHES
Environmental Impact Statement
Figure 7.1

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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creating opportunities

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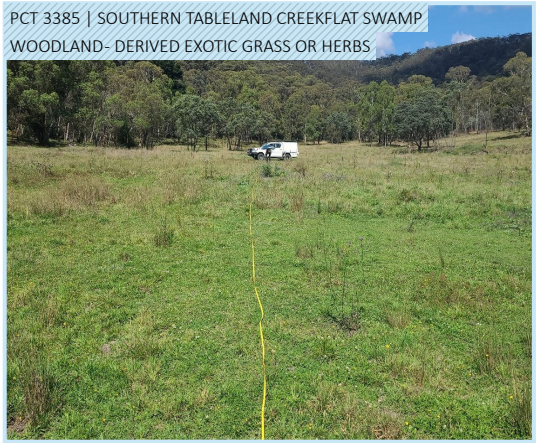
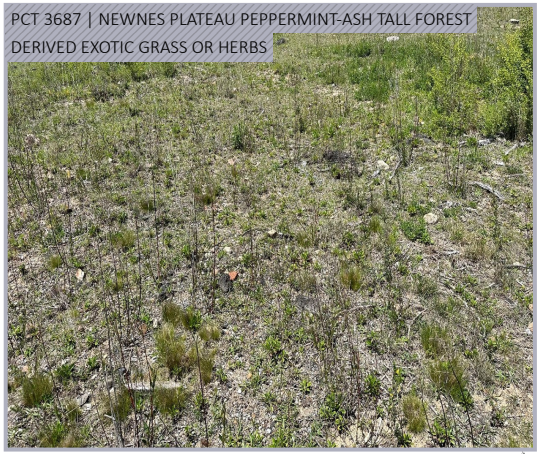
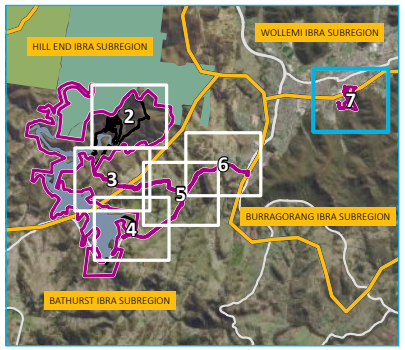
PCT 3385 | SOUTHERN TABLELAND CREEKFLAT SWAMP WOODLAND- POOR

PCT 3385 | SOUTHERN TABLELAND CREEKFLAT SWAMP WOODLAND- DERIVED EXOTIC GRASS OR HERBS



PCT 3687 | NEWNES PLATEAU PEPPERMINT-ASH TALL FOREST DERIVED EXOTIC GRASS OR HERBS





KEY

- Project area
- Disturbance footprint

Plant community type

- Unvegetated

PCT 3385 | Southern Tableland Creekflat Swamp Woodland

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3687 | Newnes Plateau Peppermint-Ash Tall Forest

- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment

- Minor road
- NPWS reserve
- State forest
- IBRA subregion

IBRA subregions and native vegetation of the project Map 7 of 7

Lake Lyell PHES
Environmental Impact Statement
Figure 7.1

EMM creating opportunities

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 125 250 m

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7.2.2 Native vegetation and habitat

Native vegetation within the construction envelope is generally structurally intact but some areas have a simplified vegetation structure and considerable weed invasion due to past land use, including historical timber felling, road construction and livestock grazing.

There is no evidence of recent bushfire in the construction envelope and the paucity of charring on trees suggests that the area has not been burnt in several decades. Notably, despite part of the 2019/2020 Gospers Mountain bushfire having affected vegetation nearby.

Dry sclerophyll forests and grassy woodlands occur over most of the construction envelope with smaller areas of wet sclerophyll forest in some protected gullies in higher elevation areas.

Ten plant community types (PCTs) were mapped within the construction envelope as shown on Figure 7.1:

- PCT 3211 – Central Tableland Montane Wet Forest
- PCT 3347 – Southern Tableland Creekflat Ribbon Gum Forest
- PCT 3348 – Southern Tableland Granites Ribbon Gum Grassy Forest
- PCT 3367 – Central Tableland Granites Grassy Box Woodland
- PCT 3369 – Central Tableland Ranges Peppermint-Gum Grassy Forest
- PCT 3385 – Southern Tableland Creekflat Swamp Woodland
- PCT 3650– Goulburn-Lithgow Ranges Silvertop Ash Forest
- PCT 3687– Newnes Plateau Peppermint-Ash Tall Forest
- PCT 3735 – Central Tableland Peppermint Shrub-Grass Forest
- PCT 3747 – Southern Tableland Western Hills Scribbly Gum Forest.

These PCTs are in varying condition, from high quality to poor and/or dominated by weed and exotic species. Examples of the varying conditions of PCTs (poor, moderate and high quality) within the construction envelope are also shown on Figure 7.1.

No threatened ecological communities occur within the construction envelope.

Habitat for threatened animals within the project is generally structurally intact and of high quality, given the high density of mature and hollow-bearing trees, rocky areas and fallen timber. But in some areas, particularly around the southern foreshores of Lake Lyell and along the access road, historical tree felling has resulted in simplification of habitat, with a relatively low density of hollows remaining for hollow-associated fauna.

7.2.3 Aquatic environment

The project area is located within the upper section of the Coxs River catchment, which sits within the broader Hawkesbury-Nepean catchment. The rivers and wetlands within the catchment are recognised as being in poor or very poor condition and under pressure. These contributing pressures come from habitat disturbance caused by drainage, grazing, feral animals and roads crossing, as well as urbanisation, agriculture, infrastructure and fire, leading to (but not limited to) elevated nutrients, barriers to fish passage and the introduction of pest species (DPE, 2010a; DPE, 2010b). The risk from invasive species in particular is identified as very high.

Aquatic surveys focused on Lake Lyell, the Coxs River, Farmers Creek and Collits Swamp Creek in order to present an adequate baseline of the environment that may be influenced by the project. Much of the riparian zone of the Coxs River has been modified or cleared, however, areas of intact riparian vegetation remain. The riparian zone of Farmers Creek upstream of Lake Lyell is well-vegetated and surrounded by native woodland and forest.

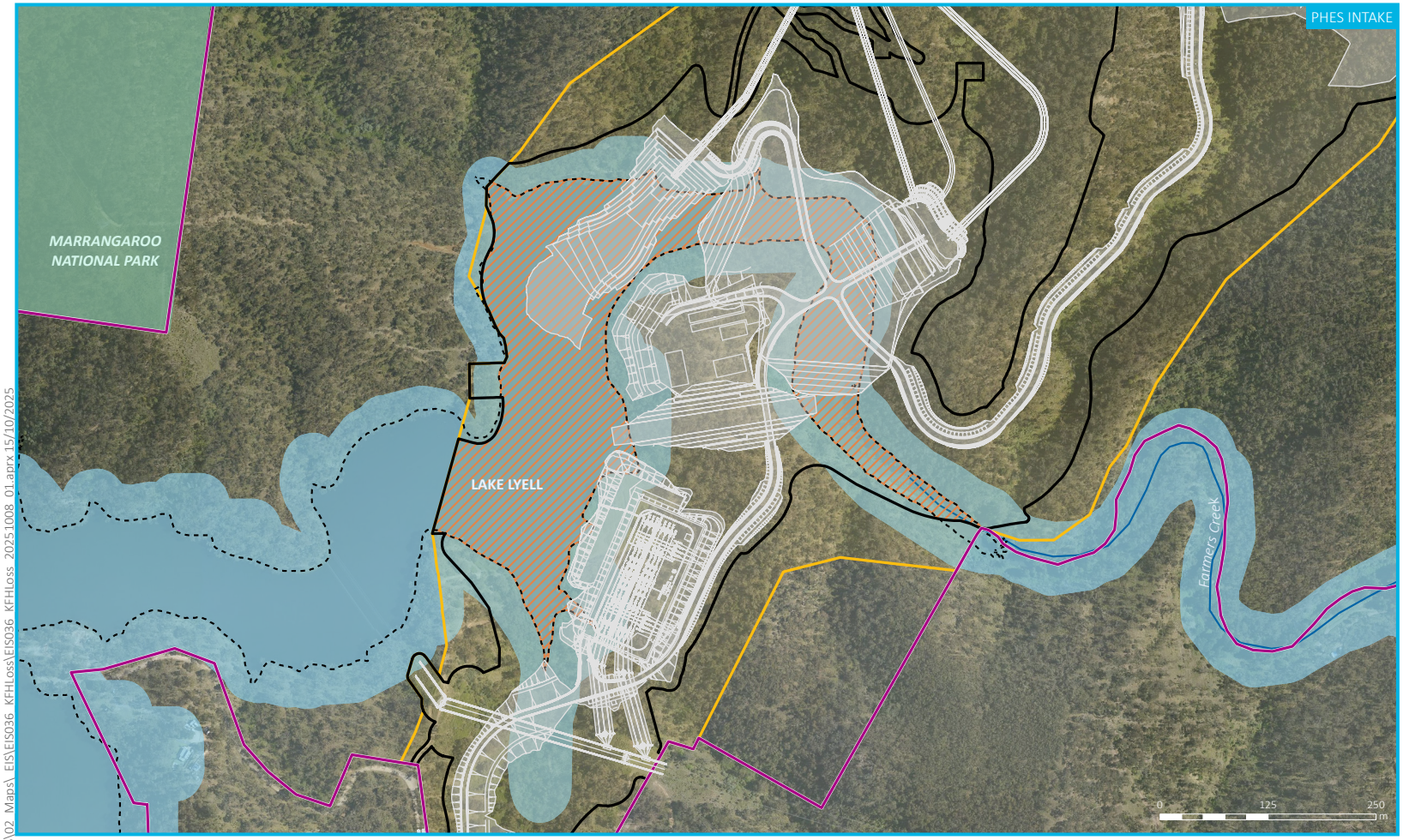
Lake Lyell, including the Farmers Creek arm of the lake, created through impoundment of the Coxs River, is a modified waterway however aquatic habitat, such as macrophytes and instream woody debris, and habitat complexity, is present and considered sufficient to support the requirements of many aquatic species, though unlikely to be critical to the survival of any given species.

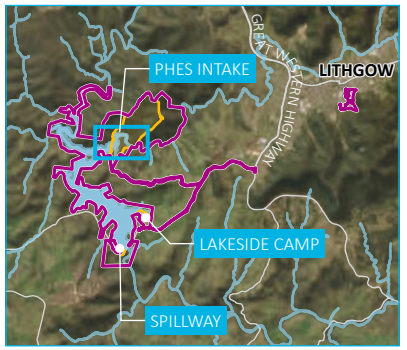
Aquatic sediments were sampled and revealed elevated levels of heavy metals, with all other analytes below or within acceptable limits. Surveys of aquatic algae and macrophytes found that species diversity and relative abundances were variable across all waterways within the project area. Macroinvertebrate abundance and diversity was also variable, with greater health in upstream and shallower environments and decreasing downstream.

Photograph 7.1 Example of typical edge habitat of Lake Lyell (Farmers Creek)

The lake is dominated by invasive species as supported by the findings of field survey, notably trout (Brown, Rainbow and Tiger trout, which are periodically stocked by DPI Fisheries), Common carp, Redfin perch, Eastern gambusia and Goldfish. However, two native fish (Australian bass and Flathead gudgeon) and one native mammal species (Platypus) were also recorded during field surveys. Due to the presence of Lilyvale Dam, Australia bass only persist within Lake Lyell due to DPI Fisheries stocking. No stygofauna (subterranean species) were detected during surveys.

Lake Lyell and all tributaries have been assessed as Type 1 highly sensitive key fish habitat and Class 1 major key fish habitat (refer to Figure 7.2), due to the sites containing in-stream snags and/or native aquatic plants and permanent flow. Based on the surveys and investigations, it is considered that Lake Lyell, the Coxs River, Farmers Creek and Collits Swamp Creek are of moderate ecological value.



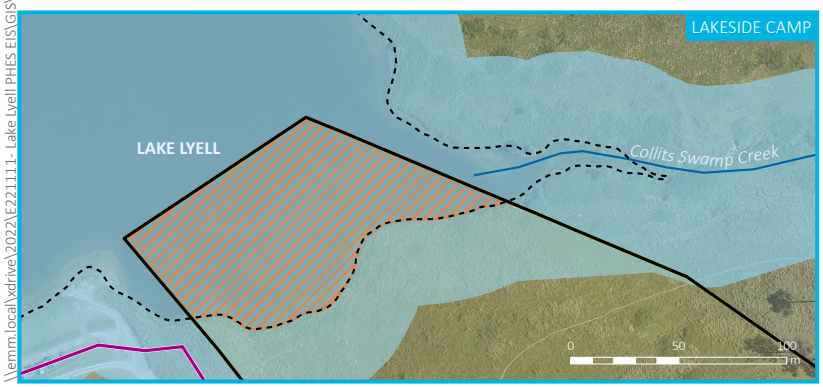


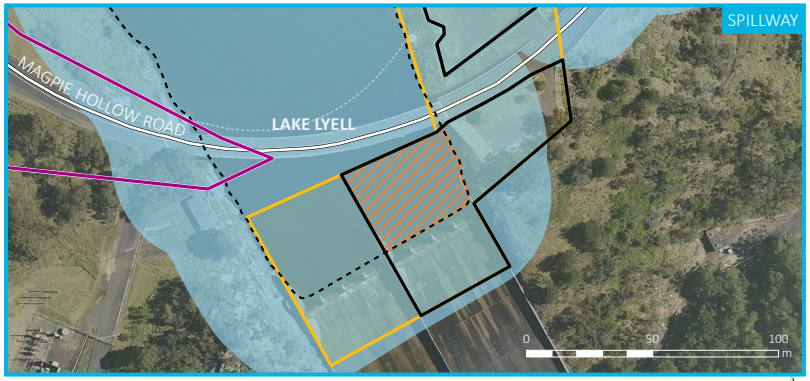
KEY

- Project area
- Disturbance footprint
- Construction envelope
- Project element
- Full supply level
- Key fish habitat loss
- Key fish habitat

Existing environment

- Major road
- Named watercourse
- NPWS reserve





Key fish habitat relevant to the project

Lake Lyell PHES
Environmental Impact Statement
Figure 7.2

EMM
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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); MetroMap (2025); DPI (2009)

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7.2.4 Threatened species

i Terrestrial species

Targeted threatened flora surveys were carried out during appropriate detection periods. No threatened flora species were recorded or assumed present in the project area.

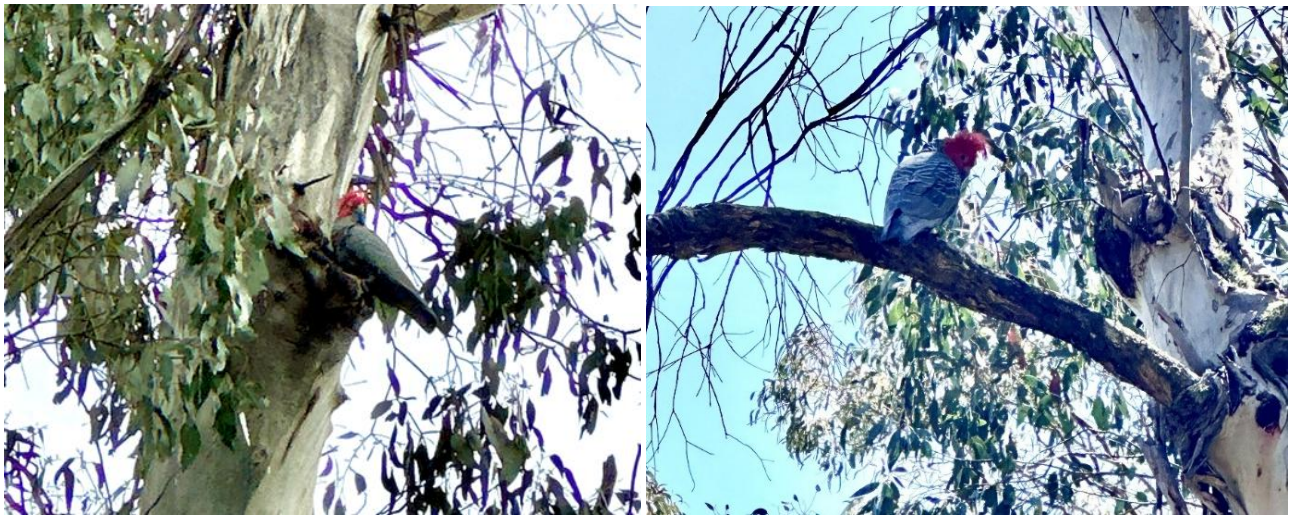
Targeted fauna surveys were conducted within the survey area in accordance with methods and timing stipulated by various NSW and Commonwealth guidelines, or as advised through consultation with CPHR. The threatened species were recorded or assumed present in the project area are summarised in Table 7.1.

Table 7.1 Threatened species recorded or assumed present within the construction envelope

Scientific name	Common name	BC Act Status	EPBC Act Status	BAM credit type	Observations
Phascolarctos cinereus	Koala	E	E	Species	Confirmed by koala detection dogs.
Ninox strenua	Powerful Owl	V	-	Dual	Observed in multiple locations north of Lake Lyell during the species' breeding season via call-playback, song meter and stag watch / listening / spotlighting surveys.
Tyto tenebricosa	Sooty Owl	V	-	Dual	Observed in multiple locations north of Lake Lyell during the species' breeding season via call-playback, song meter and stag watch / listening / spotlighting surveys.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	Dual	Seen and heard in multiple location on site incidentally and during targeted surveys. Breeding activity confirmed. See Photograph 8.1.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	Dual	A pair was incidentally observed foraging in a patch of black she-oak (*Allocasuarina littoralis*) in June 2023. Chewed cones seen throughout the single patch of *Allocasuarina* spp. on or adjacent to the site. Possible breeding activity observed.
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-	Dual	A single adult bird incidentally recorded hunting waterfowl over Lake Lyell in June and December 2023. No evidence of breeding activity.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Dual	Recorded by ultrasonic recording with high confidence (Definite).
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Ecosystem	Recorded by ultrasonic recording with high confidence (Definite).
Myotis macropus	Southern Myotis	V	-	Species	Recorded by ultrasonic recording with high confidence (Definite).
Paralucia spinifera	Purple Copper Butterfly	E	V	Species	The species has been assumed to occur in areas containing *Bursaria spinosa* (the host plant) above 850 m in altitude, as this higher elevation habitat aligns with the higher elevation habitats in which the species typically recorded.

Notes: V = vulnerable; E = endangered; Species = species-credit species; Ecosystem = ecosystem credit species; Dual species credit species and ecosystem credit species

Two serious and irreversible impacts (SAII) candidate species were recorded within the construction envelope, the Sooty Owl and Large Bent-winged Bat and two other SAII candidate species, the Swift Parrot and Regent Honeyeater, are assumed to occur in suitable habitat in the construction envelope.



Photograph 7.2 Examples of observed Gang-gang Cockatoo breeding activity

The Purple Copper Butterfly (*Paralucia spinifera*) was not detected in the construction envelope or elsewhere in the project area during targeted surveys. However, a single individual was incidentally recorded in a regularly slashed powerline easement in Marrangaroo National Park (approximately 300 m from the construction envelope) (refer to Photograph 7.3). Although not detected during surveys within the project area, the species is assumed to be present within some parts of the construction envelope providing suitable habitat.

Photograph 7.3 Purple Copper Butterfly observed in Marrangaroo National Park

ii Aquatic species

The desktop assessment and aquatic survey results concluded that no aquatic species listed under the FM Act or EPBC Act occur within the project area.

7.2.5 Platypus

Live trapping and tracking of platypuses were undertaken by Austral Research and Consulting and leading experts from the University of New South Wales (UNSW)[1]. The targeted surveys were completed over two rounds in 2023 and 2024 and detected a total of 17 platypus from the Farmers Creek and Coxs River arms of Lake Lyell. This supported eDNA analyses which detected evidence of platypus DNA in both the Coxs River and Farmers Creek arms of Lake Lyell.

Tagged platypuses had preferred, localised ranges and there was no recorded movement of platypus between the Coxs River and Farmers Creek. Tagging and tracking of platypus to analyse movement behaviour (within the Farmers Creek arm of Lake Lyell) showed the animals to be primarily utilising burrows located within the naturalised section of Farmers Creek, although some platypuses were observed to be utilising burrows within the Farmers Creek arm of Lake Lyell. The majority of burrows were located in Farmers Creek which provides more suitable and stable habitat. Tracking analyses also confirmed that platypus spend most of their time benthic foraging within Lake Lyell at depths of up to 3 m, with occasional dive depths up to 5 m.

Source: Austral Research and Consulting (2024)

Photograph 7.4 Radiotracking of tagged platypus

[1] UNSW team lead by Dr. Gilad Bino (Research fellow)

7.3 Potential impacts

7.3.1 Avoidance and minimisation

Clearing of large extents of native vegetation and associated habitat has been substantially avoided through siting the project in an area where existing infrastructure can be utilised by the project, as described in Chapter 2. Other avoidance and minimisation measures adopted which have reduced potential impacts to biodiversity include:

- construction haul roads and permanent access roads were aligned where possible within the same disturbance footprint to minimise overall clearing of native vegetation and habitat
- switchyard area used for construction laydown area has been sited partially within areas of exotic vegetation and open water and located immediately adjacent to the existing power transmission line, minimising impacts on intact native vegetation and habitat
- the upper reservoir is designed to be a rockfill embankment dam within a gully, which utilises a cut fill balance as far as possible to maximise reuse and minimise the need for disposal or transport of material off site. Reuse of extracted material was considered throughout the design of all other elements as well. This approach potentially avoids impacts to biodiversity values associated with winning additional material, or disposal of extracted material
- the preferred Lakeside camp site has been sited in an area where native vegetation has been almost entirely cleared and contains poor condition derived native grassland and exotic grassland. The alternative Town camp has also been sited using the same principles
- the construction staging of the lake diversion will ensure there is always connectivity between Farmers Creek and Lake Lyell, and no blockage to fish passage will occur during construction. Design principles proposed for the design will ensure no blockage to fish passage during operation
- the design includes a floating boom across the inlet to prevent and deter platypus as much as possible from entering the inlet. The design of the inlet also includes a screening structure to minimise risks of entrainment. The screens are set back to allow flow velocities between 1 to 2 metres per second (m/s).

7.3.2 Direct impacts

The main direct impacts of the project are associated with the loss of native vegetation and associated habitat features resulting from clearing of land for the construction of the project. Direct impacts on the aquatic environment are also expected from the disturbance and change to the lake profile within the Farmers Creek arm of Lake Lyell to allow construction and operation of the inlet.

i Loss of native vegetation and habitat

The project will involve clearing of land and will therefore result in loss of approximately 130 ha of native vegetation of varying condition. This has been calculated as a worst case, assuming disturbance for both accommodation camps. Ultimately, only one accommodation camp will be selected resulting in less disturbance overall. Direct impacts on native vegetation and threatened species habitat from the project are:

- loss of approximately 102.04 ha of native vegetation and threatened species habitat requiring biodiversity offsets
- loss of approximately 27.70 ha of vegetation not considered to be threatened species habitat and does not require biodiversity offsets

- loss of 11 trees with hollows that are known or strongly suspected to be utilised by Gang-gang Cockatoos for breeding and loss of up to approximately 568 other trees with hollows of approximately 7 cm or larger entrance diameter, many of which may have potential to be utilised for nesting
- loss of approximately 294 trees with hollows of approximately 20 cm or larger entrance diameter, many of which may have potential to be utilised by Powerful Owls or Sooty Owls for nesting
- loss of potential breeding habitat for the Glossy Black Cockatoo, likely to be utilised by a breeding pair
- loss of approximately 3.62 ha of high-quality foraging habitat for the Glossy Black Cockatoo.

These impacts will occur during the construction phase of the project, noting that clearing of native vegetation will occur in a staged approach (i.e. an early works and main works staging).

The SAII candidate species recorded or assumed to be present within the construction envelope are only considered to be at risk of SAII if particular, important habitat types are impacted. No habitats associated with SAII for these species (mapped important habitat or cave habitat) are found in or adjacent to the construction envelope and the species are therefore unlikely to be at risk of SAII from the project.

Assessments of Significance for threatened and migratory EPBC Act listed species concluded that the project is likely to have a significant impact on the Gang-gang Cockatoo, Glossy Black Cockatoo and Koala. No other EPBC Act listed species are likely to be significantly impacted by the project.

ii Loss of aquatic habitat and species

The project will impact lake sediment during construction and operation, and result in the following impacts:

- loss of approximately 11.88 ha of key fish habitat within Lake Lyell
- loss of macroinvertebrate assemblages within Lake Lyell (from direct disturbance as well as changes to distribution from increased fluctuations in water level)
- potential for fish and fauna entrapments during construction (such as isolation from coffer dam construction and de-watering), or loss of both native and introduced species through the PHES inlet.

iii Potential barriers to fish passage

The purpose of the lake diversion is to protect the inlet from flood and debris moving downstream during operation. The diversion has been designed to consider impacts on the movement of fish and animals between Farmers Creek and Lake Lyell. Potential blockage of fish passage from lake diversion could occur during low flow or drought conditions, although consideration of these events will be incorporated into the design. Temporary and permanent bridge crossings also present potential barriers if not designed and built with fish passage requirements.

7.3.3 Indirect impacts

In addition to the direct impacts, the project also has the potential for indirect impacts. Indirect impacts of the project may include edge effects on areas of retained native vegetation, disturbance to native animals in adjacent habitat during construction, interruption of animal movement, vehicle strike of animals, and impacts to water quality and waterway health (e.g. from increased turbidity during construction) which may then impact aquatic species.

Indirect impacts to key fish habitat from the operation of the PHES and associated fluctuations in water level in Lake Lyell have not been considered as these impacts already occur within the existing approved operational guidelines for Lake Lyell. As such, offsets are only proposed for direct disturbance to key fish habitat from construction and not indirect impacts from fluctuating water levels during operation.

7.3.4 Prescribed impacts

Prescribed impacts are defined under the *Biodiversity Conservation Regulation 2017* as additional biodiversity impacts (i.e. in addition to vegetation clearing) that are subject to offset requirements under the BC Act. Consideration has been given to prescribed impacts on threatened species and communities recorded or assumed to be present within the disturbance footprint and relevant to the project as shown in Table 7.2. Further detailed assessment is provided in Appendix K.

Table 7.2 Prescribed biodiversity impacts relevant to the project

Prescribed impacts	Relevant threatened entities	Relevance and consequence of impact on threatened entities
Karst, caves, crevices, cliffs, rocks and other geological features of significance	• Large Bent-winged Bat	No karst (eroded limestone landscape) features are found in the disturbance footprint. No quartz sandstone geology, typical of the cliffs and gorges of the nearby Blue Mountains area, is found in the construction envelope. The predominantly metasedimentary (quartzite) and fine-grained sedimentary (mudstone) geology of the majority of the site is not typically associated with substantial cave formation. The only large outcroppings of rock are found in the vicinity of Mount Walker, located 50 to 100 m north of the site. These areas contain large crevices and small cavities but do not appear to contain any caves. Rocky areas in the Mount Walker area contain only very small cliffs, around 5 to 15 m high, without any overhangs or protected areas suitable for larger animals to shelter.
Human-made structures	-	The Project does not include the removal of human made structures such as buildings or mine-shafts. Therefore, this prescribed impact is not relevant to the project.
Non-native vegetation	-	Non-native vegetation is found in several locations in the disturbance footprint and largely associated with grazing land. None of the threatened species likely to occupy in the construction envelope are likely to be reliant on non-native vegetation for roosting, breeding or frequent foraging. The loss of this habitat would have a negligible impact on threatened species.

Prescribed impacts	Relevant threatened entities	Relevance and consequence of impact on threatened entities
Impacts on areas connecting threatened species habitat, such as movement corridors	• Koala • Large Bent-winged Bat • Eastern Coastal Free-tailed Bat • Southern Myotis • Glossy Black Cockatoo • Gang-gang Cockatoo • White-bellied Sea-eagle • Little Eagle • Powerful Owl • Sooty Owl • Square-tailed Kite • Scarlet Robin • Varied Sitella • Dusky Woodswallow • Purple Copper Butterfly	Under present conditions, these threatened animals may move between the extensive areas of habitat across the construction envelope. During the operation of the project, the threatened arboreal and terrestrial mammals present in the disturbance footprint for the new upper reservoir and associated infrastructure will no longer be able to easily cross these areas due to the associated clearing of vegetation and expanse of open water. Threatened small woodland and forest birds, owls and microbats are likely to continue to cross during operation but may be less likely to do so due to reduced cover and higher risk of predation. The movement of raptors is unlikely to be substantially affected. The narrow bands of clearing required for the geotechnical investigations and associated access roads (up to 20 m but typically around 10 m) are unlikely to interfere with animal movement since these relevant threatened species are capable of traversing narrow tracts of cleared land between forested areas. These and some other areas impacted during the construction phase will be rehabilitated on completion of the works and animal movements through these areas would slowly return. The upgrade of Sir Thomas Mitchell Drive would result in increases in the distance between patches of animal habitat through the removal of trees but given that clearing in these areas would consist of narrow strips of land, along an existing road in an already fragmented local landscape, it is considered unlikely to significant modify the ability of threatened species to move through the landscape between areas of habitat. The project is unlikely, however, to prevent long-term movement of any threatened species of animals from one side of the project footprint to the other as habitat would remain directly connected in areas of continuous forest and woodland. Some connectivity of woodland would also remain in the more degraded areas around Sir Thomas Mitchell Drive.
Impacts that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)	Threatened and migratory waterbirds; White-bellied Sea Eagle; Southern Myotis	Short term impacts in habitat quality and extent for relevant threatened species may result from a reduction in macrophyte cover. That is, lowering of water levels lead to the loss of submerged aquatic vegetation. Habitat quality and extent for relevant threatened species should improve as macrophytes recolonise with stabilisation of the water regime with ongoing operation of the project. It is possible that daily oscillation of water improves the foraging opportunities for these species, as in the sense of tidal movements in estuaries that usually favour at least migratory waterbirds, such as through providing increased opportunities for foraging during lower water levels. If mitigation is ineffective, poor water quality may result due to discharges associated with natural rainfall events. Poorer water quality may reduce the habitat condition and resource availability for associated threatened species. Prey availability (e.g. fish and macroinvertebrates) for relevant threatened species likely to increase with operation due to increased dissolved oxygen levels and lower occurrence of algal blooms. Given the poor water that commonly occurs in Lake Lyell (e.g. elevated nutrients and intermittent elevated turbidity after wet weather), it is considered unlikely that any temporary increase in turbidity and suspended solids during construction and operation would impact relevant threatened species.
Impacts on threatened and protected animals from turbine strikes from a wind farm	-	Not relevant to the project as it is not a wind farm.

Prescribed impacts	Relevant threatened entities	Relevance and consequence of impact on threatened entities
Impacts on threatened species or fauna that are part of a TEC from vehicle strikes	All fauna species	There will be increased vehicle traffic on publicly accessible roads within and adjacent to the construction envelope during the construction phase. Unmitigated, this has the potential to increase mortality of animals due to vehicle strike in these areas. Rare or low-density populations are most at risk of significant impacts if this impact is not managed appropriately. Despite some level of impact being possible, the majority of impacts will be limited to common or abundant species. The potential for increased traffic during construction to result in increased mortality of native animals would be minimised by the construction traffic driving rules in high-risk sections of road and at night when most native animal species are active.

7.3.5 Risks to platypus

Risks to platypus have been assessed with consideration of potential loss of burrowing and feeding habitat, changes to platypus movements and behaviour in the local area, increased predation and entrapment or entrainment risks. These risks are in response to:

- lowering of Lake Lyell during construction, which may reduce feeding habitat, destroy or disrupt access to burrows, and potentially expose platypuses to increased predation when moving from Farmers Creek to other feeding areas within Lake Lyell
- constructing in-lake project elements, including the lake diversion, inlet / outlet structure, switchyard pad and bridge crossings, which would directly remove feeding habitat, destroy or disrupt access to burrows, and result in noise and vibration impacts affecting platypus movements
- constructing coffer dams and de-watering, which may result in isolation or entrapment of platypus requiring translocation
- operating the inlet / outlet structure and the associated flow velocities that may present entrainment risk to platypus
- increased water level fluctuations for operation of the PHES, which has potential to indirectly impact platypuses and their feeding behaviours and movements via increased erosional turbidity and changes to supporting food webs (i.e. potential changes to the distribution, abundance and diversity of macroinvertebrates in Lake Lyell).

Research shows that platypus have been resilient to some levels of disturbance however there is a lack of data and research into platypus within a dynamic water environment such as the project. A combination of preventative actions (platypus exclusion methods), and adaptive management and monitoring measures are proposed to assess and mitigate impacts throughout the project. Further information on management is provided in Section 7.4.2.

7.4 Management and mitigation

7.4.1 Mitigation in design

The lake diversion has the potential to form a significant barrier to both fish and platypus attempting to move between Farmers Creek and Lake Lyell. Recommendations to prevent fish barrier have been proposed in detail in the AEA (Annexure J of Appendix K). This includes a set of recommended design principles which are typical for a natural river/waterway and are based on details and contemporary rock fishway experience (as described in Stuart et. al. 2024).

7.4.2 Management plans

The development of a biodiversity management plan (BMP) is proposed to be prepared as part of the overall construction environmental management structure for the project. The BMP would detail the techniques, timing, frequence and responsibility for the implementation of mitigation and management measures, detail monitoring requirements, and identify triggers and responses for adaptive management. The full list of mitigation measures is provided in Appendix E and include measures for:

- retention of vegetation and habitat
- minimising injury of native animals during clearing and construction (including vehicle movements)
- weed control
- native vegetation restoration.

The BMP will also include specific sub plans to manage aquatic impacts, specifically:

- Platypus Management Plan – this plan would be prepared before construction and in consultation with experts on platypus behaviour and First Nations representatives. It would include requirements for a monitoring program and adaptive management strategies including options for translocation of platypus should long term monitoring reveal that platypus conditions are decreasing in response to operation of the project.
- Aquatic Management Plan – this plan will detail measures and management actions should aquatic fauna or fauna habitat be disturbed pre-, during, and post-construction.

These sub plans will include all requirements of the mitigation measures provided in detail at Appendix E.

7.4.3 Offsets

The project requires a total of 3,989 ecosystem credits to compensate for impact on native vegetation and associated ecosystem credit species habitat. An additional 18,115 species credits are required to offset the residual impacts of the project on species credit species that were recorded or assumed present within the construction envelope (refer to Table 7.3).

Table 7.3 Summary of total offset credits

Credit type	Early Works credit required	Main Works credit required	Total credits required
Ecosystem	416	3,573	3,989
Species	1,188	16,927	18,115
Total	**1,634**	**20,500**	**22,104**

LLP will pursue biodiversity offsets required for the project, with steps to be taken to meet the biodiversity credit liability being:

- establishment of Stewardship sites on EnergyAustralia-owned land. LLP has already undertaken preliminary investigation of potential credit generation from their landholdings. It is expected that relevant credits can be generated for all PCTs, however a credit shortfall is anticipated which will be addressed via the development of additional Stewardship sites and/or via the steps below
- purchase of credits (or land) from the market to meet the anticipated credit shortfall
- limited use of the NSW Government Biodiversity Conservation Fund (BCF).

The offset package will be staged to meet the offset liability for each stage of the project. As this project is CSSI, LLP is seeking two years from the date of approval to retire credits.

Aquatic offsets to key fish habitat will also be pursued for the project. Following consultation with DPI Fisheries is has been agreed that the offset approach will focus on local / catchment level initiatives and re-stocking. The offset strategy shall be developed in consultation with the DPI Fisheries, and relevant technical staff.

7.5 Conclusion

The project is located on land covered in native woodland and forest, with small areas previously cleared for agricultural and other purposes. The limited disturbance means that the project will result in the clearing of large areas of native vegetation, which provides habitat for several native and threatened species. The lake on the other hand, contains predominantly invasive species however also provides suitable habitat and supports foraging for local populations of platypus.

The project would result in direct and indirect impacts to biodiversity values (terrestrial and aquatic), including threatened species and their habitat. The key impact pathways are from vegetation and land clearing and construction activities, and construction and operation of the lake diversion and inlet. Offsets are required for direct and prescribed impacts and would be sought by LLP through a staged offsetting strategy. Offsets will also be sought for direct impacts to key fish habitat and determined in consultation with DPI Fisheries.

A BMP will be developed for the project to guide the mitigation, management and monitoring of biodiversity and aquatic fauna. Specific sub plans will be prepared to complement the BMP, primarily a Platypus Management Plan and Aquatic Management Plan.

It is recommended that ongoing avoidance and minimisation principles be adopted through detailed design, such as retaining native vegetation wherever possible and adopting design principles recommended to improve fish and platypus passage through the lake diversion. Ongoing consultation with key agencies (CPHR, DPI Fisheries) will be required as part of detailed design and as part of the development of the proposed management plans.

Chapter 8

Heritage

Environmental Impact Statement | Lake Lyell PHES Project

8 Heritage

This chapter presents a detailed summary of the project's impacts on Aboriginal cultural heritage and historic heritage. Detailed technical reports for the Aboriginal Cultural Heritage Assessment (ACHA) and Statement of Heritage Impact (SoHI) are provided in Appendix L and Appendix M, respectively. The relevant SEARs for heritage and where they are addressed by the ACHA and SoHI are summarised in Appendix A.

8.1 Assessment approach

The assessment of the impact to Aboriginal cultural heritage items (archaeological and cultural) was completed in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010). Engagement for the ACHA followed the processes and methods outlined in Heritage NSW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a), as well as additional project specific communication strategies to promote transparent and frequent two-way dialogue between the Aboriginal community and the project (refer Chapter 2 of the ACHA, Appendix L).

Archaeological field survey of the construction envelope was undertaken (over two weeks from 30 October to 9 November 2023 and an additional day following project refinement on 5 August 2025) with the assistance of Aboriginal representatives from the RAPs.Archaeological field surveys of the construction envelope encompassed some 129 km (or some 292 ha) of linear pedestrian transects and included 330 individual points of observation and documentation. Archaeological test excavation of the construction envelope was undertaken with the assistance of RAP representatives over a four-week period (26 February to 27 March 2024). Test excavations consisted of sixty-seven 0.25 to 1 m^2 manually dug test pits in a systematic grid focussing on identified sites with potential for subsurface cultural deposits, alluvial terrace and large ridge-line landforms.

A cultural values mapping study was also carried out to 'map' and document the tangible and intangible places, stories and values of the local Wiradjuri traditional owners within and near the construction envelope. This study included desktop research and oral history gained through interviews with Elders and knowledge-holders. Interviews and fieldwork for the cultural values mapping was undertaken in October 2023 and January, May and June 2024.

Research for the SoHI was conducted using primary sources such as maps, plans and gazettes, which were accessed through online archives. Field surveys were conducted between 30 October and 9 November 2023 to record historical cultural heritage that had the potential to be affected by the project. A targeted field strategy was implemented, focusing on key sites within the project area that were identified through the desktop review (refer Section 3 of the SoHI, Appendix M). Field survey of the alternative Town Camp was conducted on 23 July 2025.

The SoHI and associated field surveys were undertaken using the principles of *The Australian International Council on Monuments and Sites, Charter for Places of Cultural Significance* (also known as the *Burra Charter,* Australia ICOMOS 2013) and the NSW *Heritage Manual* (Heritage Office 1996) (which includes the *Guidelines for preparing a statement of heritage impact* (DPE 2023)).

Consultation with relevant agencies was carried out during preparation of the ACHA and SOHI. This includes meetings and correspondence with HeritageNSW to discuss matters relating to Aboriginal engagement and fieldwork, and a meeting with Heritage Council of NSW to discuss matters relating to the alternative Town camp.

8.2 Existing environment

8.2.1 Aboriginal heritage

The Country on which the project is located was traditionally occupied by people known collectively as the Wiradjuri, who all spoke a related language and shared many cultural attributes, and their descendants are still based in central NSW today. Neighbouring groups include the Dharug and Gundungurra. Although the documented boundaries are all some distance from the project area, there is some suggestion the project is within a shared zone.

Source: The AIATSIS (1996) *Map of Indigenous Australia*. The project area is located immediately west of Lithgow, on the eastern edge of traditional Wiradjuri country, in this plate

Plate 8.1 Wiradjuri Country

Regional studies of the broader Blue Mountains area suggest that Aboriginal people inhabited the area approximately 12,000 years ago, and potentially as early as 22,000 years ago. Archaeological studies of the local area have focused on the identification of Aboriginal occupation sites in two distinct environmental zones – closed rock shelter sites on pagodas (the name for sandstone rock formations in the Blue Mountains region) and terraces of the sandstone plateau, and open artefact sites and culturally modified trees in valley floors and plains. Local studies demonstrate the importance of the Coxs River and its immediate tributaries as a focus for past Aboriginal visitation and occupation.

A review of Heritage NSW's Aboriginal Heritage Information Management System (AHIMS) database was most recently conducted on 31 July 2025 and identified 103 previously documented sites in the search area (excluding additional sites registered as part of the project field surveys). The previously documented sites were dominated by sites of varying densities of stone artefacts (approximately 60%), with rock shelters making up a large proportion (approximately 21%) of the remaining site types. Occasional rarer site types such as burials, ceremonial sites and culturally modified trees are also present. Fifteen sites were identified within or on the periphery of the project area, primarily associated with the Pacific Power studies in the 1990s and include two rock shelters with deposit and various densities of stone artefact sites.

Archaeological field surveys and test excavations were completed for the project to explore and document the Aboriginal objects, sites and places within the project area, and to align them within the regional context. Some eight Aboriginal objects, sites and/or places were documented, and two previously documented sites reidentified. These were primarily found within Farmers Creek alluvial terraces, and included: five artefact scatters, one isolated find, and two potential culturally modified trees - the latter being identified by Aboriginal participants. Two further areas of potential archaeological deposit (PAD) were also identified within the construction envelope. Four of these sites were considered to have high value, artefact scatters and areas of PAD, LL AS3 (AHIMS #45-1-2976), LD8 (#45-4-0214), and LD13 (AHIMS #45-5-0915) and LD14 (AHIMS #45-4-0915). These sites were subject to test excavation and ultimately some 1,344 artefacts were recovered primarily between 10 to 40 cm below surface, with the majority recovered from three discrete locations associated with LL AS3 (AHIMS #45-1-2976), LL AS4 (AHIMS #45-1-2978), and LD13 (AHIMS #45-5-0916) (refer to Plate 8.2). The results indicate that a background scatter of ~8 to 11 artefacts/m^2 may be expected across the project area, with densities of >70/m^2 more indicative of specific visitation and/or occupation. The assemblage was dominated by milky quartz, with lesser portions of IMTC. A smaller amount of cryptocrystalline quartz considered to be exotic in origin was also encountered. The cultural assemblage is predominantly considered to reflect a range of transient, but repeated visitation, over the last 1,500 years. The assemblage from one site may hint at an earlier visitation between ~4 to 8 ka.

Plate 8.2 LD13 alluvial terrace landform – view north-west

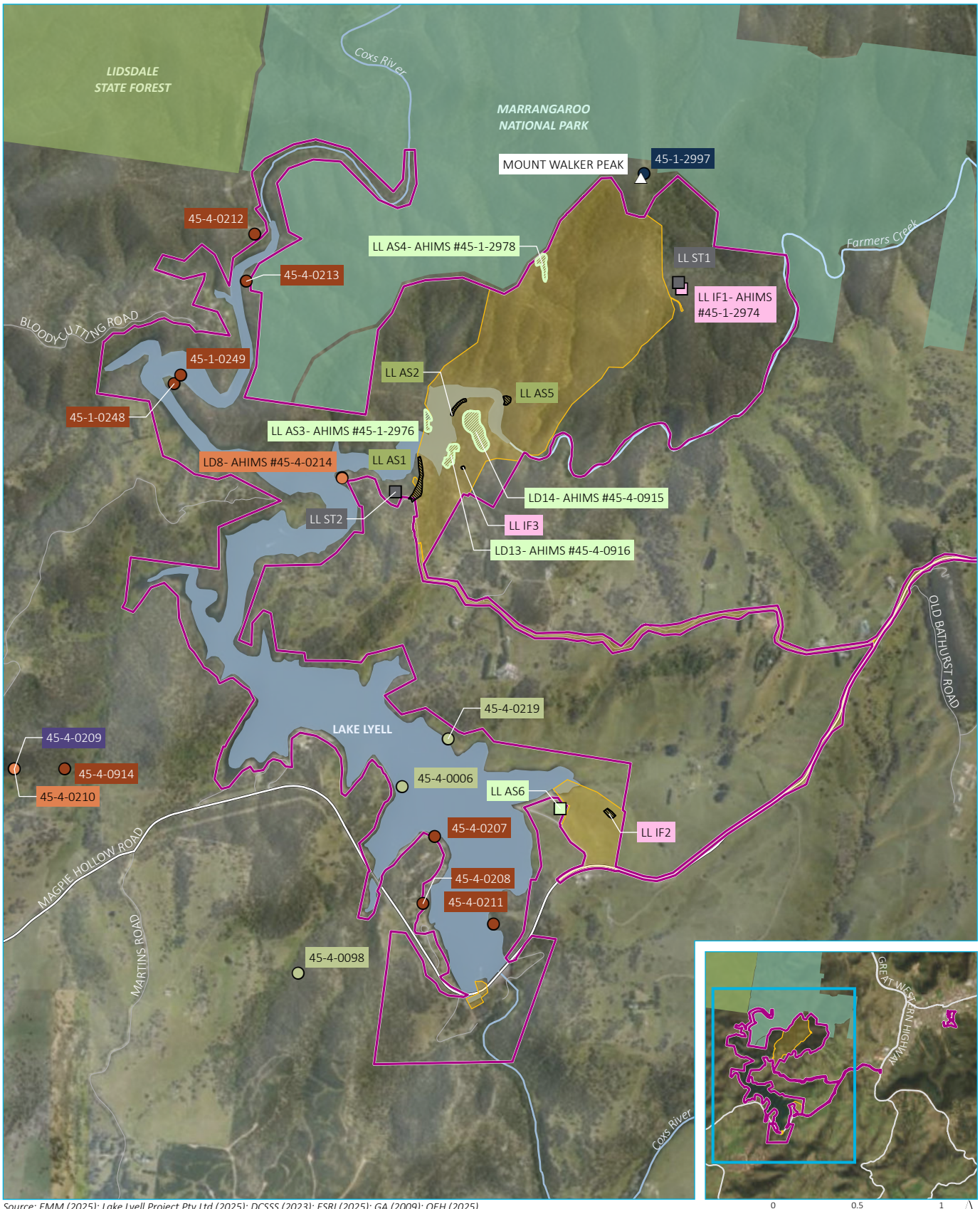
When combining and ratifying previous studies and survey and text excavation findings, there are 21 discrete Aboriginal objects and sites within the project area, as shown on Figure 8.1. These include two rock shelters, two potentially culturally modified trees, and various surface and subsurface stone artefact deposits indicative of repeated visitation and/or extended occupation. Of these sites within the project area, five are located within the construction envelope. In addition to discrete sites and places, the entire construction envelope was characterised by a low-density background artefact scatter interspersed with occasional areas of denser material associated with past foci and/or repeat occupation.

Cultural values mapping (Attachment F of the ACHA) identified two contemporary cultural values: the peak of Mount Walker situated immediately north-east of the construction envelope was identified by numerous participants for a range of activities, and a Platypus Dreaming story associated with Coxs River and its tributaries was also documented. This latter story is associated with platypus (*Ornithorhynchus anatinus*) observed to be within Lake Lyell and Farmers Creek, rather than a specific location, and therefore have not been identified as a discrete place for the purposes of the report. While some participants indicate that more than just the peak of the mountain is of value, the consensus across all consultation suggests that the peak forms the focus of these cultural values, as well as potentially view-lines to the north-west.

The identified Aboriginal sites and places (both inside and outside of the project area) were assessed against four significance criteria, including scientific, historical, aesthetic and cultural. Some nine of these sites and places were considered of high archaeological and/or cultural significance, two of moderate significance, and 17 of low significance. Various landforms of archaeological interest, primarily adjacent to Farmers Creek, were also identified and assigned moderate significance. Sites of high cultural significance, which were also identified as of importance by the Aboriginal participants, included the peak of Mount Walker, the abovementioned Platypus Dreaming story associated with Coxs River and several of the high-density stone artefact sites along Farmers Creek.

Overall, the findings have revealed that the project is situated within a rich cultural landscape with evidence of extensive, but disparate past human activity along Farmers Creek (typically within 100 m of the creek edge) – elements of which remain above the existing Lake Lyell reservoir (formerly part of Coxs River). Large flat ridgelines and spurs on the flanks of Mount Walker also contain evidence of past use and activity. Examples of the artefacts recovered across the construction envelope are provided in Plate 8.3 (scale = 1 cm).

Plate 8.3 Examples of flakes (tool-making debris) and blades in the background scatter



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009); OEH (2025)

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KEY

- Project area
- Construction envelope
- Mount Walker peak
- Area of past foci
- Identified Aboriginal site extent

Identified Aboriginal site

- Isolated find
- Modified tree
- Artefact scatter

AHIMS (by site type)

- Aboriginal ceremony and dreaming
- High density artefact scatter
- Low density artefact scatter
- Medium density artefact scatter
- Rockshelter with deposit

Existing environment

- Major road
- Minor road
- Original Coxs River
- Original Farmers Creek
- NPWS reserve
- State forest

Aboriginal cultural heritage sites within the project area

Lake Lyell PHES
Environmental Impact Statement
Figure 8.1

EMM
creating opportunities

8.2.2 Historical heritage

The Coxs River region was opened for European settlers through the construction of roads to Bathurst from the 1820s to the 1830s. Land holdings were sporadically taken up from the 1840s.

A search of National, State and local heritage registers on 10 and 14 July 2025 found there are no listed heritage items within the PHES project area, however there are three listed heritage items in the disturbance footprint for the alternative accommodation camp (i.e. the Town camp). These are the State significant Lithgow Valley Colliery & Pottery Site (SHR #00078), and the locally significant Lithgow Valley Pottery and Brickworks (LEP #A124) and Pottery Estate Heritage Conservation Area (#C11). These sites are associated with the establishment of a colliery in Lithgow in the 1870s, followed by a brickworks east of the colliery, and later, a pottery site. Plate 8.4 shows the development of the Lithgow Valley Pottery Estate from c.1880.

Source: ("Lithgow Pottery and Brickworks" 1880)

Plate 8.4 Photograph of the Lithgow Colliery Brickworks and Pottery, c.1880

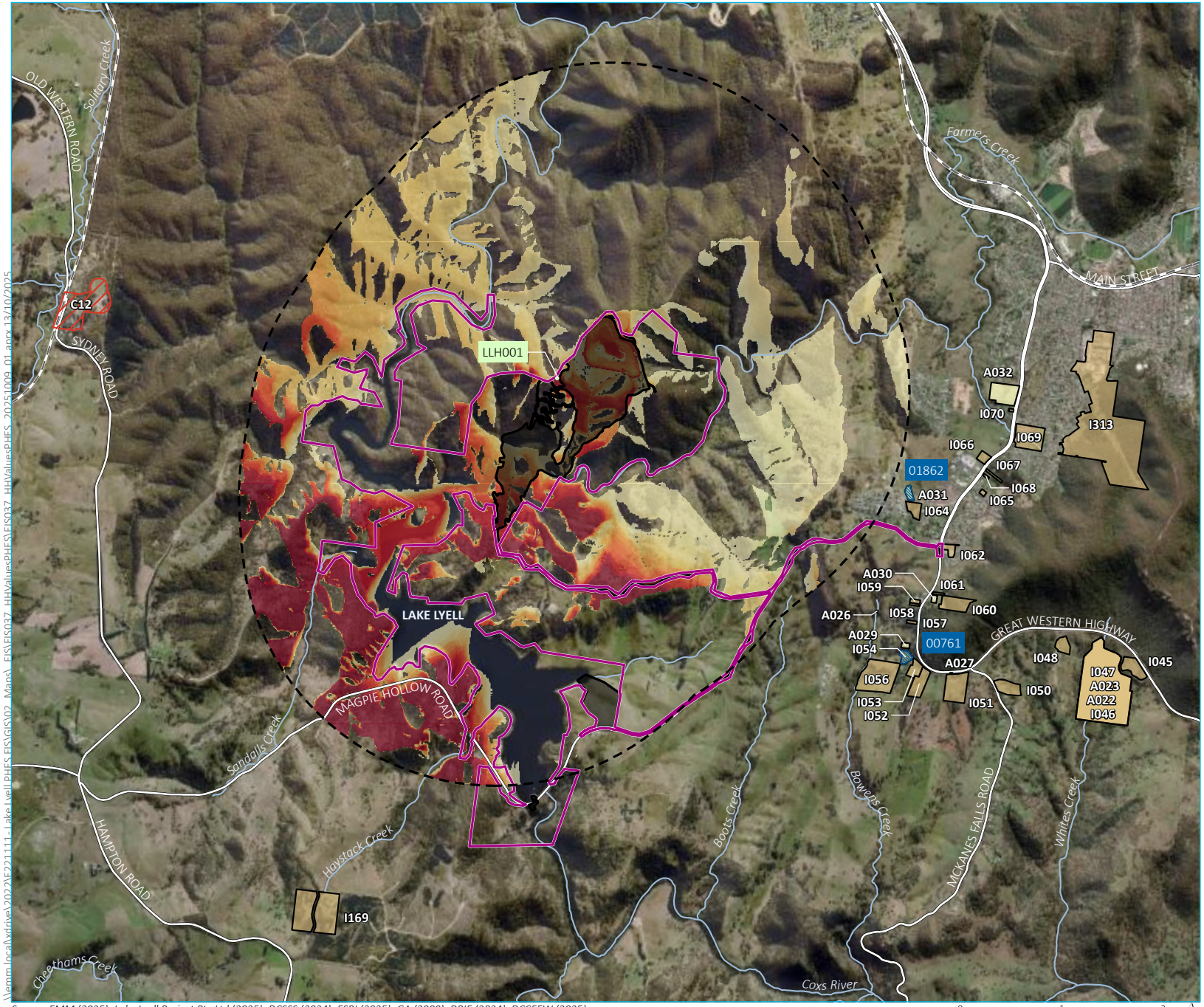
Field survey of the Town camp observed in-ground brick features within the north-west of the site, with brick footings consistent with the former boiler room and engine room buildings, and bricks consistent with the location and form of the beehive kiln.

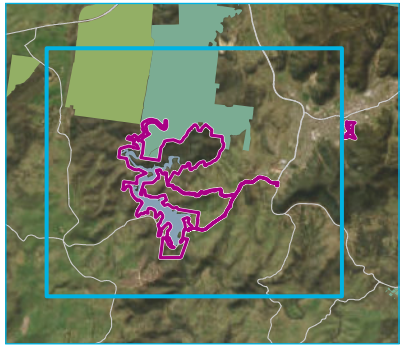
The heritage items associated with the alternative Town Camp as well as other heritage items in the surrounding area are shown in Figure 12.1 and Figure 8.3. Viewshed analysis is included in Figure 12.1 to illustrate degree of visibility from listed heritage items to the project area.

Desktop research identified one previously documented (though not heritage listed) site within the project area, Cox's No.2 Stockade, built on the west bank of Coxs River in 1832 to house the convict workforce for the construction of Mitchell's line (Sue Rosen Pty Ltd 1994). A burial associated with the convict stockade is located on the east bank of the Coxs River. The stockade (outside the construction envelope) was partially inundated with the flooding of Lake Lyell in 1982.

Field investigations identified one potential site (LLH001) within the construction envelope, situated approximately 30 m northwest of the disturbance footprint. The site consists of the remains of a mid to late twentieth-century ancillary structure that was ephemeral and likely abandoned (refer to Photograph 8.1), including timber posts, corrugated iron sheeting, scrap metal and concrete blocks. An assessment of the site's significance found that it does not meet the threshold for local significance.

Photograph 8.1 Structural remains of LLH001 (view west)





KEY

- Project area
- Disturbance footprint
- Main works buffer (2.5 km)
- Survey result- LLH001
- State heritage register

Lithgow Local Environmental Plan 2014

- Conservation Area- General
- Item- Archaeological
- Item- General

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

Upper reservoir visibility

- Highly visible
- Not very visible

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DPIE (2024); DCCEEW (2025)

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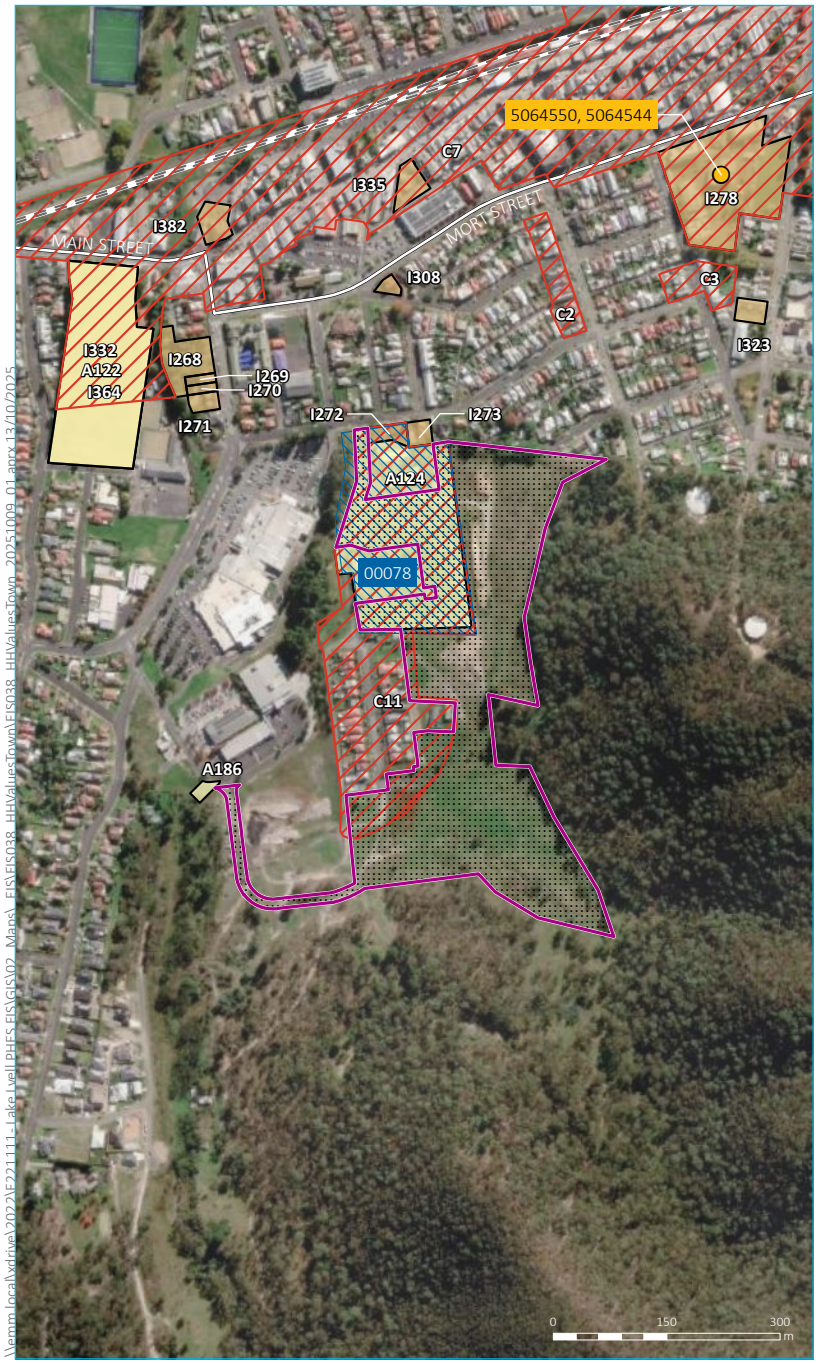
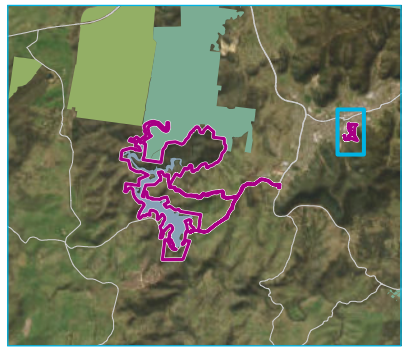
Historical heritage values surrounding the project

Lake Lyell PHES
Environmental Impact Statement
Figure 8.2

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- State heritage register
- s170 listing
- Town camp survey results

Lithgow Local Environmental Plan 2014

- Conservation Area- General
- Item- Archaeological
- Item- General

Archaeological potential

- Low potential
- Moderate potential
- High potential

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DPIE (2024); DCCEEW (2025)

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Historical heritage values at Town camp

Lake Lyell PHES
Environmental Impact Statement
Figure 8.3

EMM
creating opportunities

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8.3 Consultation with Aboriginal communities

The consultation process initially identified 35 Aboriginal stakeholder organisations who may have had an interest in the project. Following notification of these organisations, 22 responded as requesting to be consulted on the project (and of these, 21 sought to be formally registered as an Aboriginal party for the project). These included local Wiradjuri traditional owners based in Lithgow, Mudgee, Dubbo, Bathurst, and/or Wellington, as well as members of the Aboriginal communities from the broader region interested in cultural heritage management.

Opportunity for Aboriginal involvement in consultation for the project was provided throughout the ACHA, including face-to-face and/or online meetings during key phases of the project, during field surveys and site inspections, participation in archaeological test excavation and participation for Elders and key knowledge-holders to undertake interviews with a highly experienced anthropologist to discuss cultural values. Ultimately, over 400 interactions have been undertaken with the RAPs across these opportunities. These included representatives of Warrabinga Native Title Claimants Aboriginal Corporation, Mingaan Lithgow Aboriginal Corporation, Wingarra Wilay Aboriginal Corporation, North East Wiradjuri Corporation, Girragirra Murun Aboriginal Corporation, Thomas Dahlstrom, and Gallanggabang Aboriginal Corporation. Bathurst Local Aboriginal Land Council (LALC) were consulted and invited but could not attend any of these opportunities.

Discussions with the RAPs have been extensive and wide-ranging over the 20-month assessment process. Feedback from the RAPs was less supportive of the project, with ongoing concerns over the impacts of the project on intangible cultural values and specific flora and fauna. As consultation with the RAPs has progressed, increasing support (with a few exceptions) has been vocalised towards the end of the assessment process as a result of ongoing efforts in impact avoidance, proposed mitigation measures and broader opportunities for the Aboriginal community. Who speaks for Country and who participated in the field work has also formed ongoing robust discussions throughout the assessment.

A cultural values mitigation strategy around these issues has formed a focus of discussions, and opportunity for ongoing on-Country access and management of Country and resources have been of interest to Aboriginal participants to mitigate perceived impacts.

Full documentation of the consultation process and outcomes is provided in Appendix L.

8.4 Potential impacts

8.4.1 Avoidance and minimisation

Throughout the project, LLP has undertaken design refinements and discussions with the RAPs, which has resulted in the avoidance or partial avoidance of two significant sites, LD 8 (AHIMS #45-4-0214) and LL AS3 (AHIMS#45-1-2976). The proposed upper reservoir and associated activities were also moved off the peak ridgeline of Mount Walker, in part because of the mountains' contemporary cultural values.

Avoidance and minimisation of historical heritage impacts was not required for the PHES as no historical heritage sites were identified within the disturbance footprint. The alternative accommodation camp (Town camp) is located within the curtilage of heritage items associated with the Pottery Estate. While direct disturbance to the sites zone of highest archaeological potential has been avoided, indirect impacts to these heritage items may occur and have been assessed in the SoHI.

8.4.2 Aboriginal cultural heritage impacts

Two types of potential impacts to Aboriginal cultural heritage are considered, direct and indirect. Direct impacts relate to the construction activities and their removal, truncation and/or disturbance of the ground surface. Indirect impacts are the result of both construction and post-construction/operational activities that may result in environmental changes that would affect cultural material within, or near the project activities.

Construction activities, specifically earthworks and excavation, would result in the localised removal of the upper soil profile across portions of the construction envelope. Due to these activities, the project would result in the direct impact to an area of up to 146 ha within the disturbance footprint, depending on the selected accommodation camp location. No direct impacts are considered to extend beyond the construction envelope as no ground disturbance activities are proposed in these areas.

Operational activities would be limited to indirect impacts to cultural values, as there would be no further ground disturbance within the project area. Indirect impacts anticipated are visual and aesthetic changes of view-lines to/from Mount Walker.

A summary of potential direct and indirect impacts to Aboriginal heritage values is provided in Table 8.1.

Of the Aboriginal sites/places within the project area, five would be subject to direct impacts: LD 13 (AHIMS #45-4-0916), LD 14 (AHIMS #45-4-0915), LL AS4 (AHIMS #45-1-2978), LL AS3 (part) (AHIMS #45-1-2976) and the background scatter (part) (LL background scatter). Of these, three are considered of high significance (LL AS3, LL AS4 and LD 13). These are primarily found either on the periphery of the upper reservoir construction footprint or on the banks of Farmers Creek near the lower inlet where significant earthworks are proposed. Avoidance of these sites would be problematic and is unlikely to be possible given their location in the centre of the project, although potentially elements of LL AS4 may be avoided during detailed design.

The project would also cause a partial loss of value to two places of cultural value: the peak of Mount Walker and a Platypus Dreaming story encompassing portions of the Coxs River and its tributaries. The opportunity for avoidance given the nature of the project is limited. The peak of Mount Walker has been identified by the local Aboriginal community as having contemporary values, and while specific activities on the peak would remain unaffected, visual and aesthetic values would be adversely affected by the project; and by extension social values assigned to the locale. Archaeological mitigation, especially of subsurface cultural materials to further inform our understanding of the past, is proposed to mitigate some of these impacts; and discussions have been undertaken with Elders and knowledge-holders to explore suitable non-archaeological mitigation in relation to impacts to contemporary cultural values.

Table 8.1 Summary of potential impacts to Aboriginal objects and/or sites by the project

Site	AHIMS #	Site type	Status	Significance	Type of harm	Location and/or activity causing harm	Degree of harm	Consequence of harm	Notes
Within or near the project area									
Mount Walker	45-1-2997	Aboriginal ceremony and Dreaming	Valid	High	Indirect	Upper reservoir and associated activities	Partial	Partial loss of value	This place has important aesthetic characteristics that would be comprised in some views to/from the mountain as a result of the proposed works.
Platypus Dreaming story	-	Aboriginal ceremony and Dreaming	Valid	High	Direct	Farmers Creek diversion and associated activities	Partial	Partial loss of value	This value related to platypus populations in Lake Lyell. The impacts and management of this species is beyond the scope of the ACHA and explored further in aquatic ecological reports associated with the project. Should platypus be harmed or adversely affected, it has potential to result in some impacts to this value.
LD9	45-4-0219	Rock shelter with deposit	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
Lyell's Crossing	45-4-0006	Rock shelter with deposit	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LL ST1	-	Culturally modified tree	Tentative	High	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LL ST2	-	Culturally modified tree	Tentative	High	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LL IF1	45-1-2974	Isolated object	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD1	45-4-0208	Medium density artefact scatter	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.

Site	AHIMS #	Site type	Status	Significance	Type of harm	Location and/or activity causing harm	Degree of harm	Consequence of harm	Notes
LD2	45-4-0207	Low density artefact scatter	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD3	45-4-0209	High density artefact scatter	Valid	Moderate	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD4	45-4-0210	Medium density artefact scatter	Valid	Moderate	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD5	45-4-0211	Low density artefact scatter	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD6	45-4-0212	Low density artefact scatter	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD7	45-4-0213	Low density artefact scatter	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD8	45-4-0214	Medium density artefact scatter	Valid	Moderate	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD12	45-4-0914	Low density artefact scatter	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
LD15	45-1-0248	Low density artefact scatter	Valid	Moderate	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.

Site	AHIMS #	Site type	Status	Significance	Type of harm	Location and/or activity causing harm	Degree of harm	Consequence of harm	Notes
LD16	45-1-0249	Low density artefact scatter	Valid	Low	-	-	-	-	Adjacent Lake Lyell, no impacts expected from lake level fluctuation.
Within construction envelope									
LL AS3	45-1-2976	High density artefact scatter	Valid	High	Direct	Lower inlet canal, Farmers Creek diversion	Partial	Partial loss	Some 27% of this site would be adversely affected by the creek diversion required for the project.
LL AS4	45-1-2978	High density artefact scatter	Valid	High	Direct	Permanent road, upper reservoir elements	Whole	Complete loss of value	The main activity within this site is a permanent road, and opportunity to avoid some parts of the cultural deposits may be achievable in further detailed design.
LD 13	45-4-0916	High density artefact scatter	Valid	High	Direct	Switchyard	Whole	Complete loss of value	
LD 14	45-4-0915	High density artefact scatter	Valid	Low	Direct	Farmers Creek infill	Whole	Complete loss of value	
LL background scatter	See note 2	Low density artefact scatter	Valid	Low	Direct	Within inundation extent, within 20 m of the FSL	Partial	Partial loss	This site is considered to extend disparately and intermittently across the project area and beyond it. The scatter will be impacted by lake level fluctuation.

Notes: 1. The type, degree and consequence of harm definitions are based on DECCW's *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW*.

2. LL Background scatter incorporates LLIF2 (45-4-1810), LLIF3 (45-4-1809), LL AS1 (45-4-1808), LL AS2 (45-1-2975), LL AS5 (45-1-2975).

8.4.3 Historical heritage impacts

No historical heritage sites were identified within the disturbance footprint, with exception of heritage listings relevant to the alternative Town camp. While LLH001 is located within the construction envelope and may be removed by the project, the site is not listed on any heritage register and does not hold historical heritage significance, and therefore impacts are considered neutral.

The project will have indirect visual impacts on *Highland House* (Item #I169 in Schedule 5 of the Lithgow LEP) and the Royal Hotel (Item #I062). Viewshed analysis was used to inform the extent of indirect impacts at these items (as shown on Figure 12.1). For Highland House the effect is limited by distance. For the Royal Hotel any effect is expected to arise from temporary traffic management at the Magpie Hollow Road and Great Western Highway intersection. With standard controls, residual indirect impacts are minor and can be managed through the implementation of mitigation measures recommended by the SoHI (refer to Appendix M).

The construction of the temporary workforce accommodation at the Town camp will require earthworks to facilitate the construction of roads and buildings. Archaeological potential within the footprint of the Town camp ranges from low to high, i.e. Zones I to III according to the archaeological zoning plan in the Lithgow DCP, where Zone I is high potential, Zone II is moderate potential, and Zone III is low potential. Each zone has specific management requirements before works can proceed. Construction works for the project will primarily be contained with Zone III (low potential), with all of the accommodation, car parking and roads located in this zone. However, the main entry, bus loop and covered bus shelter are proposed to be placed in Zone I.

Construction activities, in particular those activities occurring in Zone I, would result in adverse impacts to fabric, setting and the conservation area, and a major adverse impact to State significant historical archaeology through disturbance and potential removal of relics (such as the brick footings and beehive kiln), which would diminish research potential. Indirect visual and vibration effects from the Town Camp are expected to be minimal to none, due to separation and screening.

8.5 Management and mitigation

A summary of proposed management and mitigation measures for Aboriginal and historical heritage is provided in this section, with all specific and detailed measures detailed in Appendix E.

8.5.1 Aboriginal cultural heritage

An Aboriginal cultural heritage management plan (ACHMP) is proposed to be prepared as part of the overall construction environmental management structure for the project (refer to Appendix E). The ACHA also recommends the development of a cultural values mitigation strategy to be developed in discussion with Elders and knowledge-holders to mitigate adverse impacts to Mount Walker and the Platypus Dreaming story (where required); and the development of an Interpretation Strategy and Plan to provide acknowledgement and other visual/educational opportunities for the Aboriginal and broader local community. While some specific mitigation measures have been developed as part of the EIS (refer to Appendix E), further discussion and engagement with Aboriginal community is required to agree on ongoing and long-term management in response to cultural values impacts.

8.5.2 Historical heritage

An unexpected finds protocol for historical heritage will be included in the CEMP to mitigate risks to potential heritage items within the disturbance footprint and broader project area. The location of No. 2 Stockade on Cox's River site (outside the construction envelope) will be made known in the CEMP to ensure avoidance.

If the preferred Lakeside camp is not chosen and the alternative Town camp is selected for the project, then additional mitigation and management measures must be implemented in compliance with the Lithgow DCP. This includes archaeological investigation (test excavation), detailed design adherence to DCP design policies, preparation of an Integrated Interpretation Plan and photographic archival recording.

8.5.3 Early works management

Given the project is proposed to be undertaken in a staged manner, mitigation measures have also been developed to target early works. The proposed pre-construction/enabling works consist of minor development activities, such as geotechnical investigations and formalisation of access tracks, many of which are existing. With the exception of two locations where LD 13 (AHIMS #45-4-0916) and LD 14 (AHIMS #45-4-0915) would be bisected, these activities are proposed in areas where cultural materials were not encountered, or are considered to be characterised as a low significant disparate and intermittent background stone artefacts.

Following approval, it is proposed that early works in these areas proceed in advance of main works documentation and activities under direction of a heritage specialist and/or RAP/s, who could advise on the need for any on site works. Where cultural materials are encountered, they would be managed in accordance with an unexpected finds process that would require development in advance of the early works for the project.

Where the preconstruction/enabling works intersect areas of high significance, notably LD 13 (AHIMS #45-4-0916) and LD 14 (AHIMS #45-4-0915), that are proposed for archaeological mitigation activities, such as salvage excavation, the development of an Archaeological Research Design (ARD) is proposed. This would be a concise document that would outline the mitigation requirements for those portions of the sites to be adversely affected by the development activities.

For historical heritage, if the Town camp is selected, this would also form part of the early work and therefore the specific mitigation measures for this site (as provided in Appendix E) are to be implemented.

8.6 Conclusion

The project would result in the disturbance of up to approximately 146 ha of land. Of the 21 discrete Aboriginal sites/places within the project area, five would be subject to direct impacts. The project would also cause a partial loss of value to two places of cultural value: the peak of Mount Walker and a Platypus Dreaming story encompasses portions of the Coxs River and its tributaries.

Archaeological mitigation, especially of subsurface cultural materials to further inform our understanding of the past, is proposed to mitigate some of these impacts to the extent possible; and discussions have been undertaken with Elders and knowledge-holders to explore broader cultural and socio-economic approaches (i.e. non-archaeological mitigation) in relation to impacts to contemporary cultural places and values.

An ACHMP will be developed for the project to guide post-approval requirements for Aboriginal heritage. A Cultural Values Mitigation Strategy is proposed to further inform and direct management and mitigation of cultural values and places; and a Heritage Interpretation Strategy and Plan to explore Aboriginal interpretive opportunities from the project.

The Town camp is located within areas of high archaeological sensitivity within the curtilage of the State heritage listed Lithgow Valley Colliery & Pottery Site (SHR #00078) and construction would result in major adverse impacts. Specific management measures are required in accordance with the Lithgow DCP.

Overall, the historical heritage impacts of the project (excluding the Town camp) are considered acceptable and can be managed with standard construction practices.

An unexpected finds protocol will be implemented to mitigate risks to any potential heritage items within the project area.

Chapter 9

Landcape and visual

Environmental Impact Statement |
Lake Lyell PHES Project

9 Landscape and visual

This chapter presents a summary of potential landscape and visual impacts of the project. A detailed Landscape and Visual Impact Assessment (LVIA) is provided in Appendix N. The relevant SEARs for landscape and visual and where they are addressed in the LVIA are summarised in Appendix A.

9.1 Assessment approach

The LVIA considers both construction and operational phase impacts for the PHES project, including visual impact resulting from the preferred and alternate temporary accommodation camp. The methodology for the assessment involved the following in accordance with the relevant guidelines:

- Establishing the relevant assessment criteria and thresholds for the project with guidance from the *Large-Scale Solar Energy Guideline* (DPHI, 2024) and *Large-Scale Solar Energy Guideline: Technical Supplement for Landscape Character and Visual Impact Assessment* (DPHI, 2024) (Solar Guidelines), *Wind Energy: Visual Assessment Bulletin* (VA Bulletin) (DPE, 2016), *Guidelines for Landscape and Visual Impact Assessment Third Edition* (GLVIA) (the Landscape Institute and Institute of Environmental Management and Assessment, 2013), and *Guideline for landscape character and visual impact assessment* (Transport for NSW, 2020). While the project is not a solar development, the relevant elements from the Solar Guideline have been adopted for the assessment in the absence of other more directly applicable Departmental guidelines being available.

- Visual baseline study - recording and analysing the existing landscape character and visual conditions which are then classified into landscape units. These landscape units enable the landscape to be rated for its scenic quality and sensitivity to change.

- Identifying a Zone of Visual Influence (ZVI) with GIS analysis, identifying sensitive receivers within the visual study area, and simulating the project's visibility based on the topography of the land and project infrastructure modelling to establish the locations from where views of the project may be possible.

- Identifying and selecting viewpoints to provide representative samples of the likely changes and the exposure to project elements.

- Assessing visual impact from the selected representative viewpoints based on visual sensitivity and magnitude of change, informed by site inspections, community views/feedback, photographs and photomontages. Separate visual impact assessments were then conducted for viewpoints likely to experience a high or moderate impact to determine specific impacts from within private properties (i.e. residences and businesses).

- Recommending reasonable and feasible mitigation and management measures to reduce visual impacts.

9.2 Existing environment

Key features in the landscape add to the character and uniqueness of a place. The features may include dramatic natural features like a mountain peak, cliff or waterfall. The Coxs River and Lake Lyell are one of the defining landscape features of the local area. Mount Walker is a prominent feature visible from most directions, including more heavily populated areas to the east of the project area.

9.2.1 Sensitive land uses

Sensitive land uses include key National and State sensitive land use designations as well as potentially sensitive land use zones identified in the Lithgow LEP. Sensitive land uses relevant to the project include National parks (Marrangaroo National Park), tourist and recreation (Lake Lyell), and natural waterways (Coxs River and Farmers Creek). Relevant to the alternative accommodation camp is the Pottery Estate State heritage listing and nearby R1 General Residential zoning.

9.2.2 Public recreation

Lake Lyell Recreation Park occupies land on the shores of Lake Lyell. The privately owned and operated facility offers camping and cabin accommodation, boat ramp access to Lake Lyell and other related recreation activities. Visitors use the recreation park's boat ramp, or launch from other areas across Lake Lyell, for water-based transport and recreation, with fishing a key recreational activity. A detailed review of local tourism and recreation of the area is provided in the Social Impact Assessment (refer to Appendix O).

9.2.3 Landscape character

Lithgow is an urban centre located close to the project area, as well as the nearby rural towns and settlements including Rydal, South Bowenfels and Littleton. The main transport infrastructure in the vicinity of the project area is the Great Western Highway which connects Lithgow with Bathurst and Sydney. The project area is predominantly covered by open eucalypt forest, with some cleared areas.

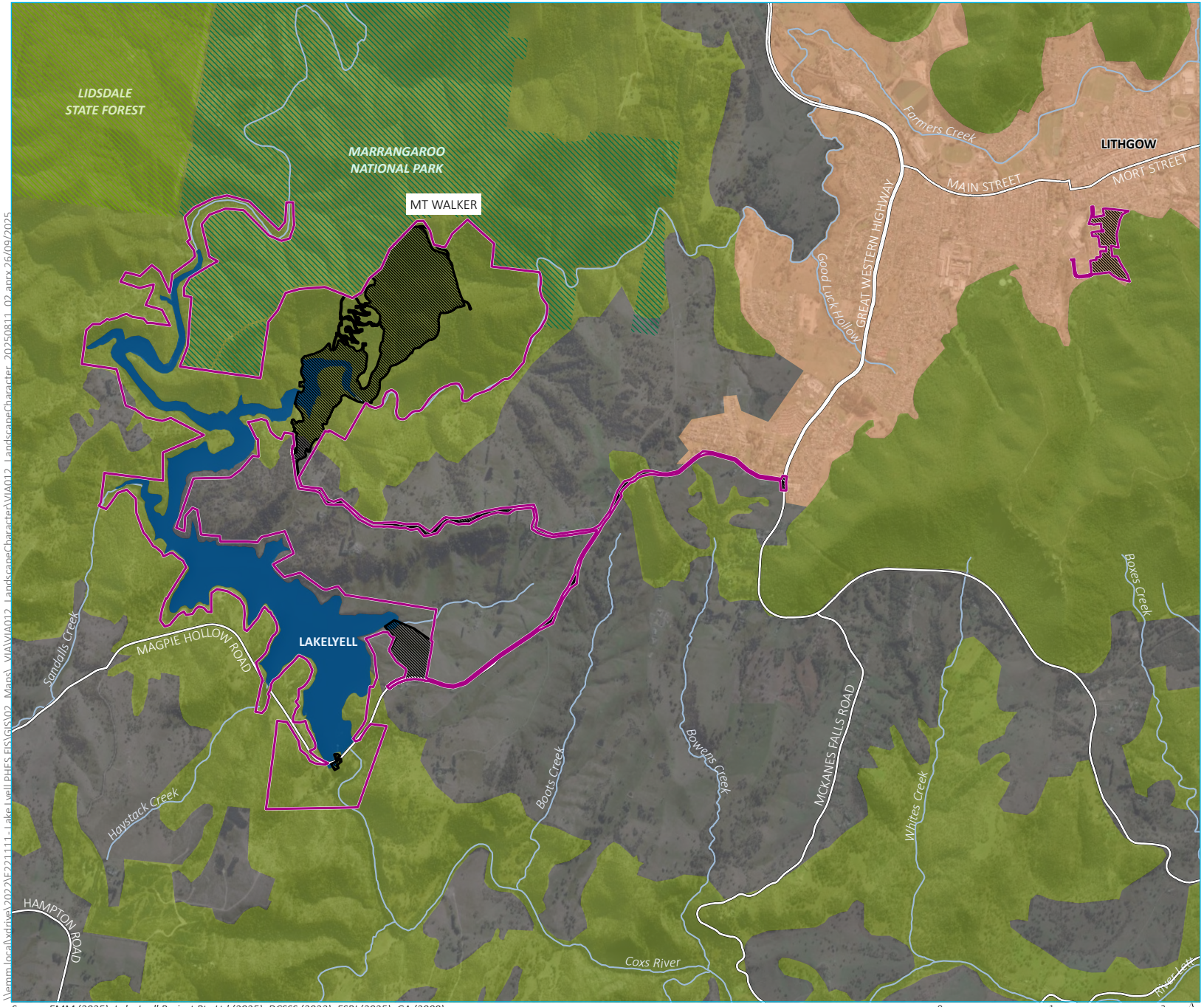
The surrounding area has experienced urban development (east of the project), conservation (north of the project), forestry activity (west of the project), and extensive clearing for pasture and agriculture (south of the project). Dominant landforms and landscape features include Mount Walker and Lake Lyell.

The existing landscape relevant to the project has been characterised into landscape character zones (LCZ) based on land use, landform and landscape features that create distinct character areas as shown in Figure 9.1 and summarised in Table 9.1.

Table 9.1 Landscape character zones

LCZ	Description	Photograph of typical setting within LCZ
Coxs River and Lake Lyell	Lake Lyell is a large, freshwater lake formed by the construction of Lilyvale Dam. The shoreline of the lake is composed of sandy beaches and rocks, with large open areas for recreation available in the Lake Lyell Recreation Park, as well as water-based recreation on the lake itself. Lower slopes around the lake support open grazing areas and patches of forest vegetation. At the southern end of the lake, the infrastructure associated with the Lilyvale Dam introduce a distinctly industrial element into the otherwise natural / agricultural setting of this landscape character zone.	
Forested mountains and ridges	This LCZ is identified by rugged valleys formed between steeply sided ridges. Creeks are generally small and ephemeral. Views from this LCZ are generally open longitudinally along the valleys. Views across the valleys are confined by the hills and ridges that separate one valley from another.	

LCZ	Description	Photograph of typical setting within LCZ
Cleared agricultural slopes	Occurring across the RU2 Rural landscape zone, the cleared agricultural slopes unit includes areas of pasture with a backdrop of forested ridges. Scattered trees and agricultural buildings and structures contribute to the character.	
Lithgow and surrounding urban areas	This LCZ is characterised by urban development (commercial and residential buildings) occupying the lower slopes and valleys along the Great Western Highway and Farmers Creek. These buildings are punctuated by tree-lined roadways occurring at regular intervals along the slopes. Lithgow is located along the Farmers Creek valley and railroad, with the towns of Bowenfels, Littleton, South Littleton, and South Bowenfels along the highway. Views from the LCZ are generally contained by neighbouring buildings and trees. There are views toward the surrounding forested mountains and ridges from various vantage points.	



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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009)

Landscape character zones

Lake Lyell PHES
Environmental Impact Statement
Figure 9.1

EMM
creating opportunities

9.2.4 Existing views

The visual setting is characterised by the landscape setting, sensitive land uses or sites, including Aboriginal and non-Aboriginal heritage. Sensitive views are also informed by heritage sites, tourist vantage points and community values.

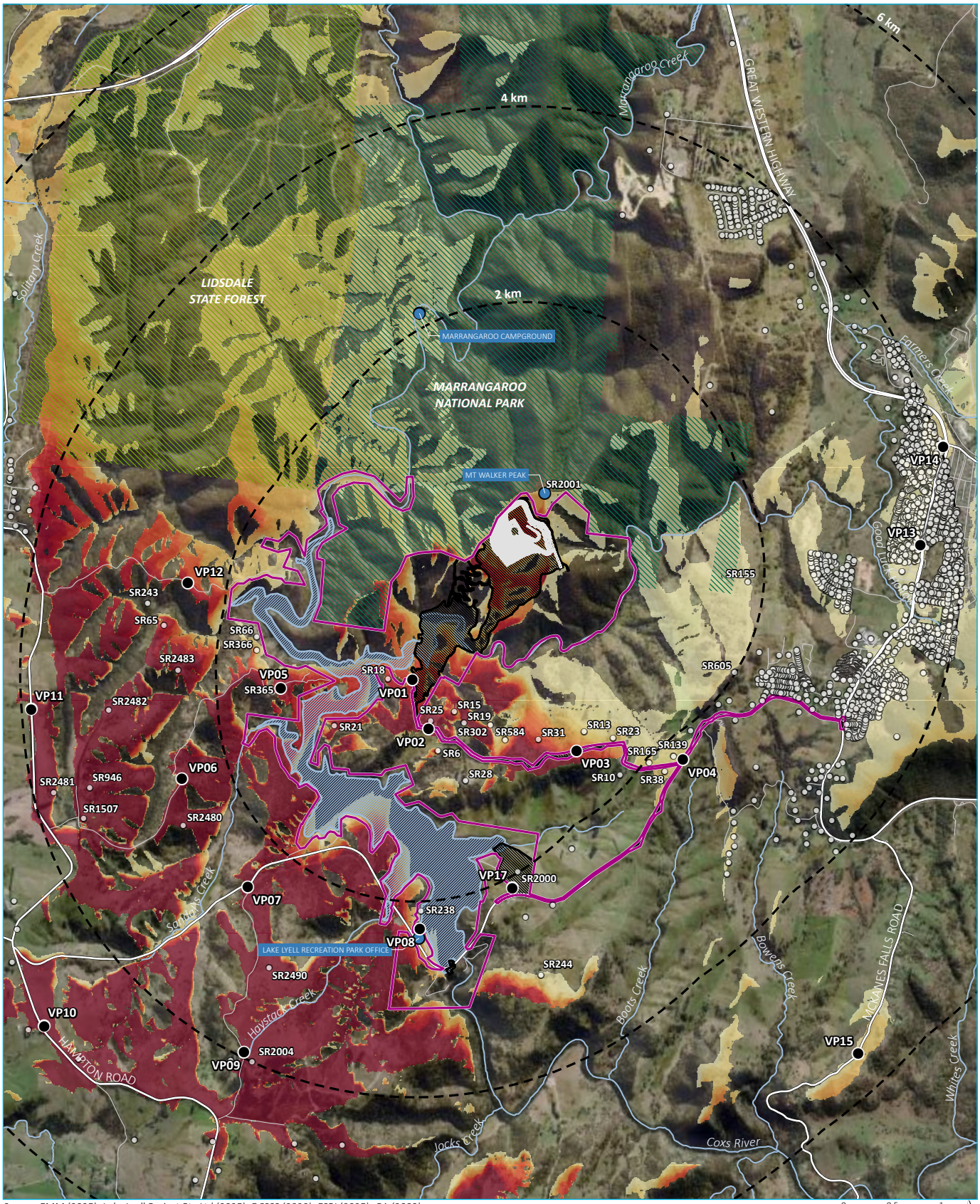
ZVI diagrams have been prepared to illustrate the theoretical visibility of the proposed permanent project infrastructure (refer to Figure 9.2) and of each accommodation camp option (refer to Figure 9.3 and Figure 9.4). The ZVIs cover the visibility distance zones that will experience the highest visual impacts.

It is important to note that ZVI analysis does not consider the diminishing size of the project elements as the viewer moves further away. It also does not account for any vegetation, trees, or structures (e.g. rural residences, farm sheds and agricultural infrastructure) that may screen views to the project. ZVI analysis only indicates where the project elements will be theoretically visible, with no such obstructions taken into account, and is therefore very conservative.

All sensitive receptors (SR) have been mapped for the project and are shown relative to the ZVI mapping in Appendix N. Considering relevant guidelines and based on ZVI mapping, site visits and stakeholder feedback, a total of 16 representative viewpoints have been selected to assess the visual impact of the operational elements and one viewpoint to assess the visual impact of the temporary Lakeside camp (refer to Table 9.2). They have been selected to represent views from:

- private residences and local roads, including Martins Road, Sandalls Drive, Sir Thomas Mitchell Drive and Magpie Hollow Road
- the Great Western Highway and the western edge of the Lithgow urban area, including residences and commercial enterprises
- tourist destinations such as the Lake Lyell Recreation Area, and nearby accommodation venues including Seclusions Blue Mountains, Eagle View Escape and Springmead B&B.

Boating activities occur throughout Lake Lyell and some restrictions will be required during construction and operation in vicinity of the project to protect the inlet structure as well as public safety. A specific viewpoint was not selected on the lake, however, has been considered qualitatively throughout the assessment based on other relevant viewpoints. Viewpoint 8, located at the water's edge within the Lake Lyell Recreation Park, represents views from heavily used areas of the of the lake. Access to private residences was not available at the time of the site inspection and photography for the LVIA. As such, representative viewpoints have been selected in lieu of assessing each residence. The rationale for each viewpoint selected, and the residences associated with each viewpoint, is presented in Table 9.2.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009)

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KEY

- Project area
- Disturbance footprint
- Key location
- Sensitive receiver *
- Upper reservoir

Zone of visual influence
- Viewpoint
- Disturbance buffer

Upper reservoir visibility
- Highly visible
- Not very visible

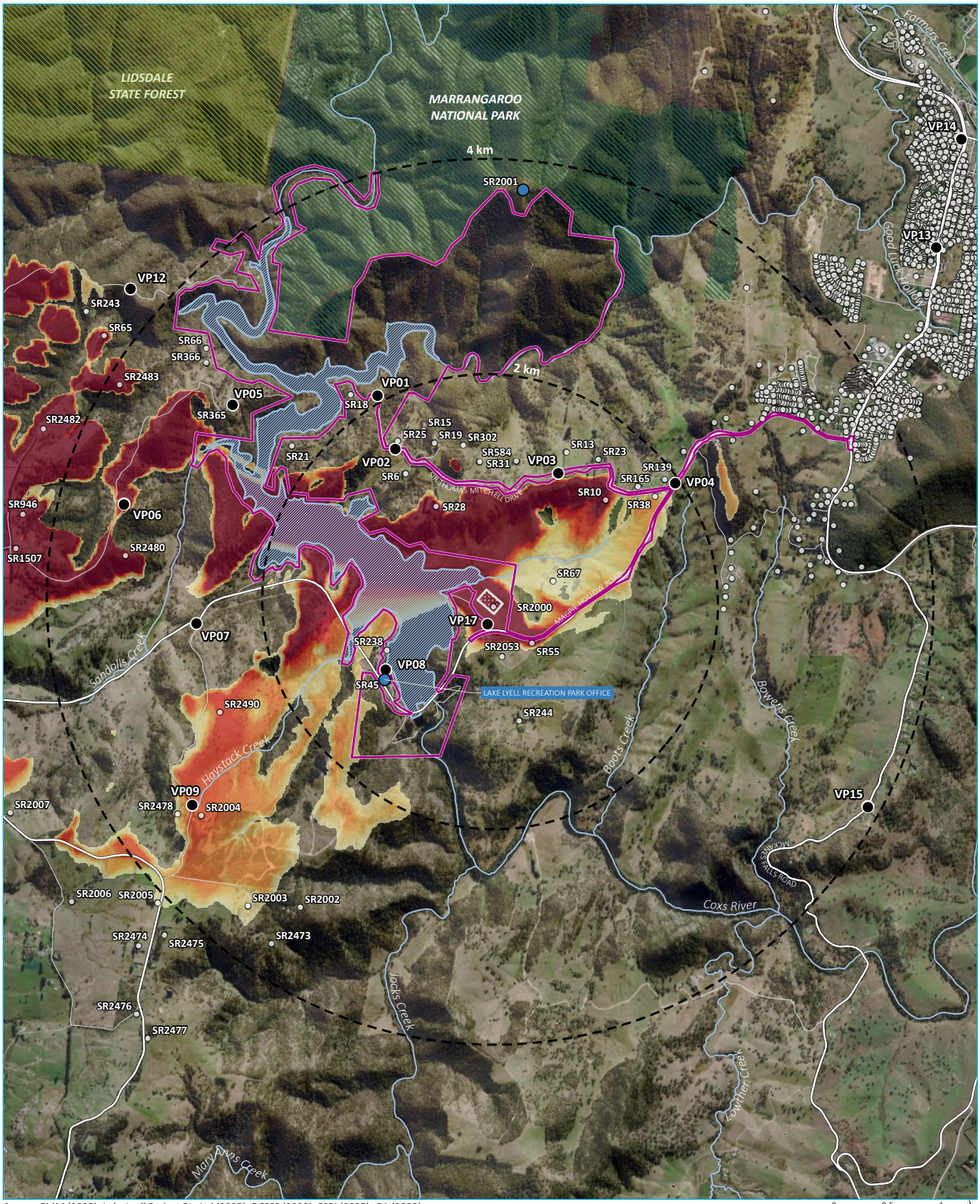
Existing environment
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Zone of visual influence- upper reservoir

Lake Lyell PHES
Environmental Impact Statement
Figure 9.2

EMM creating opportunities

* Note not all sensitive receptors are mapped. Mapped sensitive receivers are presented based on potential visibility as described in this LVIA



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009)

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KEY

- Project area
- Disturbance footprint
- Lakeside accommodation camp (approximate location)
- Key location
- Sensitive receiver *

Zone of visual influence
- Viewpoint
- Disturbance buffer

Accommodation camp visibility
- Highly visible
- Not very visible

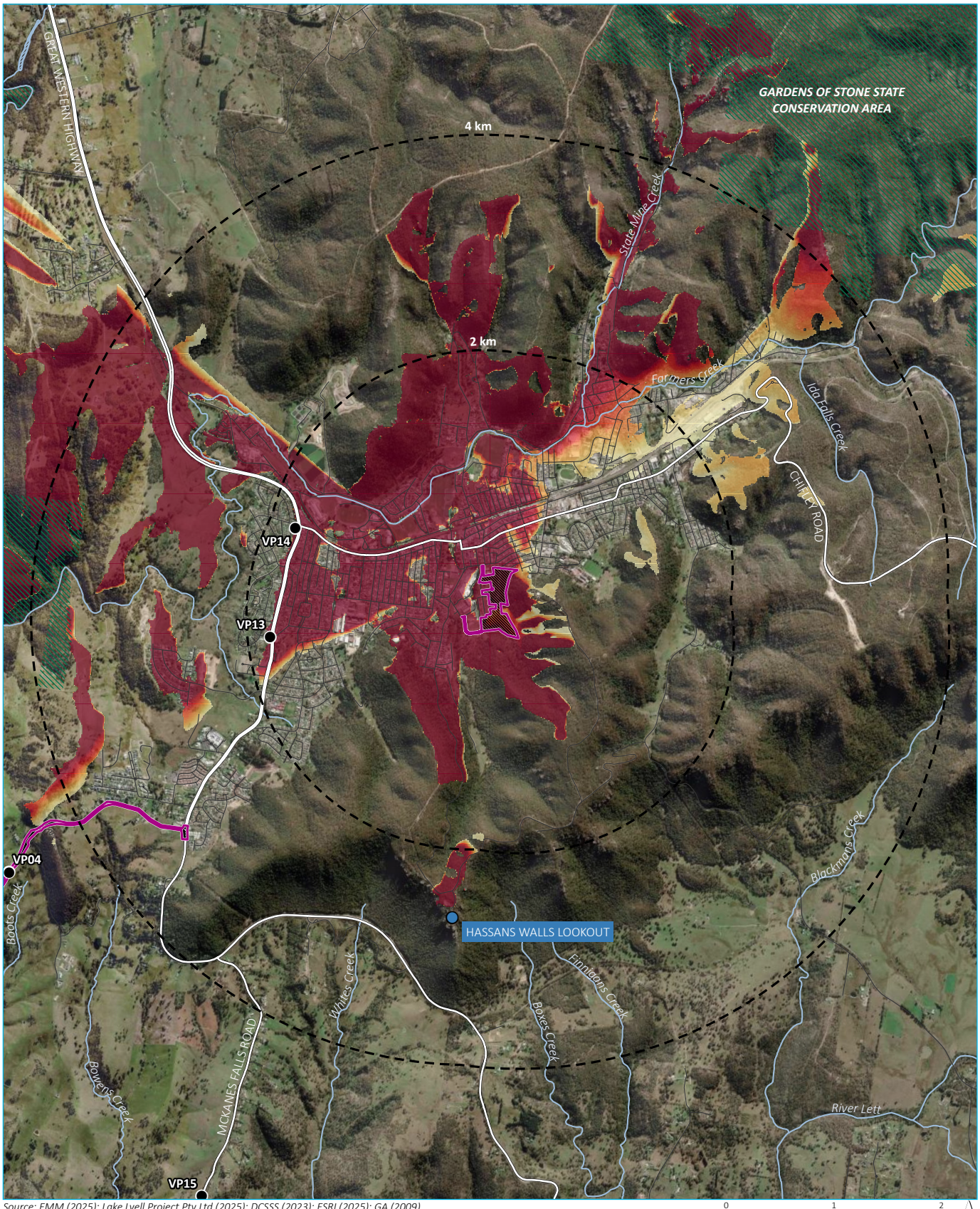
Existing environment
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Zone of visual influence – Lakeside camp

Lake Lyell PHES
Environmental Impact Statement
Figure 9.3

EMM
creating opportunities

* Note not all sensitive receptors are mapped. Mapped sensitive receivers are presented based on potential visibility as described in this LVIA



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009)

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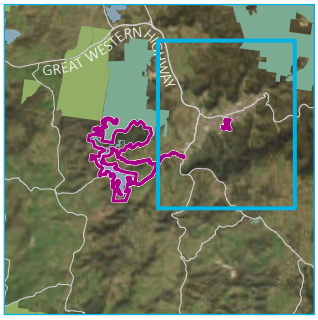


KEY

- Project area
- Disturbance footprint
- Key location
- Upper reservoir

Zone of visual influence

- Viewpoint
- Disturbance buffer

Town camp visibility

- Highly visible
- Not very visible

Existing environment

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

Zone of visual influence – town camp

Lake Lyell PHES
Environmental Impact Statement
Figure 9.4

EMM
creating opportunities

Table 9.2 Selected viewpoints and rationale for selection

Viewpoint	Location and representative receptor[1]	Rationale for selection
Sir Thomas Mitchell Drive		
1	Local road and SR18 and 21	Representative of the closest public viewpoints from which the upper reservoir will be visible
2	Rural residence (SR6, 15, 19, 25) and local road	Representative of several nearby residences
3	Rural residence (SR13, 31, 302, 584) and local road	Representative of several nearby residences
4	Rural residence (SR139, 165) and local road corner at Magpie Hollow Road	Representative of several nearby residences
Sandalls Drive		
5	Tourist destination: Eagle View Escape (SR365) and SR65, 66, 366	Representative of several nearby residences and a tourist accommodation facility
6	Springmead B&B (SR1507), rural residences (SR946, 2480) and local road	This viewpoint primarily assesses views from Sandalls Drive and is representative of nearby residences
Magpie Hollow Road		
7	Local road corner with Martins Road	This viewpoint represents views from Magpie Hollow Road which is the western access road to the Lake Lyell Recreation Park
8	Tourist destination: Lake Lyell Recreation Park (SR45, 238)	Represents views from heavily used areas of the Lake Lyell Recreation Park, including the boat ramp, office and café
Martins Road		
9	Tourist destination: Seclusions Blue Mountains (SR2004), local road and SR2490	Represents views from a tourist destination (Seclusions Blue Mountains) and residences
Hampton Road		
10	Rural residence (SR2007, 2008) and local road	Representative of several nearby residences
11	Rural residence (SR2481) and local road	Representative of views from Hampton Road and nearby residences
Old Western Road		
12	Local road and SR2002	Representative of views from Old Western Road and nearby residence
16	Local road and nearby residences	Representative of views from Old Western Road
Great Western Highway at Lithgow urban area		
13	Residences, highway (motorists), SR1068 (Lithgow Motor Inn), SR1499 (KFC) and SR1996 (Lithgow Cemetery)	Representative of potential views from Great Western Highway and from public and private viewpoints in the vicinity
14	Residences and highway (motorists)	Representative of potential views from Great Western Highway and from public and private viewpoints in the vicinity
Mckanes Falls Road		
15	Residence and local road	Representative of views from Mckanes Falls Road
16	Residences and local road	Representative of views from Old Western Road

Viewpoint	Location and representative receptor[1]	Rationale for selection
Magpie Hollow Road (towards the accommodation camp)		
17	Local road	Representative of views of the temporary accommodation camp for motorists on Magpie Hollow Road

Notes: 1. Sensitive receptors (SR) have been identified and mapped in relation to the ZVI and shown in detail in Appendix N.

9.3 Predicted landscape impacts

The landscape character impact of the project has been assessed as ranging from low to high in the four LCZs, as shown in Table 9.3. This assessment is based on the operational elements of the project and excludes construction/accommodation elements as these will ultimately be rehabilitated back into the landscape.

Table 9.3 Landscape character zone impacts

Landscape character zone	Sensitivity	Magnitude	Landscape character impact
Cox River and Lake Lyell	Moderate	Moderate	Moderate
Forested mountains, ridges and valleys	High	Moderate	High
Cleared agricultural slopes	Moderate	Low	Low
Lithgow and surrounding urban areas	Low	Low	Low

9.4 Predicted visual impacts

9.4.1 Impacts during operation

The visual impacts during operation are those that occur after the construction phase of the project throughout its 80-100-year operational life. Given the nature of the construction of the upper reservoir, some visual impacts may be effectively permanent. Visual impacts from operation of the project will be caused mainly by:

- permanent infrastructure within Lake Lyell (inlet) and changes to recreational access (i.e. access to inlet area will be prohibited)
- permanent infrastructure on the southern face of Mount Walker, including the upper reservoir dam and spillway, and the access road
- fluctuations of the water level within Lake Lyell will occur more frequently, exposing and inundating shoreline on a daily basis
- infrequent and limited vehicle and traffic movements for maintenance activities.

Viewpoints 1 to 16 have been used to provide a representative assessment of the potential visual impacts during the operation of the project. Appendix N contains the visual impact analysis and photographs from each of the representative viewpoints. Table 9.4 summarises the findings from the analysis of each representative viewpoint and generally shows:

- the project will be difficult to see from most public locations other than nearby roads
- views from residences and other sensitive receivers will vary considerably (and further assessment is needed to determine specific impacts from within private property)
- visual impacts will be highest for sensitive receivers and motorists / visitors to the south-west of the project, particularly during the period of vegetation reestablishment
- for most viewpoints, vegetation reestablishment will significantly reduce the visual impact of the project.

Table 9.4 Overview of predicted impacts on views of the project from representative viewpoints

Viewpoint	Potentially visible project elements	Visual magnitude rating	Visual sensitivity rating	Visual impact rating
1	Temporary vegetation clearing, upper reservoir and some permanent buildings	High	Moderate	**High**
2	Temporary vegetation clearing and upper reservoir	High	High	**High**
3	Temporary vegetation clearing and upper reservoir	High	Moderate	**High**
4	Temporary vegetation clearing and small part of the upper reservoir	Low	Moderate	**Low**
5	Large part of the project: temporary vegetation clearing, upper reservoir, switchyard and associated buildings	High	High	**High**
6	Temporary vegetation clearing, upper reservoir, buildings and other structures at lower elevations	Low	High	**High**
7	Temporary vegetation clearing and upper reservoir	Moderate	Moderate	**Low**
8	Parts of the upper reservoir	Low	Moderate	**Moderate**
9	Temporary vegetation clearing and upper reservoir	Low	Moderate	**Moderate**
10	Temporary vegetation clearing	Low	Moderate	**Low**
11	Temporary vegetation clearing and upper reservoir	Low	Low	**Low**
12	Temporary vegetation clearing and upper reservoir	Low	Moderate	**Low**
13	Temporary vegetation clearing and part of the upper reservoir	Low	Low	**Low**
14	Temporary vegetation clearing, part of the dam construction, and some change to the ridge due to excavation of the upper reservoir	Low	Low	**Low**
15	Temporary vegetation clearing	Low	Moderate	**Low**
16	Temporary vegetation clearing	Low	Low	**Low**

i Visual impacts on near neighbours

Near neighbours that may experience visual impacts include dwellings along Sir Thomas Mitchell Drive and some properties south-west of the project area in particular along Sandalls Drive. Visual impacts for near neighbours can vary significantly due to the steep terrain and established forest vegetation of the area. Visual impacts even at different locations on a single property may vary considerably from high to low or nil where views of the project are completely screened.

The results of the representative viewpoint analysis were used to inform further, detailed assessment of individual sensitive receivers where they were predicted to experience a moderate or high visual impact. This involved either a review of virtual views from each sensitive receiver based on modelling software where private access to a property was not achieved, or where access was available, individual photomontages were prepared based on site photography. The individual assessments are provided at Appendix N. Views within private property have varying existing screening or are located in lower terrain which has influenced their visual impact rating. In many cases, the magnitude of visual impact has reduced when compared to the representative viewpoints due to this existing screening. Of the 23 sensitive receivers individually assessed (without mitigation), five are rated as likely to experience high visual impacts, 11 are rated as likely to experience moderate visual and seven are rated as likely to experience low or very low visual impacts.

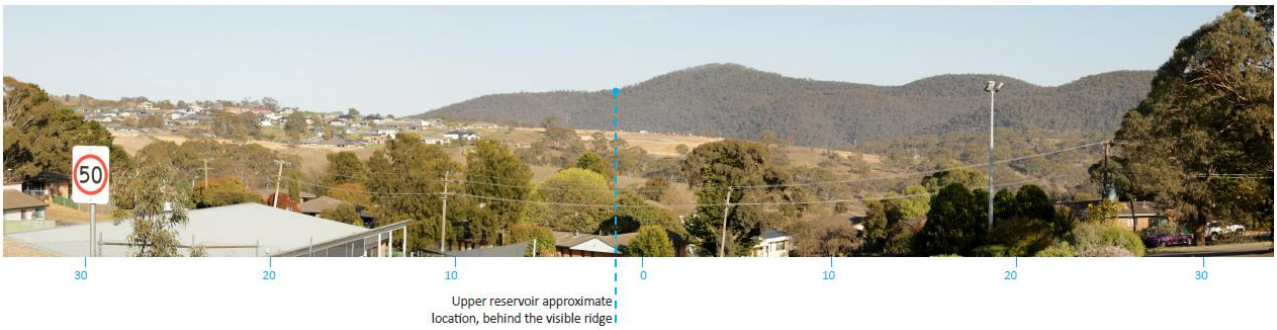
Reasonable and feasible mitigation at each receiver was explored through a series of visualisations including modelled vegetative screening. A residual impact assessment was carried out and demonstrated that vegetative screening would reduce visual impacts at most sensitive receivers. Noting however, any screening introduced on private property would be subject to agreement with individual landowners.

ii Visual impacts on Lithgow urban area

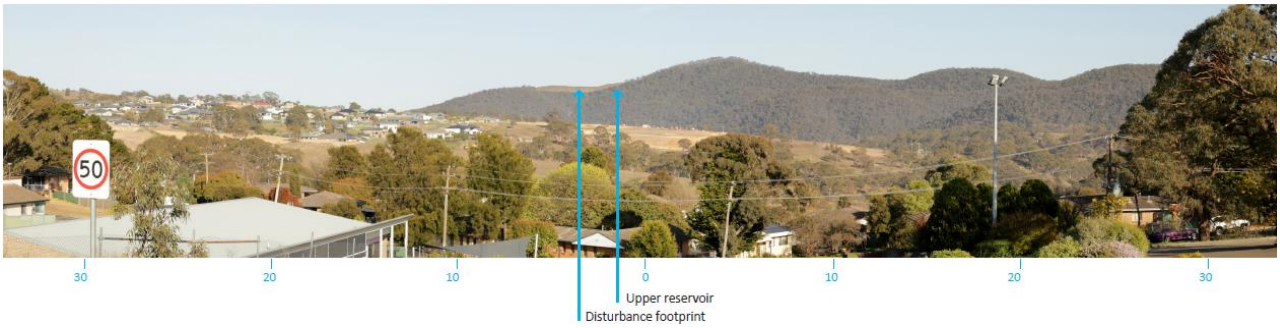
Viewpoints 13 and 14 represent views from the Lithgow urban area. The ZVI analysis for the upper reservoir indicates partial visibility of the project in parts of the Lithgow urban area, particularly along and adjacent to a section of the Great Western Highway. To better understand what part of the project would potentially be visible, a reverse viewshed analysis was prepared as well as a photomontage for VP13 (refer to Appendix N). The results showed that only a small area of the project is potentially visible as a result of clearing for the upper reservoir. It is anticipated that this will be significantly reduced with time as tree cover is reestablished on the ridge beside the upper reservoir, resulting in nil long term impact to the view from the Lithgow urban area (refer to Figure 9.5).

iii Visual impacts on Marangaroo National Park

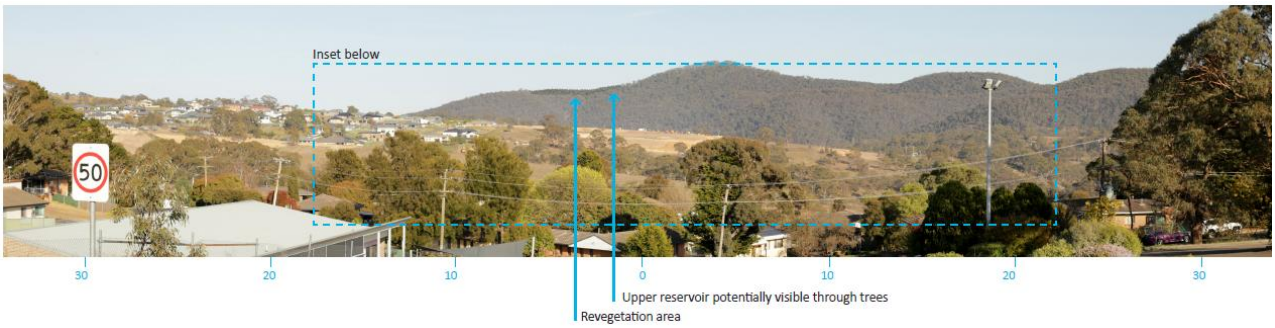
Visual impacts on Marangaroo National Park will occur mainly at the summit of Mount Walker, which is close to the location of the upper reservoir. Apart from the summit, the large areas of tree cover within the National park will generally prevent extensive views of the project and will reduce visual impacts. No identified camping areas or gathering areas within the park will have views of the project.



VP13: Great Western Highway, Lithgow – Existing view



VP13: Great Western Highway, Lithgow – View during construction (maximum land disturbance)



VP13: Great Western Highway, Lithgow – View during operation

Figure 9.5 Lithgow urban area viewpoint assessment

iv Visual impacts on Lake Lyell water-based activities

The ZVI for the upper reservoir (refer to Figure 9.2) indicates potential visibility of the upper reservoir from most parts of the lake surface, however actual visibility of the upper reservoir will vary greatly with distance from the northern shoreline and the level of tree cover on land north of the lake. Water-based activities at the northern end of Lake Lyell will be impacted by views of the lower elevation infrastructure including the inlet structure, diversion and bridge crossing of the Farmers Creek arm of Lake Lyell. However, most water-based activities would have a short duration, and many locations will have less visibility of the upper reservoir due to intervening land and tree cover.

The regular changes in lake water level caused by operation of the project will result in a visible impact to users of the lake and visitors to locations near the lake such as Lake Lyell Recreation Park. Change may be in the form of:

- visible changes in lake water level almost daily
- potential visual changes to shoreline as a result of more regular exposure of sediments and daily changes in water level.

v Visual impacts on heritage items

There is a sightline to Highland House, a local heritage item located south west of the project. However, visual change is assessed as low and has been considered as part of the historical assessment (and determined to have negligible overall impact on heritage values). Pottery Estate is a State and local heritage item that may be impacted by the construction and use of the town accommodation camp option. Operation of the project is not expected to have a visual impact on this heritage item. No other sightlines exist to non-Aboriginal heritage items.

Impacts to Aboriginal sites and values are assessed separately in the ACHA (refer to Appendix L) and identified 20 discrete Aboriginal sites and places located within the project area, with five of those sites within the construction envelope. Impacts to visual amenity would be limited to the peak of Mount Walker which has been identified by some traditional owners as having contemporary values. The summit of Mount Walker may have partial views of the upper reservoir and views of at least some of the project infrastructure near Lake Lyell. However, these views will be heavily filtered through existing trees not impacted by the project. While specific activities on the peak would remain unaffected, visual and aesthetic values would be adversely affected by the project; and by extension social values assigned to the locale. Several remaining cultural materials around the broader project area would remain unaffected by the project.

9.4.2 Impacts during construction

i Main construction

Visual impacts during construction are primarily temporary with the main impacts summarised in Table 9.5.

Table 9.5 Overview of temporary visual impacts during construction

Construction activities	Predicted visual impacts
Vegetation clearing, in particular for construction of upper reservoir	Existing native vegetation will be cleared for construction and involve use of heavy machinery for earthworks and transport. Where possible, these areas will be revegetated but will take some years to develop a canopy cover similar to existing conditions. This will result in visual impacts that are considered temporary even though it may take some years beyond the construction period to be fully reinstated. Areas retained for permanent infrastructure are assessed as operational impacts.

Construction activities	Predicted visual impacts
Traffic and vehicle movements	Vehicle movements will be a daily occurrence during the construction stage of the project. Most traffic into the project area is expected to be to and from the Great Western Highway, via Magpie Hollow Road and Sir Thomas Mitchell Drive. Vehicles may also be visible along access tracks from some locations.
Watercraft	Barges and other watercraft to support construction of the project may be launched from either the camp accommodation location or the end of Sir Thomas Mitchell Drive.
Temporary laydown areas	Laydown areas and construction yards will be located along Farmers Creek arm of Lake Lyell, toward the end of Sir Thomas Mitchell Drive. The visual impacts of these areas are expected to be negligible due to the location within a valley and away from any roadways and residences.
Installation of transmission towers and overhead wires	As construction progresses, machinery movement to install the approximately 150 m of transmission infrastructure will be visible in limited locations within the project footprint.
Construction of switchyard and associate buildings	Construction of these elements will require use of cranes and earthworks machinery. Visibility to this location is limited due to the surrounding topography, however cranes may be visible over a wider area when in use.
Dust caused by construction activity	Dust caused by construction activity may be visible at times and will have a temporary visual impact.
Lighting	Detailed in Section 9.4.3.

ii Accommodation camps

The Lakeside camp is located on the eastern shore of Lake Lyell, accessed off Magpie Hollow Road, and is the preferred camp for the project. The Town camp is located in Lithgow at the Pottery Estate off Silcock Street and is the alternative camp option. Only one of these locations will ultimately be selected and built.

Both locations for the accommodation camp are located away from the main project site and will have separate visual impacts. There will also be visual impacts related to the construction and decommissioning of the accommodation camp.

Construction of the accommodation camp will be of a much smaller scale than for the main project and will have much smaller visual impact. The following construction / decommissioning activities related to the accommodation camp will have visual impacts:

- Use of excavators and other machinery for earthworks / site preparation/site rehabilitation.
- Use of cranes to install / remove prefabricated buildings.
- Additional truck movements related to the delivery and removal of plant and building equipment.

It is anticipated that the construction and decommissioning periods for the accommodation camp will be about two to three months in duration at the beginning and end of the project construction period.

During occupation of the camp, the visual impacts for each location will vary. A summary of impacts of each camp location is provided in Table 9.6.

Table 9.6 Visual impacts during occupation of accommodation camp

Visual aspects	Lakeside camp (preferred)	Town camp (alternative)
Location	Located on eastern shore of Lake Lyell	Located at the base of a valley along the southern edge of Lithgow.
Number and type of sensitive receivers	Viewers will include local residents, motorists on Magpie Hollow Road (including visitors to Lake Lyell), and water users on Lake Lyell. A total of 21 sensitive receivers are within 2km of the camp	Viewers will include local residents and motorists. While there may be views of the camp from residences immediately adjacent to the camp location (Silcock Street, Mantle Street, Hill Street, Valley Drive, and Hassans Walls Road) the potential for views diminishes rapidly beyond these streets. Views from within Lithgow are expected to be blocked by the existing buildings and landscape.
Visual assessment	Viewpoint 17, on Magpie Hollow Road approximately 700 m south-east of the proposed accommodation camp has been selected to assess visual impacts of the accommodation camp for motorists and visitors. The visual assessment found that the visual impact on viewpoint 17 was low, with a magnitude rating of low and visual sensitivity rating of moderate.	Locations at higher elevations that have views over the buildings in Lithgow may have views of the camp. Locations along Great Western Highway may have glimpses of the camp rooftops, even though no views are expected at viewpoints 13 and 14.

9.4.3 Night lighting impacts

Visual impacts from night lighting would likely be experienced by people who are outside in the landscape. The impact of night lighting is unlikely to be experienced from inside residences since internal lights reflect off windows and limit views of the exterior at night. The highest impact is expected to be on people who enjoy the outdoors at night, specifically night-sky enthusiasts, photographers and star gazers. Potential sources of light sources include lighting for safety and security on project infrastructure and ancillary structures.

During the construction period there may be some night lighting used to support construction activities and for security at the laydown and construction yards. This lighting is expected to be confined to a small area, impacting a limited number of residences at certain times during construction. However, because of the undulating topography and existing vegetation, impacts from construction lighting are expected to be negligible. Temporary lighting for the upper reservoir during the construction phase may be visible from greater distances.

Nighttime lighting during the operation of the project will mainly be emitted from the lower elevation elements, such as the site administration building, and will have a potential impact on a small number of receivers with views of these elements. Lighting design can mitigate some of these impacts.

9.5 Management and mitigation

9.5.1 Avoidance and minimisation

Good design principles applied to the project during the design stages can help keep the visual impacts to a minimum. This is done primarily through careful siting of project elements to take advantage of the topography and existing vegetation for screening. The project design has responded to preliminary assessments of project impacts and community feedback and have modified the feasibility design (for example, relocation of the upper reservoir) to the current design assessed in the LVIA (refer to Chapter 2).

9.5.2 Mitigation measures

Recommendations have been made to mitigate visual impacts of the project. Due to the location and size of the project, mitigation recommendations are not based on or made for any specific receivers but seek opportunities to mitigate through design and mitigation at the source. This includes consideration of micro-siting of infrastructure where possible, material and colour selection, and vegetation clearing, management and re-establishment. Mitigation at specific receivers would only occur where an agreement is made between the project and landowner, as part of the Neighbour Agreement Guide.

A full list of mitigation measures are presented in Appendix E, with a summary of key measures provided in Table 9.7.

Table 9.7 Summary of mitigation measures

Mitigation type	Mitigation measures	
Mitigation in design	Site selection	Where ongoing refinement of project elements occurs during detailed design, continued avoidance in design measures are to be adopted including: • preserving high quality vegetation • preserving vegetation along watercourses and higher slopes.
	Materials and colours	The detailed design process is recommended to include materials and colours that make use of: • natural stone for construction of the upper reservoir and other earthworks (locally sourced materials may blend into the existing landscape better than imported materials) • harmonious colours and materials for buildings, structures, etc.
Mitigation at source	General construction	Practical steps to reduce visual impacts during construction will be implemented where possible. These practices include: • locating laydown areas in areas with limited visibility from residences and public roads • sensitive alignment of access tracks to minimise their appearance within the landscape and views, using landform and vegetation to assist in partially screening and integrating them • measures to minimise dust generation • minimising clearing in line with vegetation retention objectives.
	Vegetation management	• To retain the character of the landscape, existing vegetation is to be retained where possible. Specific areas to target for vegetation retention are ridgelines and hilltops and along waterways. • Revegetation is to be staged and occur as quickly as possible after project elements are completed. Revegetation is to be guided by the development of a vegetation management plan, which will provide guidance on: – scheduling to ensure suitable plants are produced in a timely manner for staged replanting – planting design to ensure visual mitigation benefits are maximised – seed collection to ensure plant stock with local provenance is used – an irrigation plan to ensure water is available to achieve reliable establishment of new planting.
	Accommodation camp(s)	The following will be considered during detailed design for the accommodation camp: • use of colours and materials that blend with the existing landscape • arrangement of structures on the site to prevent repetitive or continuous facades, i.e. maximising variation in elevation and aspect of buildings. This will prevent strong reflections from similarly aligned surfaces • vegetation screening to the perimeter of the camp

Mitigation type	Mitigation measures	
Mitigation at receiver	Highly visually impacted receptors	Residual impact assessment has demonstrated that vegetative screening at the receiver would be effective at reducing visibility of the project for most receivers. However, this could only be achieved through agreement with the landowner. As such, it is recommended that receivers with a moderate or high visual impact rating (as identified in the LVIA) will be consulted to more accurately determine existing screening and impacts, and to discuss feasible mitigation measures and whether they could be reasonably implemented on the property to reduce visual impacts. Negotiated mitigation measures may include planting of vegetative screens or architectural modifications or other solution. Mitigation at the receiver for receivers confirmed to have a high visual impact rating will be developed in consultation with affected landowner(s) as part of the Neighbour Agreement Guide process.

9.6 Conclusion

The assessment concluded that the project has a range of low to high levels of impacts on the existing landscape character and visual amenity. Even though the project design, development footprint and placement of the infrastructure has evolved to minimise or avoid visual impacts where possible, the development of the project will result in some changes to the landscape. Visual impacts will likely occur during the construction and operational stages of the project and the visual landscape will be altered from its current state for the duration of the operation of the project.

Construction impacts are generally considered temporary, and therefore are not considered to need any specific, permanent mitigation or screening treatment. Careful site selection of construction related infrastructure will significantly mitigate visual impacts arising from construction activity. The proposed accommodation camp will be in place for up to five years, and mitigation has been recommended for this construction facility to minimise visual impacts.

Operational impacts are long-term and can be permanent in some instances. These impacts are measured using viewpoints from representative locations that have views of the project, as well as individual assessments for near neighbours predicted to have a moderate to high visual impact. Representative viewpoints include key vantage points, recreational areas, National Parks, and the local road network and by selection would have visibility of the project. Individual assessment of sensitive receivers determined that impacts are often reduced compared to the representative viewpoints, due to the presence of terrain and existing vegetation screening. Nighttime lighting during the operation of the project will mainly be emitted from the lower elevation elements and will have a potential impact on a small number of receivers with views of these elements.

Recommendations have been made to mitigate visual impacts. Due to the fixed nature of pumped hydro infrastructure to achieve design and engineering requirements, further re-location of the upper reservoir to avoid visibility is not reasonable or feasible. Mitigation recommendations seek opportunities to mitigate through design and mitigation at the source, where possible. This includes consideration of micro-siting of ancillary infrastructure where possible, material and colour selection, and vegetation clearing, management and re-establishment.

Based on simulated views, it is considered that reasonable and feasible mitigation at the receiver is achievable to minimise impacts. Implementing the suggested mitigation measures reduces the impacts to low or very low in all locations except for SR45, and SR365, which were left with a residual visual impact rating of moderate. Any mitigation at a receiver would be subject to landowner preference and negotiation. Mitigation for receivers confirmed as having a high visual impact rating will be developed in consultation with affected landowner(s) as part of the Neighbour Agreement Guide process.

Chapter

10

Social and economic

Environmental Impact Statement |
Lake Lyell PHES Project

10 Social and economic

This chapter presents a detailed summary of the project's potential social and economic impacts on the surrounding local area and Lithgow region. A detailed Social Impact Assessment (SIA) and Economic Assessment have been prepared and are provided in Appendix O and Appendix P respectively. The relevant SEARs for social and economic matters and where they are addressed by these technical studies are summarised in Appendix A.

10.1 Assessment approach

The SIA was completed in accordance with the *Social Impact Assessment Guideline for State Significant Projects*) (SIA Guideline) and the *Technical Supplement: Social Impact Assessment Guideline for State Significant Projects* (SIA Technical Supplement). It has also been informed by best practice guidance and standards set out by the International Association for Impact Assessment (IAIA) and International Finance Corporation (IFC). The economic assessment was completed using an input-output analysis to identify direct and indirect impacts of the construction and operation of the project on the regional and NSW economy.

Community and stakeholder engagement was carried out to inform the SIA and involved in-depth interviews and attendance at community information sessions. The feedback obtained was analysed along with primary and secondary data obtained during the SIA to identify community values, strengths and vulnerabilities. This was supplemented with the findings of LLP's project engagement activities (refer to Appendix D) where relevant to the SIA.

A Tourism and Recreation Study was conducted to support the SIA (Annexure E of Appendix O). The purpose of the study is to describe the recreational context of the local area and assess how the project may impact existing recreational values and explore opportunities to offset impacts and/or enhance recreational values.

10.2 Existing environment

10.2.1 Economic context

The regional economy for the project is defined as the Lithgow LGA. This is the immediate region where the project is located and has the potential to provide labour and non-labour inputs to and generate economic benefits from.

The Lithgow region accounts for approximately 0.26% of the NSW population. The regional economy shows a lower proportion of the population being in the workforce compared to NSW, reflective of a generally older population (65+). Place of work data for the region indicates the significance of coal mining, State government administration, supermarket and grocery stores, aged care residential services, and hospitals (except psychiatric hospitals) to the regional economy.

The largest exporting industries in the region by value are mining, public administration and safety, utilities (electricity, gas, water and waste services), health care and social assistance, and construction (ABS, 2021). In combination these five industries accounted to approximately 66% of the regional economy (contributing about $877M) and 49% of regional employment.

10.2.2 Social baseline

The assessment of social impacts has considered a study area that includes a rural local area (where the PHES and Lakeside camp would operate), an urban local area (where the alternative Town camp is being considered), and a regional area (aligning to the Lithgow LGA). These areas are shown on Figure 10.1. Key social trends relative to these areas are summarised in Table 10.1. A full social baseline and analysis of all trends is provided in Appendix O and should be referred to for more detailed information.

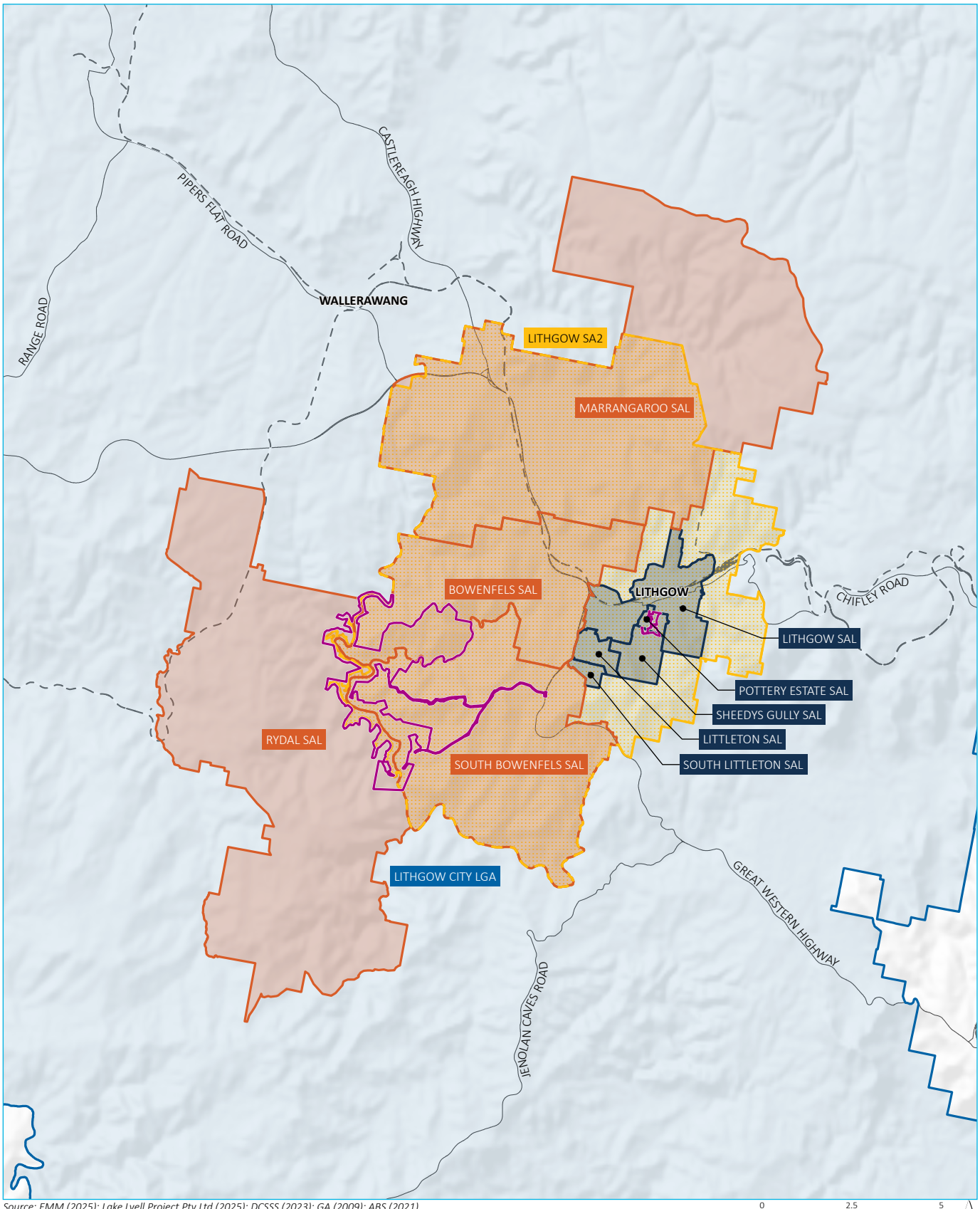
The local area (rural and urban) is made of up the nearby communities most likely to experience direct social impacts from the project, including noise, air emissions, traffic and changes to land use. The rural local area includes the suburbs of Rydal, Bowenfels, and South Bowenfels, and the locality of Marrangaroo. These communities are characterised by strong rural values and community cohesion. The urban local area includes the suburbs of Lithgow, and the localities of Pottery Estate, Sheedys Gully, and Littleton. These communities are characterised by their role in the region's rural urban centre, as well as values associated with the area's industrial heritage and scenic landscapes.

The regional study area is the geographic area most likely to experience fewer direct and more indirect social impacts of the project. Indirect impacts are associated with use of infrastructure, employment, supply chains, roads, transportation of goods, materials and equipment and cumulative impacts.

Table 10.1 Snapshot of key social trends

Social aspect	Rural local area	Urban local area	Regional area	Comments
Population (2016-2021)	3% growth	-4% decline	-1.2% decline	From 2021 to 2041 a 3.6% growth is predicted for the Lithgow LGA (lower than NSW predicted average of 24.3% growth)
Labour force characteristics	6.5% unemployment	6.1% unemployment	5.5% unemployment	NSW average is 4.9% unemployment rate
Industry of employment (top industries)	Coal mining, health care and social assistance, public administration and safety	Coal mining, State government administration, take away food services	Coal mining, health care and social assistance, public administration and safety	Despite a traditional mining focus, economic data indicates the underlying importance of the service industry and health services, a slow shift to tourism and repositioning for the region
Workforce availability (industries relevant to project)	15% growth since 2016	-7.9% decline since 2016	9.5% growth since 2016	Overall there is a limited construction workforce in the local study areas, key urban area, and regional study area
Business- most common types	Accommodation, construction, hospital	Construction, retail trade, real estate	Construction (21% of registered businesses)	There are a number of small scale domestic construction businesses in the study areas
Education	The local and regional area have a slightly lower proportion of Year 10 or higher school qualifications (75-83%) compared to NSW (~90%) and a higher proportion of certificates (~45%) compared to NSW (28.3%) indicative of trades and technical workers as a prominent occupation in the study area			
Housing prices (2019-2025) and availability by postcode	Median prices increased by ~39% Availability of houses has declined since 2011			
Health and wellbeing	Data shows more vulnerable groups (elderly, long term health or disability) within both the local and regional areas compared with the NSW average, and a higher level of social and economic disadvantage.			
Social infrastructure	Limited social infrastructure and community facilities but include childcare centres, community services, fire stations, schools and medical services, with a generally higher representation of these centred around the Lithgow urban area		Numerous social infrastructure and community facilities	The local and regional area rely on cars as modes of transport to access services, due to limited public transport modes

Sources: DPHI population projects (DPHI, 2024); ABS 2021, Census of Population and Housing: General Community Profile



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); GA (2009); ABS (2021)

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KEY

- Project area
- Rural local area
- Urban local area
- Key urban area
- Regional area

Existing environment

- Rail line
- Major road

INSET KEY

- Major road
- NPWS reserve
- State forest

SIA study area – local and regional areas

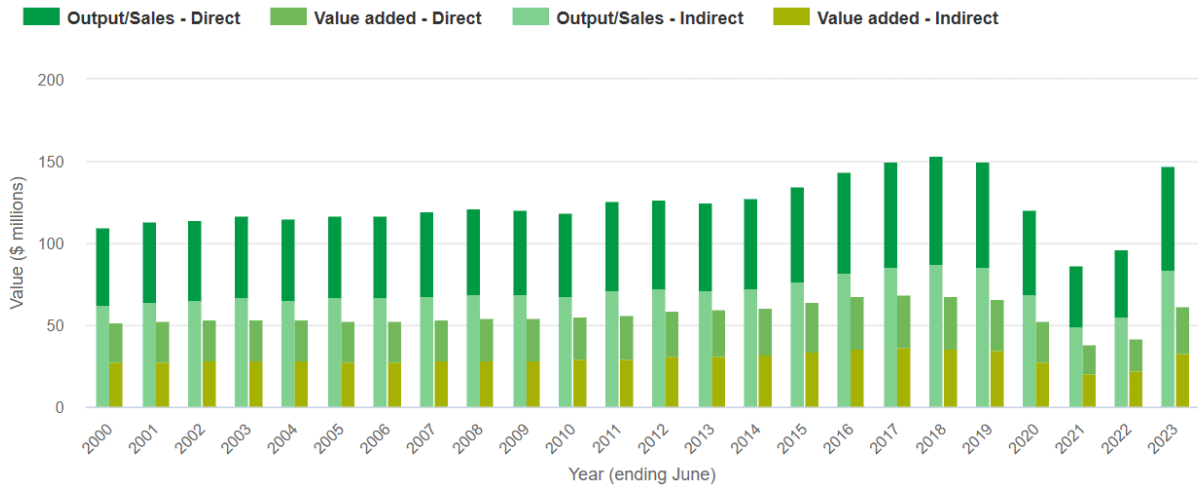
Lake Lyell PHES
Environmental Impact Statement
Figure 10.1

EMM
creating opportunities

10.2.3 Tourism and recreation

Lithgow City Council has visions to expand its tourism market and ultimately improve expenditure and liveability in the region, as supported by relevant strategic plans such as the Lithgow Emerging Economy Project: Shaping the Future of Lithgow (Tourism) 2024 (Lithgow City Council, 2024). Leisure activities are one of the main attractions to the region, as National parks, State forests as well as the various lakes and rivers provide opportunities for outdoor activities.

Figure 10.2 shows the changes in the value of tourism from 2000 to 2023, including direct and indirect value add and output. Apart from a decline during the COVID pandemic, tourism trends indicate overall growth in value. Visitor numbers to Lithgow trends upward, with the majority of visitors travelling to the region for holidays (~50%) or visiting friends and relatives (~25%).

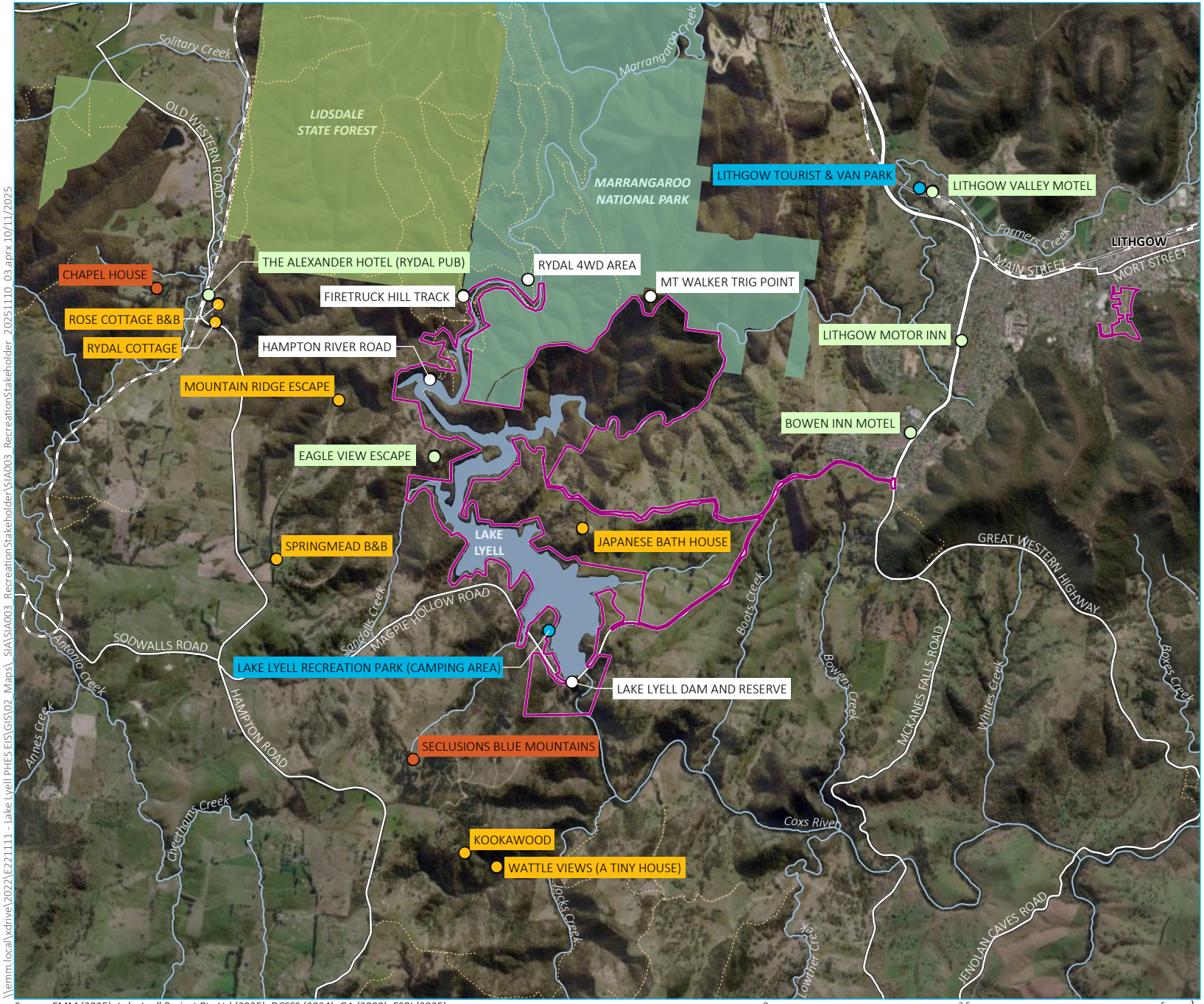


Source: National Institute of Economic Industry Research 2024, compiled by Economy,id (id.community, 2023)

Figure 10.2 Value of tourism, Lithgow City Council 2000-2023

Local tourism and recreation near to and relevant to the project are shown on Figure 10.3 and each asset is discussed in detail in Appendix O (Annexure E of Appendix O). Examples of some of the recreational activities on offer in the region are shown in Figure 10.4.

Lake Lyell is an asset owned by EnergyAustralia with its primary use as the water supply to Mount Piper Power Station, although it also has a secondary use for tourism and recreation opportunities (under Lithgow City Council lease) including camping (Lake Lyell Recreation Park), boating and fishing. Lake Lyell would operate as the lower reservoir for the project. The project is located adjacent to Marrangaroo National Park which provides hiking, camping and 4WD activities as well as access to water-based activities on Lake Lyell and Coxs River. There are also tourism operators surrounding the project that rely on Lake Lyell and adjacent National Parks and State Forests for vistas.



KEY

- Project area
- Point of interest

Nearby accommodation*

- Bed & breakfast/cottage/retreat
- Bed & breakfast/cottage/retreat + wedding venue
- Caravan park/camping ground
- Hotel/motel

Existing environment

- Rail line
- Major road
- 4WD track
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

*locations are approximate, and based on available online data

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); ESRI (2025)

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GDA2020 MGA Zone 56

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Local tourism and recreation stakeholders

Lake Lyell PHES
Environmental Impact Statement
Figure 10.3

EMM
creating opportunities

Camping at Lake Lyell Recreation Park
(source: lakelyellrecreationpark.com.au)

Boat ramp at Lake Lyell Recreation Park
(source: lakelyellrecreationpark.com.au)

Entry of Marrangaroo National Park

Lidsdale State Forest – entry signage showing permitted recreational activities

4wd tracks adjacent to project area

Lake Lyell signage with permitted water-based activities

Figure 10.4 Example of recreational activities of the local area

10.3 Potential impacts

10.3.1 Avoidance and minimisation

Planned avoidance, minimisation and mitigation measures have been considered in the SIA in assessing unmitigated and mitigated impacts. In addition, consideration of accommodation camp options (a preferred Lakeside camp and alternative Town camp) has been assessed and presented to allow meaningful engagement with the community. The Town camp was identified following early feedback from the local community for improved, direct local benefits from the workforce.

The project has been designed to allow continued recreational activities at Lake Lyell throughout construction and operation, therefore minimising disruption to lake users and minimising impacts to recreational values.

10.3.2 Social impact assessment

The assessment of social impacts considers a diverse range of factors and interests including:

- impacts viewed as both negative and positive (benefits) as they relate to different groups of people
- potential impacts and benefits on local communities and the broader region
- effects on vulnerable sectors of affected communities
- community access to services such as housing and health care.

i Community views

The SIA considered targeted engagement as well as broader consultation completed for the project by LLP. A key aspect was feedback from 'near neighbours', who are those community individuals and families most likely to be directly impacted by the project due to their proximity to the project. The views of near neighbours were considered separately, however are also part of the defined local community. These views are outlined in the following section. Full details of near neighbour and community engagement are provided in Appendix D.

a Near neighbour views and impacts

Near neighbours are local residents, tourist and accommodation and other service providers closest to the project that are predicted to experience a majority of direct impacts of the project, compared to the broader community. The views and concerns of near neighbours, as well as mitigative options, are identified through the project's near neighbour engagement program and benefits guide. Key social impacts on near neighbours include, but are not limited to:

- lack of an informed understanding of the project and its impacts leading to frustration and stress, and inability to provide meaningful feedback in the decision-making process
- loss of community cohesion and sense of connection amongst neighbours and community from an influx of workers and from conflicting views of the project, its impacts, and benefits
- change to quality of life and rural lifestyle values due to amenity impacts, primarily visual impacts, noise and dust, including from the lakeside accommodation camp
- reduction in landscape and environmental values affecting personal enjoyment and connection to nature and country
- inhibited access due to increased traffic and road upgrade works

- health and wellbeing effects including risks to mental health from uncertainty and potential for loss of livelihood, amenity and personal agency, and risks to community safety and wellbeing from construction impacts

The above impacts have been considered in rating the extent of impacts presented in the SIA (including the summary in Table 10.2 and Table 10.3). Property specific impacts for near neighbours are currently being discussed with each individual landowner and mitigation measures will be developed through direct resolutions and agreements. This process is outlined in detail in Appendix D.

b Local and regional area views and impacts

The local area includes residents and communities in the suburbs surrounding the project (as indicated by the local area of influence on Figure 10.1), as well as those service providers providing support to this community, such as health services, local businesses, etc.

Key social impacts on the local community include alteration of community composition and character due to the influx of construction workforce and pressure on community cohesion. However, conversely this also provides social and economic benefits through local business opportunities. Social and economic benefits will be also experienced in the regional area, as the source of employment and business opportunities.

c Other community groups

Other community groups considered in the SIA include special interest and environment groups, accommodation and service providers, recreational users and Traditional Owner and Aboriginal community members. Key impacts on these groups include environmental and heritage impacts associated with Mount Walker, Lake Lyell and Farmers Creek.

ii Social impacts and benefits

Social impacts are initially assessed under a worst-case scenario, followed by the residual impact assessment assuming effective implementation of the proposed mitigation or enhancement measures. The terms *unmitigated* and *mitigated* are used to describe negative impacts while *un-enhanced* or *enhanced* apply to positive impacts (benefits).

The full assessment of potential impacts and benefits is provided in Appendix O. A summary of the social impacts and benefits which have an assessed residual significance of medium or higher are presented in Table 10.2 and Table 10.3, respectively. Five mitigated social impacts rated as a high residual risk have been identified for the project. Four social benefits have been identified with a high residual benefit rating. The establishment of a Shared Benefits Program is a key consideration in the opportunity to enhance many of the project benefits in the local community.

Table 10.2 Key social impacts

ID	Category	Impact	Affected communities	Unmitigated significance	Mitigated significance
D01	Decision-making systems	Community dissatisfaction with planning and approval process	Near neighbours	High	Medium
Co01	Community	Alteration of community composition and character due to workforce influx	Local community Business operators – Regional area	Very High	High
Co02	Community	Loss of community cohesion due to distrust and conflicting views on the project	Local and regional community	Very high	Medium
W01	Way of life	Visual impacts of the proposed upper reservoir and supporting infrastructure affecting community sense of place	Local community Accommodation providers Traditional Owners and Aboriginal communities	Very high	High
W03	Way of life	Changes to way of life and rural lifestyle values caused by amenity impacts	Near neighbours Service providers (Accommodation)	High	High
S01	Surroundings	Diminished enjoyment of the natural environment of Mount Walker	Local and Regional community Recreational users	High	Medium
S02	Surroundings	Impact on scenic and environmental values due to construction activities in and around Farmers Creek	Recreational users Special interest and environmental groups Traditional Owners and Aboriginal communities	High	Medium
S04	Surroundings	Concerns regarding plans for site rehabilitation	Regional community	High	Medium
Cu01	Culture	Direct impacts to Aboriginal cultural heritage value, including impacts to heritage items and sites	Traditional Owners and Aboriginal communities	High	High
Cu02	Culture	Landscape changes and changes to access affecting cultural connections to place	Traditional Owners and Aboriginal communities	High	Medium
A03	Access	Altered and reduced public access to Lake Lyell and Mount Walker	Regional community	High	Medium

ID	Category	Impact	Affected communities	Unmitigated significance	Mitigated significance
A20	Access	Increased competition affecting access to rental and short stay accommodation	Regional community Recreational users of Mount Walker and Lake Lyell	High	Medium
HW01	Health and Wellbeing	Mental health of local stakeholders and First Nations people affected by uncertainty and potential for loss of livelihood, amenity, and personal agency	Near neighbours Traditional Owners and Aboriginal communities Local businesses	High	Medium
HW03	Health and wellbeing	Community safety and wellbeing risks due to construction activities and road upgrade works	Regional community Recreational users	High	High
Co03	Community	Alteration of community composition and character due to workforce influx (at the Town Camp)	Near neighbours (Town camp) Regional businesses – Regional area Urban local community, including service users, businesses and shopping centre	High	Medium
W06	Way of Life	Reduced residential amenity associated with changing use of the Town camp land	Near neighbours (Town camp) Local community	High	Medium

Table 10.3 Key social benefits

ID	Category	Impact	Affected communities	Unenhanced significance	Enhanced significance
A04	Access	Continued access to Lake Lyell for recreation during project operation	Regional community Recreational users	High	No change
A07	Access	Improved access, stability and sustainability of the energy network	Energy users connected to the grid	Medium	No change
L04	Livelihoods	Construction employment and training opportunities for residents in the regional area	Regional community	Low	Medium
L05	Livelihoods	Operational employment and training opportunities for residents in the regional area	Regional community	Low	High
L06	Livelihoods	Indigenous employment, training and business opportunities	Traditional Owners and Aboriginal communities	Low	High
L07	Livelihoods	Business opportunities for residents in the regional area	Regional community Local businesses	Low	High
L08	Livelihoods	Workforce influx potentially leading to inflation of local economy (Town camp)	Local community	Low	Medium

iii Workforce accommodation camp(s)

Two accommodation camps are under consideration for the project, with only one option to proceed. While both options will result in changes to local social values, the SIA identifies the key differences in social impacts and benefits between the Town camp and Lakeside camp as follows:

- Lakeside camp impacts and benefits are related to:
  - significant amenity impacts for a small number of local residents and a high number of Lake Lyell recreation users and visitors, with potential for associated impacts to local tourism businesses. The temporary development density is also very different to existing local character
  - benefits to the workforce associated with access to the lake
  - significant changes to local demographic characteristics because of workforce influx, though there would likely be less intersection of the workforce and local community, as there are fewer social opportunities
  - existing vulnerability of the local population, which may be compounded by other project impacts.
- Town camp impacts and benefits are related to:
  - moderate amenity impacts to a larger number of local residents and some visitors to Pottery Estate associated with arts and history interest groups. The development density is more similar to existing local character, but will still be more dense than nearby single dwellings
  - benefits to the workforce and Lithgow businesses associated with access to local shops and services
  - moderate changes to local demographic characteristics because of workforce influx, with more opportunities for social mixing outside of the site.
  - cultural impacts related to the State heritage significance of the site and use of 4 Silcock Street as an arts hub
  - Traffic and road safety risks associated with journey through Lithgow.

10.3.3 Tourism and recreation

Project construction has the potential to impact recreation values, users and businesses from the following activities:

- Construction and occupation of the Lakeside camp – this may negatively affect perceptions of serenity and connection to the environment, and may subsequently impact other nearby accommodation providers that rely on this serenity.
- Increased demand for short-term accommodation – until the accommodation camp is built the project will rely on available accommodation in Lithgow, potentially reducing availability for other users. However, a review of available accommodation suggests there would be sufficient capacity for this short-term duration and may also have a positive effect on local business.
- Increased construction traffic – this may result in perceived safety risks and deter visitation to recreational areas, as well as potentially increase emergency response times.

- Change in amenity (noise, dust, visual) from construction works – Noise, lighting and dust have the potential to negatively affect people's enjoyment and may deter visitation. The clearing of large areas of vegetation will alter the visual landscape that is important to visitors and tourist operators relying on views.

- Loss of biodiversity – changes to terrestrial and aquatic ecology can affect environmental values which attract some visitors to the region.

- Temporary access restrictions –access to Farmers Creek will be restricted during construction and existing restrictions on access to EnergyAustralia property on Mount Walker will be made secure to prevent inadvertent public access.

During operation, the following activities may impact and/or benefit recreation values:

- Increased water level fluctuation –operational water level fluctuations have the potential to affect appeal for recreational users, through either the water's appearance, or changes in water level affecting accessibility of the lake for recreation.

- Rehabilitation and re-use of infrastructure – there is an opportunity to enhance local environmental and recreational spaces through re-use of infrastructure.

- Public access restrictions – the diverted area of Lake Lyell near Farmers Creek and the switchyard jetty will be off limits for recreational use due to operational and safety requirements. While some people currently access EnergyAustralia property on Mount Walker and adjacent to Farmers Creek, this is not currently open to recreation use and would remain so during the project's operation.

- Improved local road network –the project would improve access to Lake Lyell and surrounds through upgrades to Magpie Hollow Road and key intersections.

- New tourism opportunities – tourists may be attracted to the site as an opportunity to see how PHES systems operate, similar to tourism experienced for the larger scale Snowy Hydro scheme.

Mitigation measures and opportunities have been identified to reduce the potential impacts likely to be experienced from the project. The residual impacts of the project on tourism and recreation are generally assessed as low, apart from amenity-related impacts and changed access during construction and operation which are assessed as having medium negative effects. Enhanced benefits are predicted from business opportunities supporting short-term accommodation during construction as well as the long-term opportunity to re-use and re-purpose project infrastructure, such as accommodation camp facilities.

The project has the potential to generate additional opportunities to enhance recreation values for stakeholders and the communities. Opportunities identified through the SIA and in consultation with LLP and other stakeholders include a floating pontoon in the lake, enhancing the existing Lake Lyell Recreation Park, creating or supporting more trails for mountain biking and hiking, re-purposing worker accommodation facilities for social infrastructure, and establishing pumped hydro tourist facilities (such as viewing locations or expo centre). These opportunities are in addition to mitigation measures identified in relevant technical assessments, such as the aquatic ecology assessment which recommends contributions to DPI's fish stocking for recreational users at Lake Lyell.

These additional opportunities (refer Appendix D) can add further value above and beyond the project and would be investigated with relevant partners such as Lithgow City Council, landowners and the local community.

10.3.4 Economic impacts

Based on the input-output economic assessment completed for the project, the average annual impacts on the regional economy and the NSW economy are presented in Table 10.4.

Table 10.4 Annual direct and indirect economic impacts of the project

Economic contribution	Regional economy	NSW economy
Construction phase		
Direct and indirect output	$400M	$566M
Direct and indirect value-added	$166M	$276M
Direct and indirect household income	$72M	$102M
Direct and indirect jobs	658	912
Operation phase		
Direct and indirect output	$290M	$306M
Direct and indirect value-added	$237M	$246M
Direct and indirect household income	$4M	$8M
Direct and indirect jobs	50	72

The impacts of construction of the workforce accommodation camp are included in the economic impacts in Table 10.4, and include economic benefits to the region estimated at up to:

- $12M in annual direct and indirect output
- $4M in annual direct and indirect value-added
- $1M in annual direct and indirect household income
- 17 direct and indirect jobs.

The construction of the project will create demand for regional labour resources and regional inputs to production which may result in some observable regional wages and price increases. However, these impacts will be moderated by the project using an accommodation camp to accommodate a majority of the construction workforce.

The project will provide regional economic activity to a region that has only been experiencing modest growth over time. In particular, it will create a demand in the region for a suitably qualified construction workforce.

It is recommended that the positive local employment and business opportunities can be maximised via:

- employment of regional residents where they have the required skills and experience
- participating, as appropriate, in business groups, events or programs in the regional community
- locally sourcing non-labour inputs to production where local producers can be cost and quality competitive
- establishment of a Community Benefit Fund (or equivalent) with the intention of supporting local non-profit organisations, community programs/events, local businesses, training, and services / infrastructure.

These recommendations have informed the development of the mitigation and management measures presented in Section 10.4.

10.4 Management and mitigation

A range of proposed social and economic impact mitigation and management strategies have been proposed and listed in full at Appendix E and are also further detailed in the SIA (refer to Appendix O). These measures are anticipated to be implemented through an impact, mitigation and monitoring framework that comprises the following:

- Project CSEP – community and stakeholder engagement will provide a key touchpoint for ongoing monitoring of, and identification of efficacy of management measures.

- Near-neighbour agreements – the project has developed a Neighbour Agreement Guide (LLP, 2025) that offers a range of targeted resolutions to address issues associated with the project's social impacts on nearby landowners that will be significantly impacted by the project. LLP has been engaging with near neighbours since mid-2023 and will continue to so in line with the Neighbour Agreement Guide and develop acceptable agreements on an individual basis.

- Community Benefits Sharing Program – a co-designed community benefit sharing program will be implemented for the project. Stakeholders involved in designing the plan should include a representative sample of members from Lithgow City Council, local residents and businesses, and local and regional community organisations and interest groups. Key objectives for the program will include (but not be limited to) accessibility to funding grants, delivery of direct benefits to those most impacted by the project, including Traditional Owners, local residences and tourism, providing legacy benefits from re-purposing of infrastructure, and exploring opportunities to offset and/or enhance recreational values.

- Workforce management plan – the project will prepare a workforce management plan that documents the required worker support services, expectations for worker behaviour, sets targets for recruitment of local and regional workers, and provide for long term skills partnerships and upskilling opportunities with schools and tertiary institutions. The plan will also provide a workforce accommodation strategy to secure worker accommodation that enhances project benefits for local accommodation suppliers, without negatively influencing capacity available to tourists and visitors.

- Procurement strategy – the project will develop a procurement strategy. The strategy will be prepared in consultation with Lithgow City Council and local and regional businesses. It will identify targets for local and regional suppliers and align with the Workforce Management Plan to support trades traineeships with existing local businesses.

- Industry and Aboriginal Participation Plan (IAPP) – the project will prepare an IAPP that is aligned with the Procurement Strategy and Workforce Management Plan, and in consultation with Traditional Owners and Aboriginal stakeholders. The plan will confirm the project's commitments for increasing employment and income opportunities for Aboriginal peoples and communities in the construction and operation of the project.

Public access to Lake Lyell and Mount Walker for recreation will be maintained throughout construction and operation of the project. However, there will be certain measures needing to be implemented to ensure site safety and public safety, during construction and operation. Appropriate signage and notification for any changes to access will be provided to the community during construction, and new hazard signs will be installed indicating the lake is subject to changing water levels during operation.

10.5 Conclusion

The social and economic assessment for the project identified both negative and beneficial impacts from construction and operation of the project. The assessment considered the rating of these impacts both with and without mitigation measures to inform the likely residual impacts. The most significant residual negative impacts are associated with community impacts and change of the local area, in particular changes to scenic, cultural and environmental values and amenity. The influx of workers and impacts on local accommodation and businesses is also a key concern. The most significant benefits of the project identified in the SIA are associated with employment and business opportunities.

A social impact, mitigation and monitoring framework is proposed to further mitigate residual social and economic impacts of the project. The relevant plans and programs proposed under this framework will involve consultation and engagement with key stakeholders, including Lithgow City Council, local residents and businesses.

A tourism and recreation study was also conducted as part of the SIA to better understand the existing recreational assets and values in the local area that may be impacted or benefited by the project. The study found that recreation stakeholders are concerned about the perceived loss of access to Lake Lyell and surrounding areas for recreational purposes however also identified a suite of opportunities to offset and/or enhance recreational values.

A Community Benefits Sharing Program is also proposed for the project, which includes further opportunities to mitigate and/or offset social and economic impacts.

Chapter

11

Traffic

Environmental Impact Statement |
Lake Lyell PHES Project

11 Traffic

This chapter presents a summary of potential traffic impacts of the project. A detailed Traffic Impact Assessment (TIA) is provided in Appendix Q. The TIA was prepared in accordance with the relevant assessment requirements, guidelines and policies and provides recommendations for appropriate management and mitigation measures.

The relevant SEARs for traffic and where they are addressed in the TIA are summarised in Appendix A.

11.1 Assessment approach

The assessment focuses on construction phase impacts, as operational and decommissioning traffic volumes would be minimal and are not expected to impact the existing road network. The methodology for the assessment involved the following in accordance with the relevant guidelines:

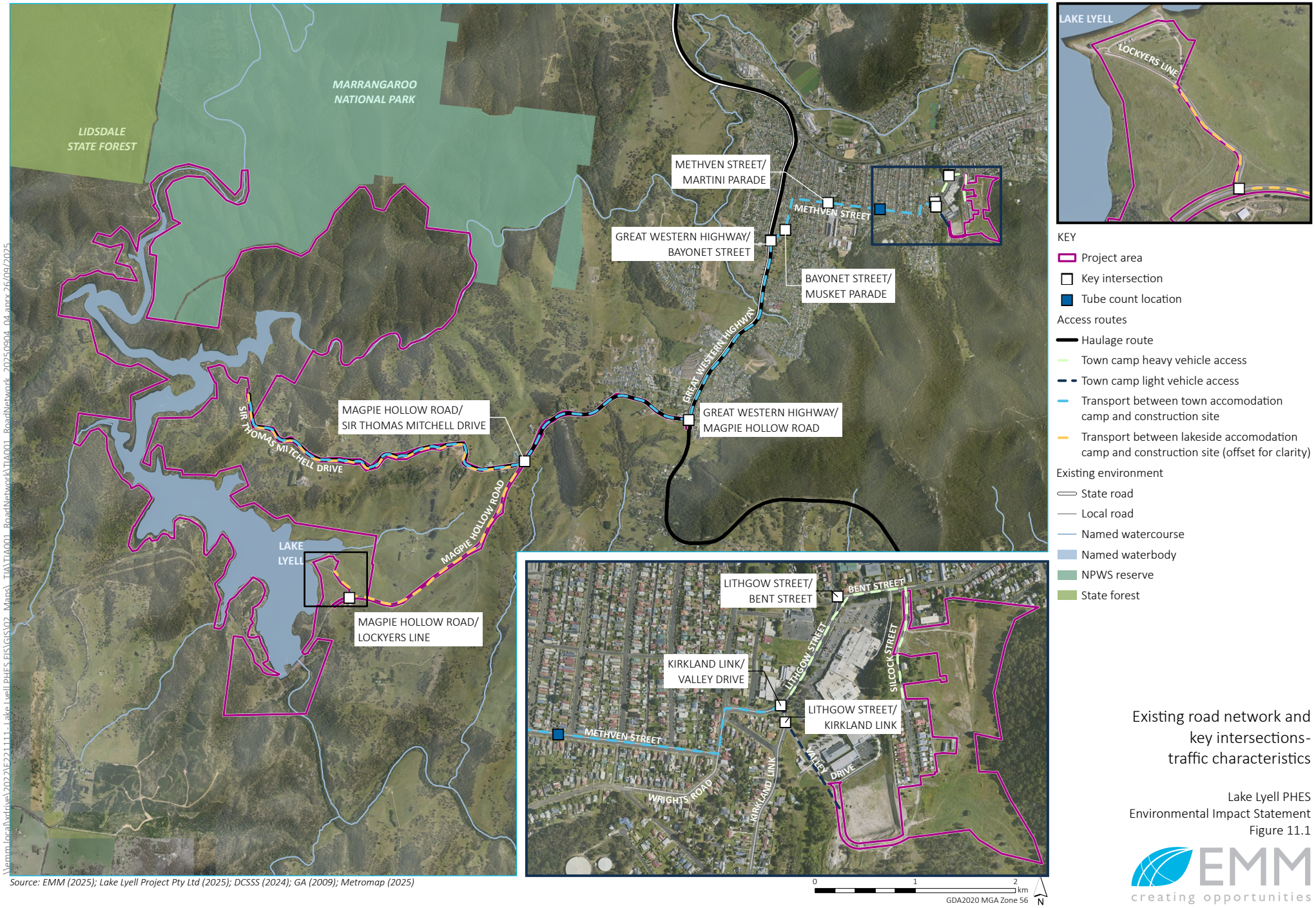
- determining the project's likely traffic generation (volumes and scheduling) associated with the construction phase (including transport/movement of excavated materials)
- determining the adequacy of the local road network to accommodate the project's predicted traffic volume
- considering the availability / adequacy of onsite parking for site personnel
- assessing the potential impacts with construction traffic for the project, including:
    - an assessment of the existing road network in terms of its safety and capacity
    - an assessment of the vehicular accessibility to the nominated construction sites
    - an assessment of heavy vehicle accessibility to the sites and travel routes
    - identifying the likely road upgrade requirements
    - identifying other traffic management measures that would be required as part of this project.

The TIA has relied on design inputs and estimates for traffic generation and likely vehicle fleets, and preliminary designs for road upgrades. Where there is uncertainty in these inputs, a 'worst case' scenario has been adopted to provide a conservative assessment of potential impacts. These assumptions are documented in the TIA and referenced as needed in the assessment of impacts presented in Section 11.3.

11.2 Existing environment

11.2.1 Road network and traffic characteristics

Key roads and intersections used by the project are shown in Figure 11.1.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); Metromap (2025)

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Existing road network and key intersections - traffic characteristics

Lake Lyell PHES
Environmental Impact Statement
Figure 11.1

EMM
creating opportunities

11.2.2 Intersection capacity and performance

The existing traffic volumes (scaled to 2030) and Level of Service (LOS) for each intersection is provided in Table 11.1 for the project with the preferred lakeside accommodation camp and in Table 11.2 for the alternative town accommodation camp. The LOS is a good indicator of overall performance for individual intersections with LOS A being good operation and LOS F unsatisfactory.

Table 11.1 Existing traffic volumes at key intersections and LOS – with preferred lakeside camp

Intersection	AM Peak (Wednesday)		PM Peak (Wednesday)	
	Volume	LOS	Volume	LOS
Great Western Highway/Magpie Hollow Road	954	C	1,082	C
Magpie Hollow Road/Sir Thomas Mitchell Drive	64	A	83	A

Traffic data has not been collected for the Magpie Hollow Road/Lockyers Line intersection as it is adjacent to the Magpie Hollow Road / Sir Thomas Mitchell Drive intersection, with no other intersections in between. Therefore, traffic data from the Magpie Hollow Road/Sir Thomas Mitchell Drive intersection, along with on-site observations, has been used to estimate the existing volumes for this intersection.

Table 11.2 Existing traffic volumes at key intersections and LOS – with alternative town camp

Intersection	AM Peak (Wednesday)		PM Peak (Wednesday)	
	Volume	LOS	Volume	LOS
Great Western Highway/Bayonet Street	1,314	C	1,517	C
Bayonet Street/Musket Parade	400	A	544	A
Martini Parade/Methven Street	888	B	941	A
Lithgow Street/Kirkland Link	993	B	1,220	B
Kirkland Link/Valley Drive	134	A	381	A
Lithgow Street/Bent Street	952	A	1,021	A

11.2.3 Road safety and crash history

Sight line issues have been identified at the following locations:

- Southbound traffic on Great Western Highway at the Great Western Highway / Magpie Hollow Road intersection (looking left from Magpie Hollow Road to Great Western Highway).
- North-east and south-westbound traffic on Magpie Hollow Road at the Great Western Highway / Sir Thomas Mitchell Drive intersection.
- Eastbound traffic on Magpie Hollow Road at the Magpie Hollow Road / Lockyers Line intersection.

Crash data from the Transport for NSW (TfNSW) Centre for Road Safety interactive history database between 2019 and 2023 was reviewed for the proposed haulage route on Sir Thomas Mitchell Drive, Magpie Hollow Road, and in Lithgow along the route from the alterative town camp. The crash history data showed that there were 21 recorded crashes on the transport route during this period. The crash history comprised one fatality, seven resulting in serious injury, 16 resulting in moderate injury, 14 non-casualty incidents and one minor/other injury.

The majority of crashes involved a vehicle running off the road. T-bone type crashes also occurred on three occasions, generally at intersections along the Great Western Highway. Speeding was involved in five crashes while fatigue was involved in seven crashes.

There were no crashes at the three key intersections for the project with the preferred Lakeside camp. However, several crashes occurred along the route between the construction site and the alternative town camp location, including one fatal incident near the Valley Plaza access on Lithgow Street. These crashes would potentially require further investigation should the accommodation camp be established in town.

11.2.4 Public transport

Lithgow Railway Station is located approximately 10.5 km north-east from the main construction site access.

There are two public bus routes near the project area that travel along the Great Western Highway. There is also a school bus service on Magpie Hollow Road that runs both morning and afternoon routes via the proposed haulage route. Additional public and private bus routes utilise the proposed transport routes associated with the alternative Town camp.

Bicycle and pedestrian facilities are limited in the vicinity of the project.

11.2.5 Recreational facilities

A tourism and recreation impact study was undertaken as part of the Social Impact Assessment (refer Appendix O of the EIS), which identified key recreational facilities with potential to be impacted by the project. A Japanese Bath House is located approximately 1 km south of the main construction site access. Lake Lyell Recreation Park is located west of Lilyvale Dam; however they also operate a campground located on Lockyers Line, which is adjacent to the proposed accommodation camp. Recreational four-wheel driving occurs throughout surrounding National parks and forests, including Marrangaroo National Park to the north of the project.

11.3 Predicted construction impacts – with preferred lake side camp

11.3.1 Assessment scenarios

The Great Western Highway to the east is an approved B-double heavy vehicle route (up to 19 m in length, over 50 t). Haulage for the project will either come from the north/west (from Lithgow direction) or the south/east (from Penrith/Sydney direction) along the Great Western Highway. To assess worst-case conditions, the following scenarios have been considered in the assessment:

- 100% of construction delivery and material transport, and 75% of local workers arrive from the Blue Mountains and Sydney, 25% of local workers from Lithgow
- 100% of construction deliveries and material transport, and 75% of local workers arrive from Lithgow, 25% of local workers from the Blue Mountains and Sydney.

Each of the above scenarios has been assessed for the project with both the preferred Lakeside camp and the alternative Town camp, resulting in the four project impact assessment scenarios outlined in Table 11.3.

Table 11.3 Assessment scenarios

Scenario	Background traffic	Most project traffic to/from Penrith/Sydney	Most project traffic to/from Lithgow	Preferred lakeside camp	Alternative town camp
2025 baseline	✓ (2025)	✗	✗	✗	✗
2030 baseline	✓ (2030)	✗	✗	✗	✗
2030 scenario 1	✓ (2030)	✓	✗	✓	✗
2030 scenario 2	✓ (2030)	✗	✓	✓	✗
2030 scenario 3	✓ (2030)	✓	✗	✗	✓
2030 scenario 4	✓ (2030)	✗	✓	✗	✓

11.3.2 Impacts on road capacity and intersection performance

Traffic generation will peak during construction and is expected to be negligible during operation and decommissioning:

- daily traffic generation during peak construction:
  - construction site – 766 light vehicle movements, 274 heavy vehicle movements, and 104 shuttle bus movements, for a total of 1,144 vehicle movements
  - accommodation camp (Lakeside or Town camp option) – 390 light vehicle movements, 110 heavy vehicle movements, and 104 shuttle bus movements, for a total of 604 vehicle movements
- weekday AM and PM peak hour traffic generation:
  - construction site – 383 light vehicle movements, 58 heavy vehicle movements, and 52 shuttle bus movements, for a total of 493 vehicle movements during each peak hour
  - accommodation camp (Lakeside or Town camp option) – 182 light vehicle movements, 42 heavy vehicle movements, and 52 shuttle bus movements, for a total of 276 vehicle movements during each peak hour.

The outcomes of the SIDRA intersection modelling and LOS for each key intersection is provided in Table 11.4.

Table 11.4 Predicted intersection performance –preferred lakeside camp

Intersection	AM Peak (Wednesday) LOS			PM Peak (Wednesday) LOS		
	Baseline	Scenario 1	Scenario 2	Baseline	Scenario 1	Scenario 2
Great Western Highway / Magpie Hollow Road	C	B	B	C	B	B
Magpie Hollow Road / Sir Thomas Mitchell Drive	A	A	A	A	A	A
Magpie Hollow Road / Lockyers Line	A	A	A	A	A	A

Note: There are six levels of service – LoS A to C are good to satisfactory, D is nearing capacity, E is at capacity and F is unsatisfactory.

With construction traffic, Magpie Hollow Road / Sir Thomas Mitchell Drive and Magpie Hollow Road / Lockyers Line will continue to perform at LOS A under all scenarios. The proposed signalisation of the Great Western Highway / Magpie Hollow Road intersection will improve to LOS B during construction.

11.3.3 Impacts at intersections and road safety

Intersection operations are assessed from a combination of the peak hourly through and turning traffic movements that occur at each intersection. The following intersection upgrades are required to facilitate construction traffic movements to and from the development footprint:

- A basic left turn (BAL) treatment will be required on the south approach of the Magpie Hollow Road / Sir Thomas Mitchell Drive intersection and a full-length channelised right turn (CHR(s)) treatment will be required on the north approach of the Magpie Hollow Road / Sir Thomas Mitchell Drive intersection.
- A Channelised Short Right Turn (CHR(S)) treatment will be required for right-turning southbound vehicle at the Magpie Hollow Road / Lockyers Line intersection.

Further to the above, there are existing sight line issues and as such the following is required to improve safety along the haulage route in accordance with *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (Austroads 2023):

- Signalisation at Great Western Highway / Magpie Hollow Road intersection.
- Realignment of Magpie Hollow Road / Sir Thomas Mitchell Drive intersection.
- Truck warning signage as well as intersection warning signage along Magpie Hollow Road to the east and west of the Magpie Hollow Road / Lockyers Line intersection.

Concept designs have been developed for the intersection upgrades and provided in Appendix Q.

11.3.4 Impacts to road pavement

Road width design standards for sealed rural roads are defined by the Austroads Guide to Road Design Part 3: Geometric Design (Austroads 2023). Austroads design standards are not met for the majority of the roads along the haulage route. The following road upgrades are required along the haulage route to accommodate construction traffic:

- Magpie Hollow Road between Great Western Highway and Lockyers Line will be upgraded to a 9 m-wide sealed road to accommodate the additional construction traffic volumes.
- The sealed and unsealed sections of Sir Thomas Mitchell Drive between Magpie Hollow Road and the main construction access will be upgraded to a 9-m-wide sealed road to accommodate the additional construction traffic volumes.
- The sealed and unsealed sections of Lockyers Line between Magpie Hollow Road and the accommodation village access will be upgraded to a 7-m wide sealed road to accommodate the additional construction traffic volumes (mostly shuttle bus movements).

11.3.5 Impacts of oversize and/or overmass vehicles

The Great Western Highway to the east is part of the NSW oversize and/or overmass (OSOM) load carrying vehicles network, and is approved with conditions.

An OSOM route study (ARES Project Services, 2024) was prepared for the project. Two potential OSOM haulage routes have been identified for the project (refer to Figure 11.2). The largest OSOM vehicle for movements along Sir Thomas Mitchell Drive is a prime mover (approximately 57 m long, 4.2 m high). The largest OSOM vehicle for movements along Magpie Hollow Road to Lockyers Line is a prime mover (approximately 33 m long, 5.8 m high).

Route 1 utilises the Sydney motorways and then the Great Western Highway through the Blue Mountains. This is the shortest route and will require very few road modifications; however, will likely require further assessment and approval from TfNSW. Route 2 takes a longer route using the Hume Highway and Mid Western Highway to avoid the Blue Mountains; however, goes through the centre of a few regional towns and requires more road modifications.

Permits would be required to be sought from NHVR in consultation with Lithgow City Council to allow OSOM vehicle access on Sir Thomas Mitchell Drive, Magpie Hollow Road and Lockyers Line.

Further details on the OSOM haulage routes are detailed in the TIA (refer to Appendix Q).

Figure 11.2 Proposed OSOM routes

11.3.6 Impact on public transport, school buses, cyclists and pedestrians

As there are no public transport facilities and limited cyclists or pedestrian facilities in the vicinity of the site, no impacts to existing services or facilities are predicted.

Truck drivers will be notified about the presence and timing of school buses travelling along Magpie Hollow Road. This will be incorporated in the Drivers Code of Conduct.

11.3.7 Impacts on parking

Sufficient parking is expected to be provided on site for the people that will be driving to the site, as most of the project's workforce will be travelling via shuttle buses from the accommodation camp. Therefore, there will not be any parking impacts to the road network.

11.4 Predicted construction impacts – with alternative Town camp

11.4.1 Impacts on road capacity and intersection performance

Traffic generation is the same as for the project with the preferred lake side camp (refer to Section 11.3.1), however the location of the alternative Town camp changes the route for accommodation camp traffic and introduces additional intersections requiring consideration. The outcomes of the SIDRA intersection modelling and LOS for each key intersection is provided in Table 11.5.

Table 11.5 Predicted intersection performance – alternative town camp

Intersection	AM Peak (Wednesday) LOS			PM Peak (Wednesday) LOS		
	Baseline	Scenario 3	Scenario 4	Baseline	Scenario 3	Scenario 4
Great Western Highway/Magpie Hollow Road	C	C	C	C	B	B
Magpie Hollow Road/Sir Thomas Mitchell Drive	A	A	A	A	A	A
Great Western Highway/Bayonet Street	C	C	C	C	C	C
Bayonet Street/Musket Parade	A	A	A	A	A	A
Martini Parade/Methven Street	B	B	B	A	B	B
Lithgow Street/Kirkland Link	B	C	C	B	F	F
Kirkland Link/Valley Drive	A	A	A	A	A	A
Lithgow Street/Bent Street	A	B	B	A	A	A

Note: There are six levels of service – LoS A to C are good to satisfactory, D is nearing capacity, E is at capacity and F is unsatisfactory.

With construction traffic, Magpie Hollow Road / Sir Thomas Mitchell Drive, Bayonet Street / Musket Parade, Great Western Highway/Bayonet Street, and Kirkland Link / Valley Drive will continue to perform at existing LOS. The proposed signalisation of the Great Western Highway / Magpie Hollow Road intersection will maintain a LOS C during the AM pear and improve to LOS B for the PM peak during construction.

However, for the Lithgow Street / Kirkland Link intersection, project traffic cannot be accommodated under current give-way control due to excessive delay and queuing. Vehicles from Valley Drive experience insufficient gaps to turn right onto Lithgow Street during the PM peak period represented by LOS F, considering both project and cumulative traffic impacts. Should the alternative town camp proceed, this issue may require the introduction of signals at this intersection. The intersection performance under signal control improves to a LOS A.

11.4.2 Impacts at intersections and road safety

The following intersection upgrades are required to facilitate construction traffic movements to and from the development footprint:

- As for the project with the preferred Lakeside camp, a basic left turn (BAL) treatment will be required on the south approach of the Magpie Hollow Road / Sir Thomas Mitchell Drive intersection. A BAL treatment will be required on the north approach of the Magpie Hollow Road / Sir Thomas Mitchell Drive intersection.

11.4.3 Impacts to road pavement

As for the project with the preferred Lakeside camp, upgrades to a 9 m-wide sealed road to accommodate the additional construction traffic volumes would be required for Magpie Hollow Road between Great Western Highway and Sir Thomas Mitchell Drive. However, upgrades to Magpie Hollow Road from Sir Thomas Mitchell Drive to Lockyers Line would not be required.

11.5 Predicted cumulative impacts

No other major works or projects have been identified in the locality that coincide with the construction phase timeframe; as such, no cumulative traffic impact assessment is required for the project with the preferred Lakeside camp.

For the alternative Town camp, a Bunnings small-format store is proposed on Valley Drive and as such there are potential cumulative traffic impacts in the area associated with operation of the Bunnings. These impacts were considered, with cumulative impacts similar to those described in Section 11.4.

11.6 Management and mitigation

Project-related traffic impacts are expected to be suitably managed with the implementation of management and mitigation measures, which would be documented in a detailed construction traffic management plan (CTMP) as part of the CEMP. The detailed CTMP will be prepared prior to commencement of works and in consultation with the relevant authorities and the nominated construction contractor. An outline of the draft construction traffic management plan is provided in Appendix Q and includes:

- road upgrades to cater to expected construction volumes
- appropriate traffic control measures and/or upgrades for narrow sections of Sir Thomas Mitchell Drive
- measures to improve sight lines and intersection upgrades to facilitate construction traffic movements to and from the development footprint
- communications with local schools about the presence of additional trucks in the area
- a Driver's Code of Conduct to address all relevant site and locality road safety and traffic management measures
- a road maintenance strategy to maintain the local roads during construction in consultation with Lithgow City Council
- a complaint management process.

Detailed safeguards and mitigation measures are provided in the TIA (Appendix Q) and Appendix E.

11.7 Conclusion

The traffic impact assessment has considered the potential impacts of the project's construction on road capacity, intersection performance, haulage routes, road safety, road pavements, public transport, school buses, cyclists, pedestrians and parking.

During construction, under the preferred Lakeside camp project scenarios the LOS will remain as per the baseline scenario or improve due to a proposed signalisation of the Great Western Highway / Magpie Hollow Road intersection. The assessment identifies intersection upgrades and road pavement improvements required to improve sight lines and comply with relevant standards, to be implemented by the project.

To mitigate the impacts of the project on local school bus operation, truck drivers will be notified about the presence of school buses on Magpie Hollow Road as part of a Driver's Code of Conduct. A CTMP will be prepared to minimise risks to the safety of all workers and road users within the vicinity of the development footprint.

Overall traffic impacts of the project are expected to be manageable with the implementation of the required road and intersection upgrades, suitable management and mitigation measures.

Chapter

12

Noise and vibration

Environmental Impact Statement |
Lake Lyell PHES Project

12 Noise and vibration

This chapter presents a summary of potential noise and vibration impacts of the project. A detailed Noise and Vibration Impact Assessment (NVIA) is provided in Appendix R. The NVIA was prepared in accordance with the relevant assessment requirements, guidelines and policies and provides recommendations for appropriate management and mitigation measures.

The relevant SEARs for noise and vibration and where they are addressed in the NVIA are summarised in Appendix A.

12.1 Assessment approach

The noise and vibration assessment considers both construction and operational phase impacts, including noise from traffic generated by the project (road noise). The methodology for the assessment involved the following in accordance with the relevant guidelines:

- establishing the relevant assessment criteria and thresholds for the project in accordance with the Interim Construction Noise Guideline (ICNG) (DECC, 2009), Noise Policy for Industry (RPfI) (EPA, 2017) and Road Noise Policy (DECCW, 2011)
- quantitative modelling and assessment of construction noise using RTA Technology's Environmental Noise Model (ENM). The modelling required inputs such as ground contours of the project and surrounding area, construction hours and scheduling of activities, location and type of noise generating activities within the project, and noise enhancing meteorological conditions
- reviewing construction methodologies and determining recommended safe working distances to assess blasting and vibration impacts
- predicting road traffic noise based on vehicle movements generated by the project
- predicting operational noise based on required operational plant and equipment for the project
- recommending reasonable and feasible mitigation and management measures to reduce noise impacts.

The NVIA has relied on design inputs for determining plant and equipment specifications and construction scenarios. Where there is uncertainty in these inputs, a 'worst case' scenario has been adopted to provide a conservative assessment of potential impacts. These assumptions are documented in the NVIA and referenced as needed in the assessment of impacts presented in Section 12.3.

12.2 Existing environment

Sensitive receivers, which have the potential to be affected by noise from the project, including road traffic noise, are rural or suburban residential dwellings in the areas of South Bowenfels, Rydal and Lithgow. The closest residence is located approximately 250 m south-east of the southern access road. There are also passive recreation areas surrounding the project such as the Mount Walker Trig Point, Marrangaroo Campground (within Marrangaroo National Park), Hampton River Road Campground and Lake Lyell Recreational Park. Assessment locations identified for the noise assessment are shown in Figure 12.1.

Given the nature of the project area and its surrounds, existing ambient noise levels at assessment locations in proximity to the main works construction are likely to be dominated by rural noise sources and natural elements, with intermittent road traffic noise. It is expected that the rural residential areas in the vicinity of the project would be below the *Noise Policy for Industry* (EPA 2017) (NPfI) minimum background noise levels. As such, the NPfI minimum background noise levels have been applied for the purposes of the NVIA (refer to Appendix R). This is a conservative assumption, leading to the most stringent noise criteria available being applied to these rural residential receivers.

Existing ambient noise levels for the alternative town accommodation camp are characterised by urban and commercial development, including road traffic noise. Background levels for the Town camp have relied on monitoring conducted on Silcock Street as part of a separate development application (Acoustic Dynamics, 2022) (refer to Appendix R), as it provides relevant locational background noise results.

Table 12.1 Summary of adopted and/or measured rating background levels

Monitoring location	Time of day[1]	Rating background level (RBL) dB(A)[2]	Ambient $L_{Aeq, period}$ noise level, dB(A)
All residential assessment locations (representative for Lake Lyell and Lakeside Camp)	Day	35	-
	Evening	30	-
	Night	30	-
Silcock Street, Lithgow (representative for Town Camp)[3]	Day	35	49
	Evening	37	52
	Night	32	47

Notes:

1. Day: 7:00 am to 6:00 pm Monday to Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 7:00 am Monday to Saturday; 10:00 pm to 8:00 am Sundays and public holidays.
2. The RBL is an NPfI term and is used to represent the background noise level.
3. The noise monitoring was conducted at 27 Silcock Street, Lithgow between Saturday 12 March 2022 and Friday 25 March 2022 (Acoustic Dynamics, 2022)

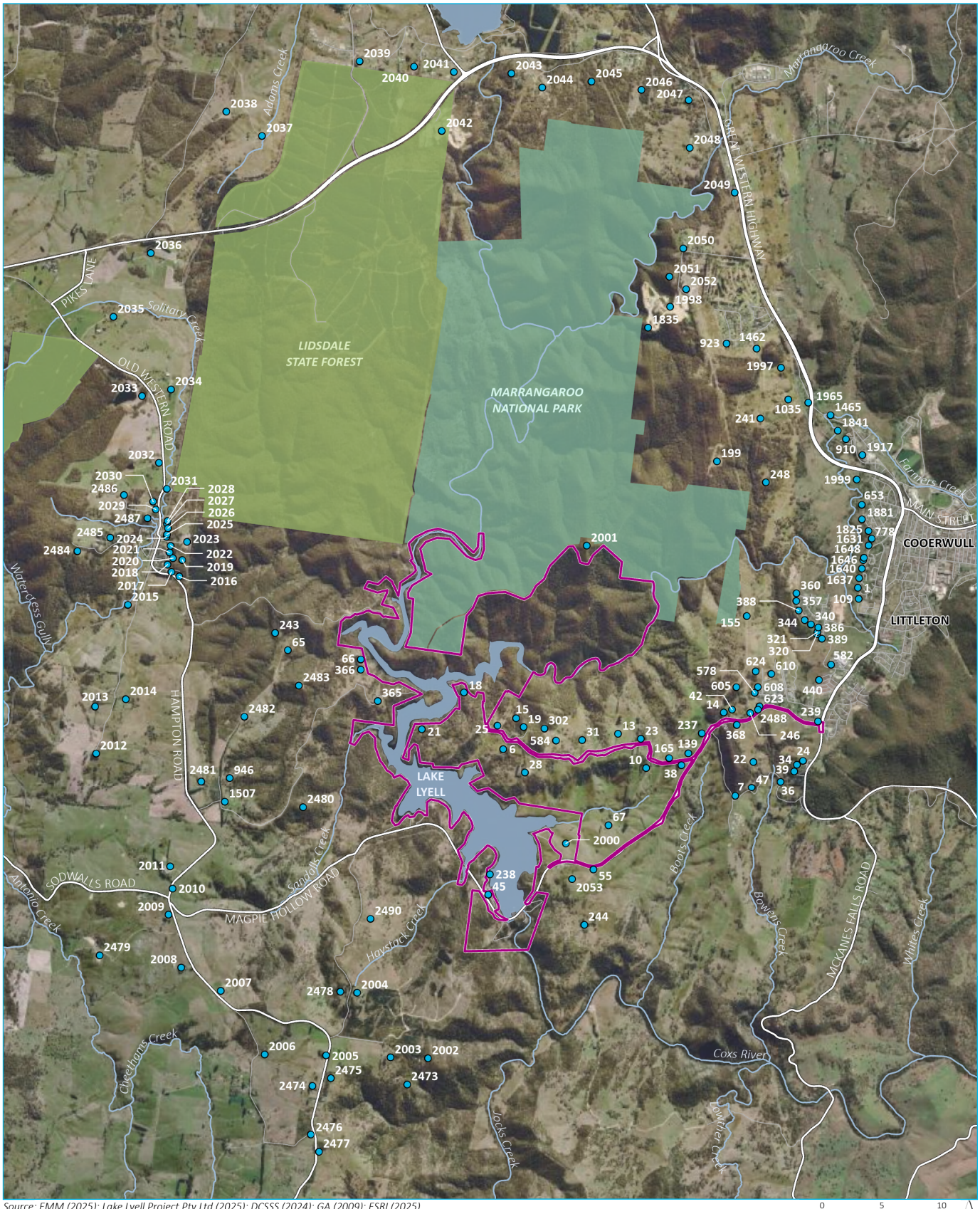
Similarly, background levels for urban receivers near the Great Western Highway have relied on monitoring conducted at Robinia Drive, South Bowenfels as part of a separate project (SLR, 2021) (refer to Table 12.2), as it provides relevant locational background noise results.

Table 12.2 Summary of measured rating background levels – South Bowenfels

Monitoring location	Period[1]	RBL[2], dB(A)	Ambient $L_{Aeq,period}$ noise level, dB(A)
15 Robinia Drive, South Bowenfels	Day	42	52
	Evening	33	47
	Night	30[3]	44

Notes:

1. Day: 7:00 am to 6:00 pm Monday to Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 7:00 am Monday to Saturday; 10:00 pm to 8:00 am Sundays and public holidays.
2. The RBL is an NPfI term and is used to represent the background noise level.
3. The monitored level was adjusted to match the minimum background level in the Noise Policy for Industry.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); ESRI (2025)

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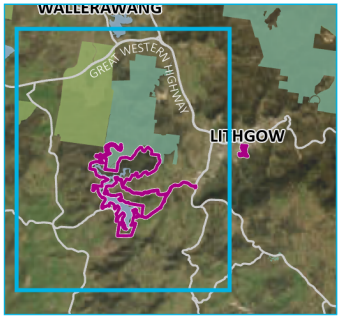

KEY

- Project area
- Assessment location

Existing environment

- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Noise assessment locations

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Environmental Impact Statement
Figure 12.1

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12.3 Predicted construction impacts

12.3.1 Construction noise

Estimated noise levels at each assessment point were predicted by reviewing the proposed construction schedule and identifying the period of potential worst-case construction noise. Estimated noise levels were then compared with Noise Management Levels (NMLs), identified in line with the EPA's Interim Construction Noise Guideline (ICNG, 2009) to understand which receivers might be the most affected.

The assessment approach adopted considered a "worst-case" scenario which assumed all plant and equipment operating simultaneously. This approach is conservative with the assumed level of activity unlikely to occur in practice, and actual construction noise levels would be lower than predicted in this assessment.

i Main construction

The results of the construction noise assessment are shown in Figure 12.2.

During standard construction hours, construction noise levels from the project are predicted to be above the NMLs at 12 assessment locations. Noise levels are not predicted to exceed the highly noise affected noise level of $L_{Aeq,15minute}$ 75 dB at any assessment location.

Outside of standard construction hours, construction noise levels are predicted to be above the relevant NMLs at 27 locations during the day out of hours period, seven locations during the evening period, nine locations during the night-time period and 75 locations during the morning shoulder period.

Further detail on construction noise levels at individual assessment locations is provided in the NVIA (refer to Appendix R). The magnitude of predicted main construction noise impacts from the project area (including construction noise associated with the Lakeside camp) has been summarised in Table 12.3.

Table 12.3 Magnitude of predicted construction noise impacts – Main construction

Period[1]	Noticeable (0-10 dB above RBL)	Clearly audible (10-20 dB above RBL)	Moderately Intrusive (20-30 dB above RBL)	Highly Intrusive (>30 dB above RBL)
Day & Day OOH	40	13 (6, 13, 19, 21, 23, 28, 45, 55, 66, 67, 238, 365, 366)	4 (15, 18, 25, 302)	Nil
Evening	15	4 (19, 21, 302, 365)	3 (15, 18, 25)	Nil
Night	15	5 (19, 21, 66, 365, 366)	4 (15, 18, 25, 302)	Nil
Morning Shoulder	66	36 (28, 31, 38, 45, 55, 65, 108, 129, 139, 155, 165, 237, 238, 243, 244, 246, 584, 586, 587, 594, 595, 605, 606, 607, 623, 946, 1507, 2001, 2004, 2019, 2023, 2480, 2482, 2483, 2488, 2490)	8 (6, 13, 19, 21, 23, 66, 365, 366)	4 (15, 18, 25, 302)

Notes: 1. Day: 7:00 am to 6:00 pm Monday to Friday, 7:00 am to 1:00 pm Saturday; Day OOH: 1:00 pm to 6:00 pm Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 7:00 am Monday to Saturday; 10:00 pm to 8:00 am Sundays and public holidays; Morning Shoulder: 6:00 am to 7:00 am Monday to Saturday; 6:00 am to 8:00 am Sundays and public holidays

ii Early works construction

During ICNG standard construction hours, early works construction noise levels are predicted to be above the relevant NMLs at 49 locations. Noise levels are not predicted to exceed the highly noise affected noise level of $L_{Aeq,15minute}$ 75 dB at any assessment location.

Outside of standard construction hours, early works construction noise levels are predicted to be above the relevant NMLs at 61 locations during the day out of hours period, seven locations during the evening period and eight locations during the night-time period.

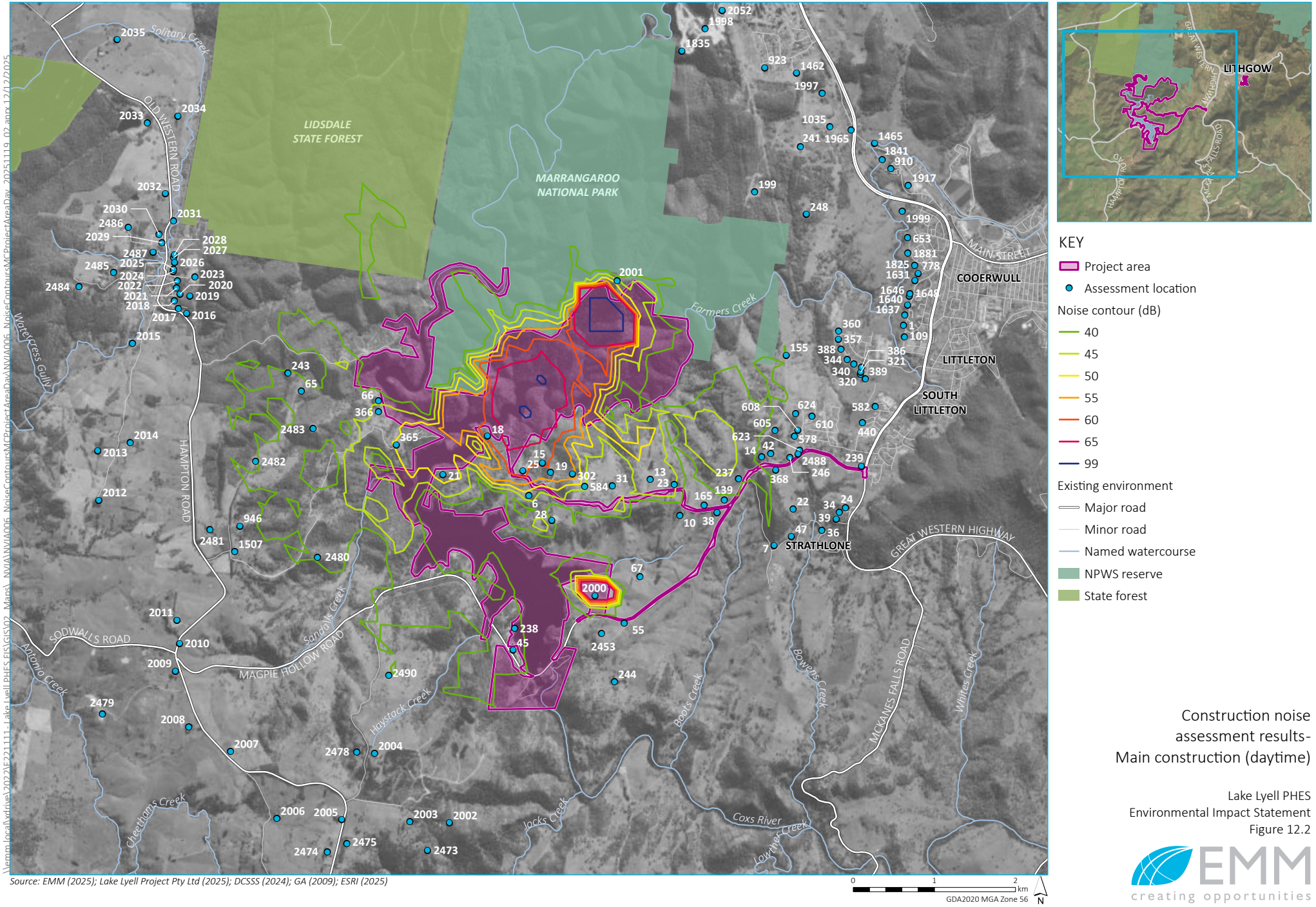
Further detail on construction noise levels at individual assessment locations is provided in the NVIA (refer to Annexure C of Appendix R).

The magnitude of predicted early works construction noise impacts from the project (including the Lakeside camp) has been summarised in Table 12.4.

Table 12.4 Magnitude of predicted construction noise impacts – Early works

Period[1]	Noticeable (0-10 dB above RBL)	Clearly audible (10-20 dB above RBL)	Moderately Intrusive (20-30 dB above RBL)	Highly Intrusive (>30 dB above RBL)
Day & Day OOH	25	25 (6, 7, 10, 13, 15, 18, 19, 22, 24, 25, 28, 31, 34, 39, 67, 244, 302, 440, 578, 582, 584, 605, 608, 610, 624)	16 (14, 23, 38, 42, 55, 129, 139, 165, 200, 237, 246, 247, 368, 587, 588, 623)	10 (29, 108, 392, 393, 586, 594, 595, 606, 607, 2488)
Evening	12	4 (15, 19, 25, 302)	1 (18)	Nil
Night	14	4 (16, 19, 21, 302)	3 (15, 18, 25)	Nil

Notes: 1. Day: 7:00 am to 6:00 pm Monday to Friday, 7:00 am to 1:00 pm Saturday; Day OOH: 1:00 pm to 6:00 pm Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 7:00 am Monday to Saturday; 10:00 pm to 8:00 am Sundays and public holidays.



Construction noise assessment results- Main construction (daytime)

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Figure 12.2

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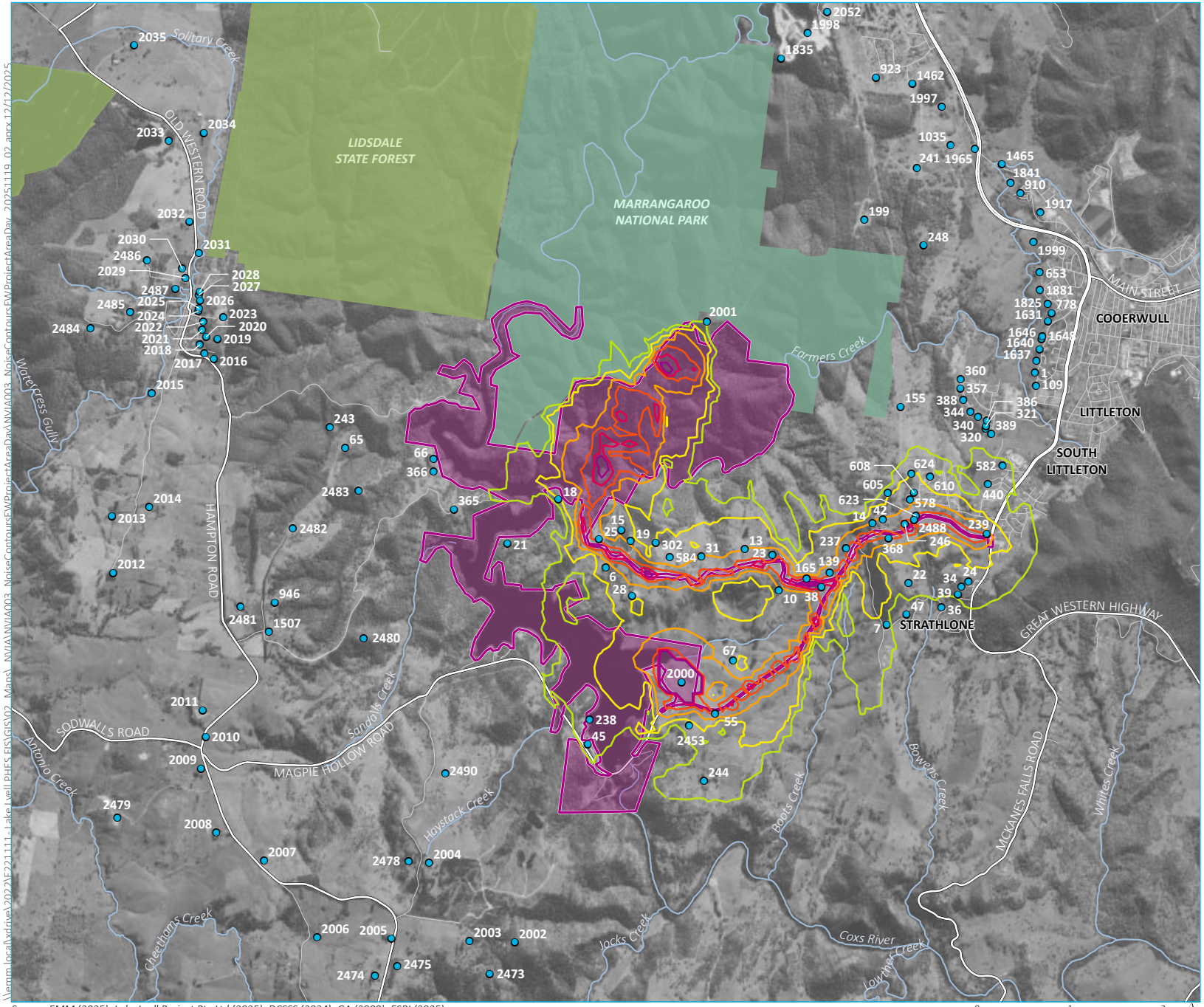

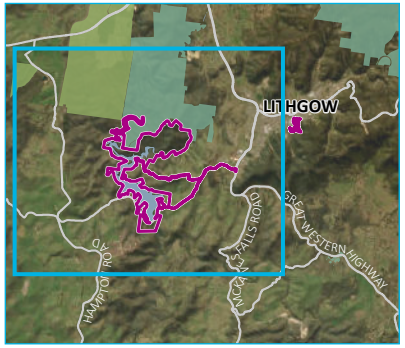

KEY

- Project area
- Assessment location

Noise contour (dB)

- 45
- 50
- 55
- 60
- 65
- 70

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); ESRI (2025)

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Construction noise assessment results- Early works (daytime)

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Figure 12.3

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iii Town camp construction and occupation

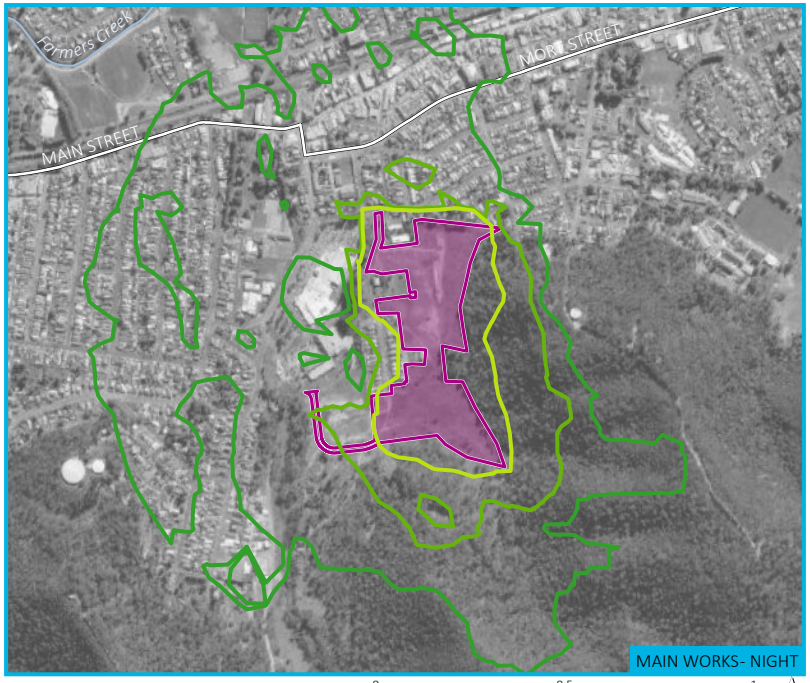
Given the Town camp's alternative location within the township of Lithgow and its proximity to a substantial number of sensitive receivers, noise contours have been prepared to provide an indicative assessment of potential impacts on the surrounding community, during both early work and main construction (i.e. occupation and use of the camp).

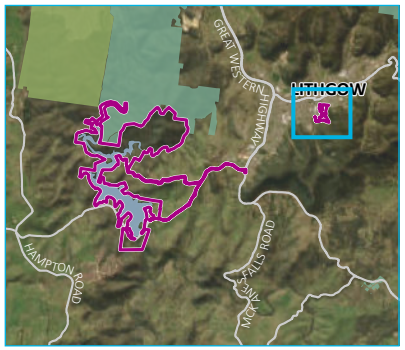
Noise impacts are anticipated to be greatest during early works for the establishment of the camp, with worst-affected receivers located on Silcock Street predicted to experience construction noise levels up to 71 dB. During main construction (occupation of the camp), these receivers are predicted to experience construction noise levels up to 55 dB. Noise levels are not predicted to exceed the highly noise affected noise level of $L_{Aeq,15minute}$ 75 dB at any assessment location both during early works and main construction. The magnitude of predicted construction noise impacts from the Town camp option are presented in Table 12.5 and Figure 12.4.

Table 12.5 Magnitude of predicted construction noise impacts – Town camp

Construction phase	Period[1]	Nominated RBL	Noticeable (0-10 dB above RBL)	Clearly audible (10-20 dB above RBL)	Moderately Intrusive (20-30 dB above RBL)	Highly Intrusive (>30 dB above RBL)
Early Works (construction of camp)	Day & Day OOH	35 dB	Receivers outside the 45 dB noise contour	Receivers within 45-55 dB noise contours	Receivers within 55-65 dB noise contours	Receivers inside of 65 dB noise contour
Main construction (occupation of camp)	Day, Day OOH & Evening	35 dB	Receivers within 35-45 dB noise contours	Receivers within 45-55 dB noise contours	Receivers within 55-65 dB noise contours	Receivers inside of 65 dB noise contour
	Night	32 dB	Receivers within 32-42 dB noise contours	Receivers within 42-52 dB noise contours	Receivers within 52-62 dB noise contours	Receivers inside of 62 dB noise contour

Notes: 1. Day: 7:00 am to 6:00 pm Monday to Friday, 7:00 am to 1:00 pm Saturday; Day OOH: 1:00 pm to 6:00 pm Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 7:00 am Monday to Saturday; 10:00 pm to 8:00 am Sundays and public holidays.





KEY

- Project area (town camp)

Noise contour (dB)

- 40
- 45
- 50
- 55
- 60
- 65

Existing environment

- Major road
- Named watercourse
- NPWS reserve
- State forest

0 0.5 1 km

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); ESRI (2025)

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Predicted construction noise impacts – Town Camp

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Figure 12.4

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12.3.2 Sleep disturbance

During the main construction phase of the project, predicted noise levels are predicted to satisfy the relevant sleep disturbance screening criteria at most residential assessment locations, except for assessment locations 6, 15, 18, 19, 21, 25 and 302 during the night-time and/or morning shoulder period. These exceedances can be attributed to the proximity of the assessment locations to the lower laydown area, concrete batching plant and southern haul road.

During the early works construction phase of the project, predicted noise levels are predicted to satisfy the relevant sleep disturbance screening criteria at most residential assessment locations, except for assessment location 15, 18 and 25 during the night-time period. This exceedance can be attributed to the proximity of the assessment location to the nearest on-site geotechnical drilling pad.

No night-time construction works are proposed as part of the Town camp. Therefore, no assessment of sleep disturbance is required as per the NPfI.

12.3.3 Construction vibration

The main construction activities with the potential to generate vibration include demolition, blasting (carried out during construction excavation), piling, ground treatments (e.g. compaction), construction equipment, tunnelling, road traffic and industrial machinery.

All assessment locations are beyond the safe working distances for human response considerations and cosmetic damage. Given the relatively large distances between the construction work areas and the nearest residences (closest is 250 m away from the haul road), vibration impacts from the construction of the project are considered unlikely.

12.3.4 Blasting

Blasting would be carried out for several elements of the project, including works associated with underground tunnels, main tunnel access, upper reservoir, switchyard, lower inlet/outlet structure and lake diversion.

Residential receivers surrounding the project are located outside the relevant blast offset distances required to maintain acceptable emission levels from tunnelling and open cut blasting. No vibration sensitive areas or locations are located within these offset distances.

The nearest area with the potential to accommodate livestock is approximately 1 km away. Based on studies (Casaday and Lehmann, 1967), the impacts on livestock from the blasting activities are considered unlikely.

12.3.5 Road traffic

The project would result in additional road traffic movements during construction. Existing road traffic noise levels on Magpie Hollow Road are predicted to exceed the relevant *Road Noise Policy* (RNP) criteria for both the day and night-time periods. Existing road traffic noise levels on Sir Thomas Mitchell Drive are predicted to be below the relevant RNP criteria for both the day and night-time periods.

Road traffic noise levels are predicted to increase from existing levels during the construction of the project on both Magpie Hollow Road and Sir Thomas Mitchell Drive. Road traffic noise increases are predicted to occur on Magpie Hollow Road (between 1 to 4 dB increase) and Sir Thomas Mitchell Drive (between 9 to 13 dB increase). These traffic noise increases result in levels above the RNP criteria and hence feasible and reasonable measures must be considered, in the context of the temporary, albeit longer-term nature of the works. These measures will need to be addressed in detail in the construction traffic management plan for the project and the construction noise and vibration management plan (refer to Appendix E).

It is of note that the road traffic noise results are based on light and heavy vehicle movements during the peak construction scenario (during offsite haulage over a short period of two to three months) and hence the assessment of road traffic noise is considered to be worst-case. Further, the application of the RNP criteria to construction projects is highly conservative given that the RNP is designed for permanent scenarios and not temporary impacts related to construction activities.

12.3.6 Marrangaroo National Park

The Mount Walker Trig Point has been identified as an assessment location (#2001) for the noise assessment, and representative of potential impacts to Marrangaroo National Park. The receptor type 'passive recreation' has been applied to this location in accordance with the ICNG and NPfI, the accepted and appropriate framework for noise impact assessment. The NPfI identifies 'passive recreation' as an 'Area specifically reserved for passive recreation (e.g. National park)'. The 'passive recreation' receptor type is also typically applied to places where people normally go to undertake quiet activities (e.g. picnics, bushwalks, etc.).

It is anticipated that construction noise would be clearly audible within the National park (i.e. 10 to 20 dB above RBL) however would not exceed the adopted criteria for passive recreation. Potential noise and/or vibration impacts on native fauna have been considered and addressed in the biodiversity assessment (Chapter 7 and Appendix J).

12.4 Predicted operational impacts

12.4.1 Operational noise

Operational noise levels were assessed for the daytime, evening and night-time periods including consideration of noise-enhancing meteorological conditions. Sleep disturbance impacts from the operation of the project during the night-time period were also assessed. The assessment found that noise impacts from operation of the project would not exceed any relevant regulatory requirements.

12.4.2 Operational vibration

Given that there are no significant vibration generating components included in the operational design of the project, and the significant distances between the infrastructure and the nearest residences, vibration impacts from operation of the project are considered unlikely.

12.4.3 Road traffic

Operational road traffic volumes are expected to be less than 2% of the existing road traffic experienced on the nearby roads. As such, adverse noise impacts from operational road traffic noise are considered unlikely.

12.5 Management and mitigation

The project noise and vibration impacts are expected to be suitably managed with the implementation of mitigation measures, which have been identified following a 'reasonable and feasible' assessment in line with the recommendations of the ICNG. Detailed safeguards and mitigation measures are provided in the NVIA (refer to Appendix R) and Appendix E.

Management and mitigation measures to address noise and vibration impacts would be consolidated and implemented through a Construction Noise and Vibration Management Plan (CNVMP) as part of the CEMP. The CNVMP would generally follow the approach in the ICNG, including identifying receivers and noise criteria, approved work hours and practices, complaints handling processes and any noise monitoring that is required. The CNVMP will also include procedures to:

- Measure construction noise levels at early stages to validate the predicted construction noise levels.
- Re-evaluate the predicted construction noise levels at assessment locations, and where required review noise management and mitigation measures to reduce levels as close to NMLs as possible, including:
    - limiting construction within a certain distance of assessment locations during the evening and night-time period
    - selecting quieter equipment or reduced equipment fleet
    - measuring construction noise levels at assessment locations, especially during the evening and night-time period, if relevant, and implementing further noise management and mitigation measures where an exceedance of NMLs is identified
    - entering into a negotiated agreement with noise affected receivers.
- Identify affected neighbours that should be consulted prior to and during construction where an exceedance of NMLs has been predicted and should be notified of proposed mitigation measures that will be used to manage construction noise levels to below NMLs where practicable.
- The Neighbour Agreement Guide developed for the project will be used as a mechanism to formalise agreements and mitigation with noise-impacted receivers on an individual basis.

12.6 Conclusion

Construction noise levels are expected to exceed the NMLs at some assessment locations during all assessment periods (i.e. daytime and nighttime hours). Noise levels are not predicted to exceed the highly noise affected noise level of $L_{Aeq,15minute}$ 75 dB at any assessment location or under any construction phase or scenario.

The project would include additional road traffic movements during construction resulting in increases to road traffic noise on Sir Thomas Mitchell Drive and Magpie Hollow Road during peak construction.

All assessment locations are located outside of the blast offset distances required to maintain acceptable emission levels from tunnelling and open cut blasting, and safe working distances for vibration impacts.

It is recommended that an out of hours works protocol be developed for the project and to reduce potential impacts, that high noise generating activities be limited during more sensitive periods. Site specific and general management measures are recommended to mitigate the predicted impacts, which would be implemented through a CNVMP.

Operation of the project would not result in any exceedances in noise levels, vibration or road-traffic noise.

Chapter

13

Air quality and greenhouse gases

Environmental Impact Statement | Lake Lyell PHES Project

13 Air quality and greenhouse gas

This chapter presents a summary of the project's air quality impacts and greenhouse gas emissions. Detailed technical reports for the air quality impact assessment (AQIA) and greenhouse gas assessment (GHGA) are provided in Appendix S.1 and Appendix S.2 respectively. The relevant SEARs for air and where they are addressed by the AQIA and GHGA are summarised in Appendix A.

13.1 Assessment approach

The AQIA was prepared in general accordance with the guidelines specified by the NSW EPA in the A*pproved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA 2022). Local meteorological conditions were quantified from the Bureau of Meteorology Marrangaroo automatic weather station and background air quality was characterised using data from the NSW DCCEEW Bathurst air quality monitoring station. The assessment considered a single construction scenario, which was determined to be the 'worst-case' in terms of type and scale of the construction activities (defined as movement of spoil). Emissions of total suspended particulates (TSP), particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}) and particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$) were estimated and modelled using the CALMET/CALPUFF model suite. Ground-level concentrations were predicted at assessment locations (e.g. residences).

The GHGA was prepared in accordance with the *NSW Guide for Large Emitters* (NSW EPA 2025). The assessment included estimates of GHG emissions from the construction and operation of the project and proposed measures to minimise these emissions. The assessment considered the following categories of GHG emissions:

- scope 1 emissions – direct emissions that occur within the boundary of an organisation and are a result of the organisation's activities
- scope 2 emissions – indirect emissions that occur from the generation of the electricity purchased and consumed by an organisation
- scope 3 emissions – indirect emissions that occur from upstream and downstream activities e.g. extraction and production of fuels and raw materials, use of products and services.

13.2 Existing environment

The local air quality environment is influenced by agricultural practices, wind generated dust from exposed areas, dust entrainment and exhaust emissions from vehicle movements along unsealed and sealed roads, seasonal emissions from household wood heaters and long-range transport of fine particles into the region. The air quality environment is also episodically influenced by bushfires and dust storms.

Air quality data showed the influence of regional drought conditions and bush fires in 2018, 2019 and 2020 and high rainfall in 2022. Air quality impact assessment criteria for annual mean PM_{10} (25 micrograms per cubic metre, µg/m^3) and $PM_{2.5}$ (8 µg/m^3) were exceeded in 2019. The 24-hour criteria for PM_{10} (50 µg/m^3) and $PM_{2.5}$ (25 µg/m^3) were exceeded several times between 2018 and 2020, and again in 2023.

The following values were adopted as background conditions for the purposes of cumulative air quality assessment:

- 24-hour PM_{10} concentration – daily varying 2023 dataset with two days above the impact assessment criteria (existing exceedance)
- annual average PM_{10} concentration – 12.1 µg/m^3

- 24-hour $PM_{2.5}$ concentration – daily varying 2023 dataset with one day above the impact assessment criteria (existing exceedance)
- annual average $PM_{2.5}$ concentration – 5.5 µg/m³
- annual average TSP concentration – 30.3 µg/m³
- annual average dust deposition – 2 grams per square metre per month.

13.3 Predicted impacts

13.3.1 Air quality

The main concern during construction is dust from fugitive emission sources. The main dust-generating sources from the construction of the project are:

- hauling of spoil along unpaved and paved roads
- excavating spoil material, including drilling and blasting
- loading and unloading of spoil
- dozers working on spoil emplacement areas
- crushing and screening of spoil
- concrete batching processes
- wind erosion from stockpiles and exposed surfaces
- diesel fuel combustion from construction plant, equipment and trucks.

As assessment of potential incremental (project-only) and cumulative air quality impacts was carried out, where cumulative impacts were assessed by combining the adopted background concentrations with the predicted incremental concentrations from the project. The construction phase was predicted to be compliant with NSW EPA impact assessment criteria at all assessment locations.

During the operation of the project, the volume of traffic, fuel use, and corresponding emissions will be substantially lower than during the construction phase. The construction phase therefore represents the more significant phase of the project in terms of potential air quality impacts. The operational phase of the project was not considered further in the assessment.

13.3.2 Greenhouse gas

The main GHG emission sources from the project are fuel combustion, explosives, vegetation clearing, electricity use and embodied emissions. GHG emissions from the reservoirs were excluded from the assessment as the lower reservoir is the existing Lake Lyell and the area under the upper reservoir would be lined / rock and therefore would not contain organic matter that could decompose and release emissions.

Detailed GHG emission estimates for each emission source are presented in Section 4.3 and Appendix A of the GHGA. A graphical representation of the project's estimated GHG emissions during the construction and operation phases is presented in Figure 13.1 for scope 1 and scope 2 GHG emissions and Figure 13.2 for scope 3 emissions.

Emissions are presented to 2050, despite the project having a maximum 100-year lifetime, as DCCEEW projections of the GHG emissions intensity of electricity generation end in 2050. GHG emissions intensity of electricity generation is projected to decrease in the future as the sector decarbonises.

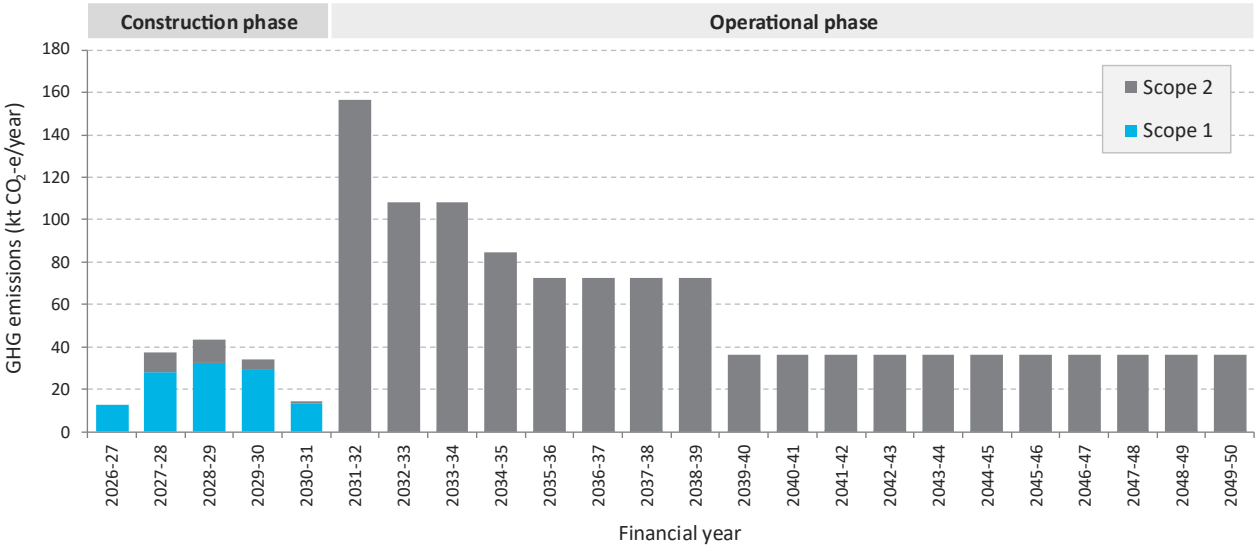


Figure 13.1 GHG emissions for the project – scope 1 and scope 2 emissions

Figure 13.2 GHG emissions for the project – scope 3 emissions

The total scope 1 and scope 2 emissions during the construction of the project would be 116 kilotonne (kt) CO_2-e and 26 kt CO_2-e, respectively. The aggregated scope 1 and scope 2 emissions over the project life, including both construction and operation, would be 1,286 kt CO_2-e, of which 9% would be scope 1 and 91% would be scope 2. On average, this would equate to 53.6 kt CO_2-e/year.

During the operation of the project, total scope 1 emissions would be negligible (1 kt 1CO_2-e), whereas scope 2 emissions would be relatively high (1,144 kt CO_2-e) on account of the project's gross electricity consumption. Scope 2 emissions would reduce with time, being around 157 kt CO_2-e/year in 2031-32, and 36 kt CO_2-e/year from 2039-40. The reduction would be due to the progressive decarbonisation of the electricity grid.

The total scope 3 emissions during the construction of the project would be 76 kt CO_2-e. During the operation of the project, total scope 3 emissions would be 36 kt CO_2-e. The aggregated scope 3 emissions over the project life, including both construction and operation, would be 112 kt CO_2-e.

13.4 Management and mitigation

13.4.1 Air quality

Air quality impacts are expected to be suitably managed with the implementation of mitigation measures detailed in the AQIA and presented in Appendix C. An Air Quality and Greenhouse Gas Management Plan will be developed to outline these specific measures.

Whilst the project is not a coal mine, similar practices are employed by the operation of coal mines and those measures which would be implemented during the construction of the project and therefore best practice dust control measures have been sourced from the NSW Coal Benchmarking Study: *International Best Practice to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Katestone 2011). Measures to be implemented include the use of water sprays, minimising travel speeds and distances travelled by on-site equipment, and measures to reduce diesel combustion.

13.4.2 Greenhouse gas

The project's scope 1 emissions during operation will be very low, and it has been designated as a large emitter based almost entirely on its gross electricity consumption from the grid, and the associated scope 2 emissions. A large proportion of the electricity consumed would be returned to the grid as renewable energy and it is anticipated the scope 2 emissions will also decrease as the grid decarbonises.

Although it is not strictly a mitigation measure – as it is the rationale for the project and part of its normal operation – the return of electricity to the grid will greatly offsets the project's effective scope 2 emissions during operation. This is based on the assumption that the electricity returned to the grid would otherwise have to be produced elsewhere with the prevailing energy mix for the grid.

A range of mitigation measures are proposed for the project. These include progressive rehabilitation and minimising hauling distances. In addition, LLP will investigate options such as LED lighting on fixed plant and buildings, the purchase of electric vehicles, and procurement of low carbon materials.

The *NSW Guide for Large Emitters* requires the GHGA to address the anticipated regulatory obligations for the project under the Safeguard Mechanism, to consider how the project's operational scope 1 emissions compare to NSW emissions, and to set out long-term and interim scope 1 and scope 2 emission goals for the project. The project would not be a Safeguard facility, and therefore the Safeguard Mechanism was not considered further. The operational scope 1 emissions from the project were negligible and constant (0.1 kt CO_2-e/year due to SF_6 leakage). It has therefore been assumed that emission-reduction targets are not necessary.

13.5 Conclusion

During the project's construction phase, compliance with air quality impact assessment criteria was predicted at all assessment locations. A range of best practice dust mitigation measures will be implemented, including the use water sprays, minimising travel speeds and distances travelled by on-site equipment, and measures to reduce diesel combustion. These measures will be detailed and implemented as part of the CEMP.

Greenhouse gas emissions are anticipated to be greatest during construction and reduce significantly following the first year of operation. The project's scope 1 emissions during operation will be very low. Operational emissions primarily relate to electricity use and would decrease as the grid decarbonises.

LLP has made commitments to reduce its GHG emissions over the life of the project.

Chapter

14

Land

Environmental Impact Statement |
Lake Lyell PHES Project

14 Land

This chapter presents a summary of potential impacts on soils, land use and rehabilitation of the project. A detailed Soils, Land Use and Rehabilitation Assessment (SLRA) is provided in Appendix T. The relevant SEARs and where they are addressed in the SLRA are summarised in Appendix A.

14.1 Assessment overview

The SLRA involved a soil survey to characterise soils to be disturbed by the project's construction, a review of existing land uses within the project area and an assessment of potential land use conflicts from the project's construction and long-term operation. The land use assessment particularly focuses on agricultural land and Marrangaroo National Park. A rehabilitation strategy has also been developed to outline the framework and proposed approach to decommissioning and rehabilitation activities associated with the project, including any final landforms. This involved identifying rehabilitation objectives, completion criteria and proposed monitoring for the project.

The SLRA incorporated guidance from the following documents:

- Australian Soil and Land Survey Field Handbook soil classification procedures (NCST, 2009)
- Australian Soil Classification (ASC) Third Edition (2021) (Isbell, R. F.,2021).
- *Development adjacent to National Parks and Wildlife Services Lands* (DPIE, 2020)
- *Land Use Conflict Risk Assessment Guide* (DPI, 2011).

14.2 Existing environment

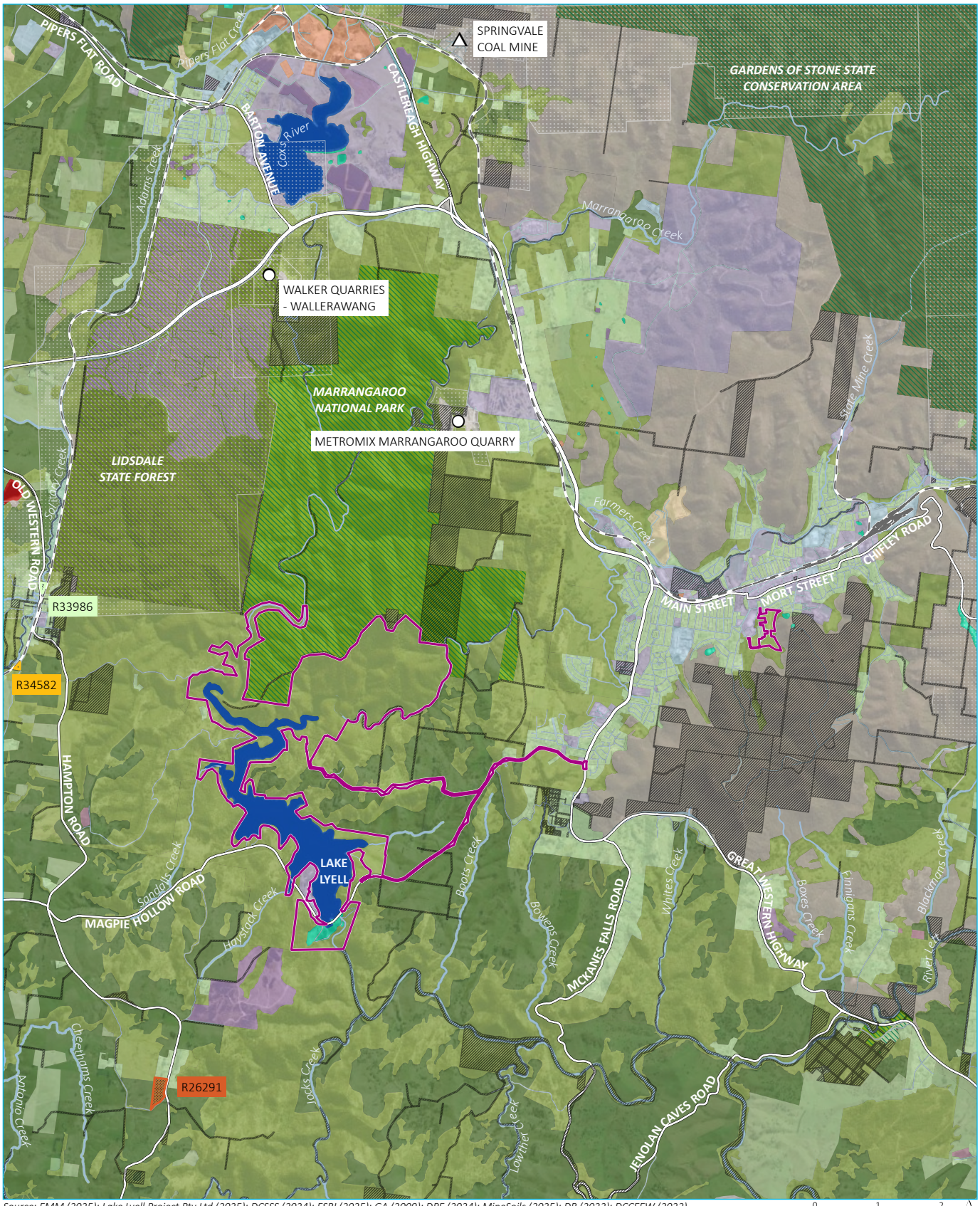
14.2.1 Land use setting

Land in the construction envelope is primarily zoned for electricity generating works (SP2) and rural uses (RU1 and RU2). However, land use across the site and surrounding areas is varied.

The present land use of Lake Lyell and surrounds is characterised by recreational activities such as fishing, boating, water-skiing, kayaking, camping, and swimming. Areas of cleared vegetation have historically been used for agricultural purposes, but no agricultural activity is currently being undertaken within the construction envelope. Mount Walker is generally vacant bushland with tracks for access and connectivity as well as fire management.

Land uses within the broader locality and region include a wide range of agricultural industries, urban and residential development, power generation, mining, quarrying, industry, tourism, recreation, and forestry, as shown on Figure 14.1. The dominant land use character of the locality is a combination of pastures for grazing, bushland areas, and urban areas.

The project locality also contains crown reserves, travelling stock routes, operational mines and quarries, Marrangaroo National Park, and Lidsdale State Forest. None of these land uses are located within the project area.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DPE (2024); MineSoils (2025); DR (2022); DCCEEW (2022)

0 1 2 km

GDA2020 MGA Zone 56

N

KEY

- Project area
- Operational mine
- Operational quarry
- Current mining title
- Crown land

Travelling stock route
- High conservation value
- Medium conservation value
- Low conservation value

Land use (regional)
- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 2.2.0 Production native forests
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 5.1.0 Intensive horticulture
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 5.9.0 Waste treatment and disposal
- 6.1.0 Lake
- 6.2.0 Reservoir/dam
- 6.3.0 River
- 6.5.0 Marsh/wetland

Existing environment
- Rail line
- Major road
- Named watercourse
- NPWS reserve
- State forest

Land uses within and surrounding the project

Lake Lyell PHES
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Figure 14.1

EMM creating opportunities

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14.2.2 Topography and soils

The project area was selected due to the general landscape dynamic of an existing reservoir situated immediately below areas of steep elevation, making it a suitable location for pumped hydro energy generation. The existing landform topography in context of the construction envelope is presented in Figure 14.2, which shows terrain ranging from approximately 720 to 1,180 m above sea level. The south facing slopes of Mount Walker are characterised by a series of ridge and spur lines with numerous creeks and gullies. The hillslopes typically slope in the order of 25° to 30° and the ridge and spur lines are characterised by slope angles of <10°. Some steeper areas of terrain (35° to 45°) are observed around the drainage lines in local areas.

When reviewing the likely inherent fertility of soils (based on available regional mapping), the construction envelope is dominated by soils with Low (1) and Moderately Low (2) fertility classes[2]. Soils with 'Low' fertility, due to their poor physical and/or chemical status, only support limited plant growth. Soils with 'Moderately Low' fertility can generally only support plants suited to grazing; as large inputs of fertiliser are required to make the soil suitable for arable purposes. Regional land and soil capability mapping generally reflects this, with the construction envelope mapped as moderate (class 4), low (class 6) and very low capability (class 7) land[3]. These types of lands are generally incapable or have limited capability for agricultural purposes and are more often associated with low-impact land uses such as grazing, forestry and nature conservation.

The soil survey undertaken (refer to Appendix T) found the construction envelope to contain six (6) dominant Soil Units, as shown on Figure 14.2. In addition, a limited area within the Town camp area was subject to fill material. The soil units determined to be present within the construction envelope are generally similar to those presented in NSW regional soil mapping, with a dominance of Kandosols. However, Dermosols and Chromosols identified within the construction envelope are not shown on the NSW regional soil mapping.

While the soils within the construction envelope were found to be generally physically and chemically stable, the steep nature of the landscape exacerbates the potential for erosion risks. Erosivity testing was completed and indicates that Kandosols, Dermosols and Chromosols (soil units 1, 2 and 3) within the construction envelope have a moderate potential risk of dispersion in the topsoils. Site inspections also concluded that there is low to moderate levels of observable erosion and sedimentation currently occurring in the construction envelope and its surrounds, primarily on context of high slopes and surface exposure factors (refer to Photograph 14.1).

A summary of the erodibility of the soil units within the construction envelope, which takes into account site observations, dispersion risk, the general physical and chemical characteristics of each unit, and landscape position, is presented in Table 14.1. No evidence of acid sulphate soil (ASS) indicators were observed as part of the soils survey and due to elevation and distance from the coast, the risk of ASS is considered very low. Similarly, there is a very low risk of salinity based on regional mapping and results of soil survey.

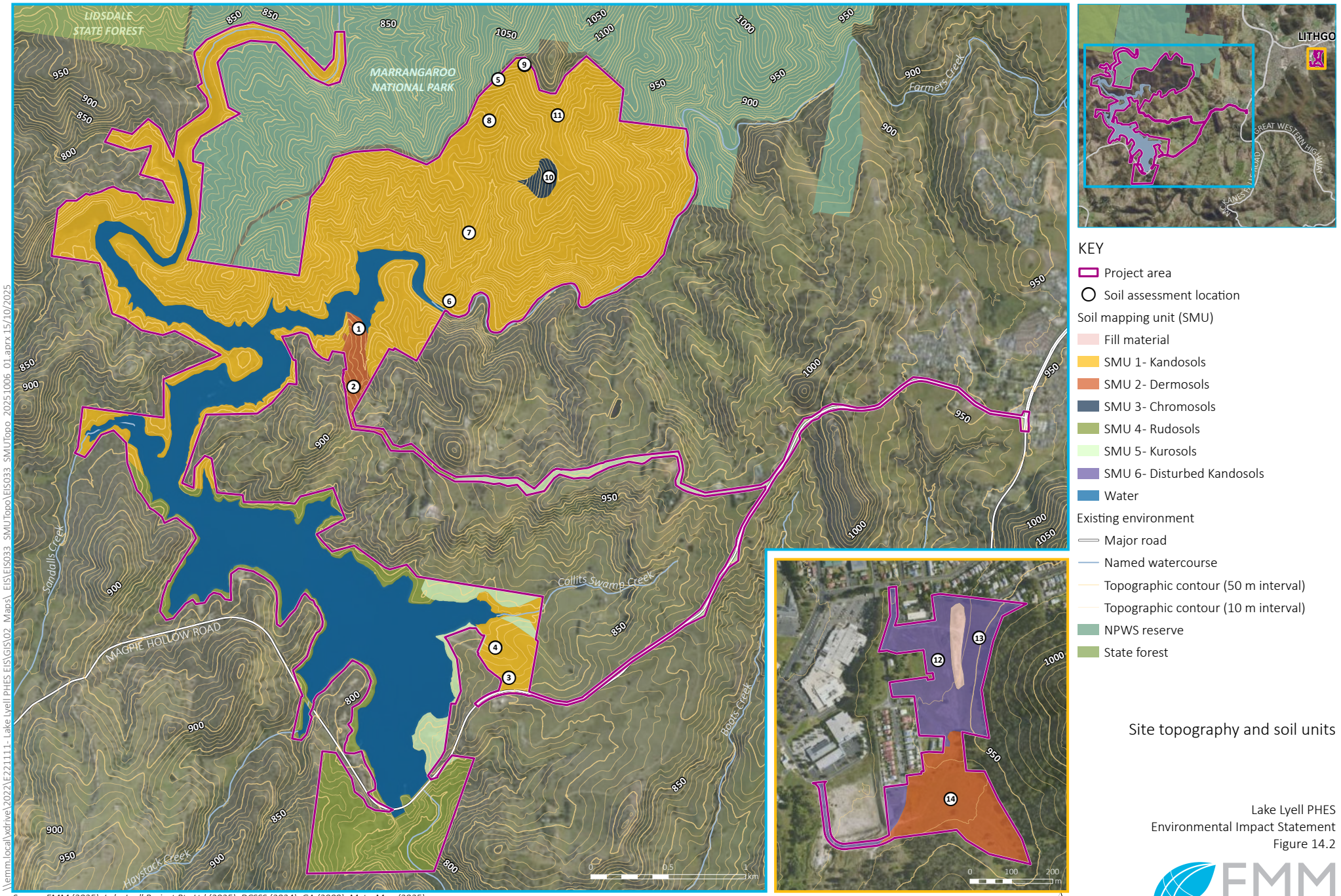
2 Regional mapping describes soil fertility in NSW according to a five-class system: Low (1), Moderately low (2), Moderate (3), Moderately high (4), High (5)

3 The Land and Soil Capability scheme uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards. The scheme consists of eight classes, which classify the land based on the severity of long-term limitations.

Photograph 14.1 High slopes within the construction envelope

Table 14.1 Erosion risk for soil units within the construction envelope

Soil mapping units		Erosion risk
#	Name	
1	Kandosols (slopes >20%)	High
	Kandosols (slopes <20%)	Low – Moderate
2	Dermosols	Low – Moderate
3	Chromosols	High
4	Rudosols	Low – Moderate
5	Kurosols	Low – Moderate
6	Disturbed Kandosols	Low



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); MetroMap (2025)

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Site topography and soil units

Lake Lyell PHES
Environmental Impact Statement
Figure 14.2

EMM
creating opportunities

14.3 Predicted impacts

14.3.1 Land use

i Agricultural Land

No agricultural activities are currently undertaken within the construction envelope. However, approximately 15 ha of land that is capable of agricultural use (albeit of moderate, low and very low capability land) will be impacted during the project's construction. Some of this impacted land would be rehabilitated following construction. Overall, the extent of this impact is considered negligible in the context of the broader land area subject to agricultural use in the Lithgow LGA (0.02%).

The operational footprint would in total impact about 47 ha of land, downgrading the LSC class to class 8 (i.e. extremely low capability land). This is also considered a negligible impact to agriculture in context of this land not being used for agriculture and largely never having been used for agriculture.

Agricultural productivity of land outside of the disturbance footprint will not be affected by the project, given:

- there will be no impacts to downstream water users, including private groundwater users, and there are no irrigated agricultural lands in close proximity to the project
- there will be negligible impact on local and regional agricultural infrastructure (including road and rail networks)
- noise impacts during construction are not expected to exceed 90dB for any extended period of time (exposure above these levels is known to affect animals such as livestock)
- travelling stock routes will not be impacted.

ii Marrangaroo National Park

An assessment of potential land use impacts on Marrangaroo National Park was completed in accordance with the *Guidelines for Development adjacent to National Parks and Wildlife Services Lands* (DPIE, 2020), which identify ten key issues for consideration. A summary of the assessment is provided in Table 14.2 and concludes that direct impacts are not anticipated and potential indirect impacts will be minimised, such that the use and values of the park are not compromised into the future.

Table 14.2 Potential land use impacts on Marrangaroo National Park

Issue (per Guidelines)	Assessment summary
Erosion and sediment control	Marrangaroo National Park is not expected to experience erosion and sediment control impacts from the project's surface disturbance activities. A ridge line occurring on the boundary between the construction envelope and Marrangaroo National Park provides topography that alleviates erosion and sedimentation risks to Marrangaroo National Park. Further, erosion and sediment control measures will be implemented to prevent offsite migration of sediments.
Stormwater runoff	Marrangaroo National Park is not expected to experience stormwater runoff impacts from the project. Discharge of stormwater to NPWS land will be generally avoided, due to the natural topography and ridge line that separates Marrangaroo National Park from the project disturbance footprint.
Wastewater	There will be no adverse impacts on Marrangaroo National Park due to wastewater from the project, as disposal systems will be designed and operated to ensure no discharge of wastewater to NPWS land.

Issue (per Guidelines)	Assessment summary
Pests, weeds and edge effects	The project is expected to lead to minor changes to the nature of the vegetation surrounding Marrangaroo National Park, however due to project design and available mitigation measures (including biosecurity management), direct disturbance to Marrangaroo National Park are anticipated to be avoided and indirect impacts to be minimised.
Fire and the location of asset protection zones	All asset protection measures are within the disturbance footprint, and there is no expectation for NPWS to change its fire management regime for the land it manages.
Boundary encroachments and access through NPWS land	A spatial survey of project boundaries in relation to Marrangaroo National Park has informed project design. Further, any access required to occur within Marrangaroo National Park will be legally authorised and comply with park management objectives. Therefore, no pre-construction, construction or post-construction activity occurs on land managed by NPWS.
Visual, odour, noise, vibration, air quality and amenity impacts	Temporary amenity impacts are expected to be experienced during construction of the project, related to noise, air quality and visual (lighting). The extent of these impacts will vary depending on the location and intensity of surface disturbance across the project's construction schedule and is further detailed in technical assessments (refer to Appendix N, Appendix R and Appendix S.1). Mitigation measures will be implemented to mitigate the severity of impacts, forming part of specific management plans to manage amenity throughout construction.
Threats to ecological connectivity and groundwater-dependent ecosystems	No vegetation clearing or direct disturbance to habitat within Marrangaroo National Park will occur. However, impacts on native vegetation and other flora and fauna habitats will occur within the construction envelope that provide a linkage, buffer, home range or refuge role for Marrangaroo National Park. The BDAR prepared for the project (refer to Appendix J) notes noise, vibration and artificial lighting may lead to some animals temporarily ceasing to utilise habitat adjacent to the disturbance footprint during the construction of the project or may impair their normal activities, but it is unlikely to cause a significant impact on any species. Usage is predicted to return to pre-construction levels during operation due to minimal ongoing impacts. Negligible impacts to groundwater dependent ecosystems are predicted, including GDEs in NPWS land.
Cultural heritage	The project will not impact on sites of heritage value (including Aboriginal cultural heritage) within Marrangaroo National Park.
Access to parks	The project will maintain and not compromise public and NPWS access to Marrangaroo National Park.

iii Other land use considerations

The project has been designed in a way that:

- avoids directly impacting Crown lands, in particular the naturalised section of Farmers Creek and the Mount Walker Trig Station. However, amenity impacts during construction will occur due to their proximity to the project
- avoids building permanent infrastructure within flood prone lane (there is no flood prone land within the construction envelope)
- maintains and not compromises access to Lake Lyell and Marrangaroo National Park for public recreation. However, some restrictions on the Farmers Creek arm of Lake Lyell will be required to ensure public safety during construction and operation. Water levels within the lake would be maintained within operating ranges that continue to allow public recreation on the lake and from Lake Lyell Recreation Centre. A community benefits package will be developed to ensure adequate facilities are provided that minimise impacts to recreation opportunities
- avoids known mining areas and does not interfere with local coal mining industry or mineral or petroleum rights
- has a neutral impact on two, local operational quarries.

The possibility for, and potential level of, future land use conflict was assessed for the project by comparing and contrasting the project against surrounding land uses and activities for real or perceived incompatibility and conflict issues, based on the risks and impacts identified in the EIS and proposed mitigation and management measures. The high and moderate potential conflicts resulting from the Land Use Conflict Risk Assessment (LUCRA) are presented in Table 14.3. The full list of potential conflicts (n=31) is detailed in Appendix T.

Table 14.3 LUCRA moderate and high risk items

Potential conflict	Conflict risk
Stakeholders in the locality who wish to maintain views of the existing landscape may be concerned about the change in visual amenity resulting from the project.	High
Recreational users of Lake Lyell and its surrounds may be concerned about impacts or restrictions to recreational activities including camping, four-wheel driving and biking, hiking, fishing, swimming and other water-based activities.	Moderate
Stakeholders in the locality may be concerned about changes to water quality, quantity and surface water flows that may affect the site and locality, including Lake Lyell, from surface disturbances during construction activities.	Moderate
Stakeholders may be concerned about potential impacts to biodiversity within the construction envelope, the adjacent Marrangaroo National Park, and wider locality from construction activities.	Moderate
Recreational users of Lake Lyell and its surrounds may be concerned safety risks during construction and operation of the reservoir and inlet.	Moderate
Stakeholders in the locality, including local agricultural operators and Marrangaroo National Park, may be concerned about biosecurity breaches including weed, plant pest, plant disease or pest animal introduction and/or spread, as a result of the project.	Moderate
Stakeholders in the locality, including neighbouring landholders and Marrangaroo National Park, may be concerned about the risk of fires occurring at the site as a result of project electrical infrastructure or land management practices, and their potential to spread to surrounding land.	Moderate
Adjacent residents to the proposed Pottery Estate temporary workers accommodation may be concerned about the perceived impacts to local residents' security, visual amenity, and increases in nuisance noise, light and dust.	Moderate

14.3.2 Geotechnical stability

A basic conceptual geological model was developed which presents the interpreted subsurface profile inferred from data obtained from the geotechnical investigation program[4], published literature, past experience and engineering judgment.

The site is expected to have shallow superficial soil cover over the elevated areas while a thick soil deposit (colluvium) is more likely for low lying areas including the gully dam location. The site is underlain by metamorphic rocks, represented predominantly by quartzite. Indications of the presence of faulting and igneous intrusions (basalt and andesite observed in boreholes) were present in the existing site investigation data at the upper reservoir area. However, no obvious evidence of faulting or dyke intrusion was observed on the surface during the geological site inspection. Presence of faulting and igneous intrusion may impact on the design of the project infrastructure and shall be investigated with targeted geotechnical investigations.

[4] LLP completed a Phase 1 and Phase 2 geotechnical investigation program between 2022 and 2024 including completion of boreholes, hydrogeological bores, and geological surface mapping.

A preliminary assessment of cut batter stability was carried out and it is envisaged that individual batters in competent rock will be 10 m high at 4V: 1H separated by 6 m wide benches. The stabilisation works would mostly comprise of rock bolting with highly fractured zones or erosion-prone seams which may need to be treated with shotcrete with or without bolting.

It is interpreted that the general geological context is suitable for a hydroscheme subject to risks due to gap in geotechnical data at the structure locations, however re-evaluation of the geological model will be required on completion of the additional investigation.

Geoscience Australia mapping shows no known neotectonic features proximal to the site, with the nearest being the north-south-trending Lapstone Structural Complex ~45 km to the east (Geoscience Australia 2021). Seismic activity is not anticipated to be a key risk to geotechnical stability of the PHES.

Based on the results of geotechnical investigations, several faults and dykes were interpreted and projected to extent to the existing ground surface. The siting and design of the upper reservoir has considered the initial findings.

14.3.3 Soils and erosion

i Erosion and sedimentation risk

Up to 137 ha of land will be physically disturbed as part of the project. In areas where earthworks, excavations and landform modifications are necessary for construction, soils will be subject to higher impact disturbance. Soil will be permanently impacted, buried and/or entirely removed at all permanent infrastructure footprint and foundation locations within the operational footprint (an area of 47 ha). Areas used for construction and no longer needed for operation will be progressively rehabilitated, with these impacts expected to be temporary, minimal and readily addressed by measures described in the project's rehabilitation strategy (see Section 14.5).

There is a moderate erosion risk across the disturbance footprint, with areas of higher erosion risk located on steeper slopes (i.e. greater than 20% grade). Potential impacts from erosion include:

- loss of soil from project sites which can reduce the effectiveness of rehabilitation outcomes
- sedimentation of land and waterways (e.g. streams, rivers, and lakes), as well as a decrease in water quality of these surface water features.

Suitable soil impact mitigation measures will be implemented to minimise erosion and prevent offsite sedimentation. These will be implemented concurrently with the surface water management system (refer to Appendix F) to prevent sedimentation into waterways.

ii Spoil

Spoil generated by the project will primarily be utilised on site for other construction activities or as part of permanent infrastructure and landforms. The project anticipates the ability to re-use at least 95% of all excavated material within the project's construction. The remaining 5% of material will need to be transported offsite to a facility or site approved and licensed to accept the material. The permanent placement of spoil includes:

- construction of the upper reservoir rockfill dam, where the embankment would utilise about 73% of all excavated rock to be permanently placed
- In-reservoir placements, specifically the lake infill pad (to protect the inlet/outlet structure) and the switchyard laydown pad
- land-based placements, specifically for the lower access road and workshop pad.

The types of spoil to be stockpiled temporarily when necessary includes mulch, topsoil, excavated rock stockpiled for processing and excavated spoil stockpiled for future use.

An excavated rock management strategy has been prepared for the project, to guide the design principles and concepts for the permanent placement of spoil for the project (refer to Appendix I). This includes proposed water management measures and controls to facilitate drainage and/or the collection of seepage to avoid material impacts to the receiving environment.

The excavated rock management strategy (Appendix I) is complimented by the project's Rehabilitation Strategy (refer to Section 14.5 and Appendix T), to guide final landforms.

14.4 Management and mitigation

Land use impacts will be mitigated by compliance with the recommendations and controls specified within the technical assessments undertaken for the project, in particular the mitigation measures relating to bushfire, visual amenity, biodiversity, and social and recreation. To complement these measures, further recommendations to minimise land use conflict with surrounding users include:

- ongoing consultation with stakeholders to identify and address land use conflict concerns if they arise throughout construction and operation
- consultation with NPWS during the preparation of the CEMP and OEMP and incorporating feasible measures that address the aims of the *Guidelines for Development adjacent to National Parks and Wildlife Services Lands*
- rehabilitate all lands disturbed by the temporary worker accommodation to a pre-disturbance condition/ approximately equivalent agricultural capability (i.e. capable for use as pasture land for livestock grazing).

A soil and water management plan (SWMP) will be prepared that includes controls that address specific soil resource impact risks based on disturbance activity, phase of the project and terrain and soil characteristics considerations. The SWMP will be supplemented by erosion and sediment control plans to manage site specific erosion and sedimentation risks based on disturbance levels. A detailed list of all measures is provided in Appendix E and include measures, procedures and/or methods for:

- soil stripping, to reduce structural degradation and improve re-use capability
- soil stockpiling, to ensure stabilised stockpiles and prevent offsite sedimentation from wind and water
- soil preparation and respreading, to support regrowth and stability
- erosion and sedimentation control, which includes compliance with *Managing Urban Stormwater: Soils & Construction* (Landcom, 2004) guidelines, to prevent offsite migration of sediment into surrounding land and waterways.

Provision for ongoing monitoring and auditing of the effectiveness of control measures will be included in the CEMP.

14.5 Rehabilitation strategy

A Rehabilitation Strategy has been prepared as a high-level concept to outline the framework and proposed approach to decommissioning and rehabilitation activities associated with the project, post-construction. The Strategy is provided in Appendix T and summarised in this section.

14.5.1 Objectives

The ultimate rehabilitation objective for the project is to create safe, stable and sustainable landforms that compliments existing natural values and connectivity to Marrangaroo National Park. To achieve this, the following objectives have been identified:

- Preserve the construction envelope's natural assets and values and ecological connectivity to Marrangaroo National Park.
- Agreement on future land use and consider long-term site management.
- Establish processes prior to construction works to source seeds, tubestock, topsoils, organic matter and landscape items such as rock and logs to be used in revegetation and progressive, ongoing rehabilitation during the construction works phase.
- Establish appropriate treatments for minimisation of runoff into waterways.
- Protect existing native fauna and their habitats including (e.g. trunks, logs, large rocks, etc.) in construction adjacent areas.
- Where practicable, rehabilitate disturbed areas to a pre-existing or improved state at completion of construction activity.
- Minimise the visual impact of construction works from significant public viewpoints and sensitive receptors.

14.5.2 Rehabilitation phases and completion criteria

About 74 ha of the disturbance footprint would be progressively rehabilitated following construction. This includes rehabilitation of temporary construction pads and work areas (e.g. for concrete batching, laydown, stockpiling, etc.), workforce accommodation, and temporary access roads. Further, some permanent infrastructure will require rehabilitation and stabilisation as part of the project's operational requirements. This includes the final landform of the inlet infill area and other batters and slopes associated with permanent facilities and access roads.

Completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover, etc.) which can be measured against to demonstrate progress and the ultimate success of rehabilitation. As such, they provide a defined end point at which time rehabilitation can be deemed successful. Indicative completion criteria have been established for the project according to rehabilitation phases, as summarised in Table 14.4. The methods to be implemented in achieving these criteria are detailed in Appendix T and will be incorporated into the project's Rehabilitation Management Plan.

Table 14.4 Rehabilitation activities and indicative completion criteria

Phase	Description	Rehabilitation action(s)	Indicative completion criteria
1	**Preparation** – activities undertaken during (or prior to) construction and operations to enhance rehabilitation, such as salvaging and managing soil resources, salvaging habitat resources and acquiring seed and tubestock. Temporary stabilisation of batters and construction of appropriate erosion and sediment control devices.	• Minimise risk of injury to people and animals. • Minimise the impact of vegetation clearance activities on flora and fauna. • Erosion management. • Topsoils stripping and management. • Final rehabilitation target species selection. • Final land use habitat materials planning.	• Appropriate security measures and safety controls implemented (where required) prior to commencing works. • Appropriate measures have been implemented (where required) to minimise the impact on flora and fauna. • Erosion and sediment control structures have been progressively installed and maintained during disturbance. • Topsoil has been stripped and stockpiled in accordance with requirements. • Appropriate seeds or tubestock have been selected and obtained. • Appropriate habitat materials such as felled timber obtained.
2	**Decommissioning** – removal of all temporary construction and accommodation infrastructure, hardstands, plant, equipment, buildings and other structures and all contaminated and hazardous materials. Removal of temporary stockpiles.	• Construction materials and infrastructure is removed to ensure the site is safe and free of hazardous materials. • Disconnection of redundant services. • Contaminated areas are identified and remediated, removed or otherwise managed. • All surface entries and tunnels have been closed and sealed.	• All surface infrastructure that is not required for the final land use dismantled and removed from the site. • All demolition work carried out in accordance with AS2601-2001: The Demolition of Structures or its latest version. • All services, including power, water, data and telephone, that are not required for final land use have been safely isolated, disconnected and terminated. • Contaminated soils presenting constraints to final land use have been identified and remediated or removed from the areas to be rehabilitated or appropriately managed (in accordance with legislation). • All surface entries and tunnels not required for operational access have been closed and sealed to prevent public access.
3	**Landform Establishment** – the process of forming the final landform. This phase includes all earthworks required to construct the final landform into the desired surface profile. It includes the construction of permanent surface water management/drainage structures.	• Landform is safe, stable and non-polluting.	• Landform survey verifies constructed landform safe and stable and is generally in accordance with the approved landform detailed design. • Rehabilitated slopes are free draining with appropriate drainage in place so that water will not undermine the structure in the long term. • Final landform drainage structures including drains, banks, drop structures and dams constructed in accordance with best practice erosion and sediment control requirements (as per the Blue Book), where required.

Phase	Description	Rehabilitation action(s)	Indicative completion criteria
4	**Growth Medium Development** – establishing and enhancing the physical structure, chemical properties and biological properties of growth media suitable for the desire vegetation community. This includes placing and spreading soil and applying ameliorants.	• Growing media appropriate for the intended final land use is reinstated at all rehabilitation areas. • Growth media characterised and ameliorated for final land use as required.	• Topsoil or suitable alternative is spread uniformly in designated areas at the specified depth appropriate to the final land use. • Areas of benign excavated material utilised for targeted native vegetation establishment have leaf litter accumulated. • Soil ameliorants (e.g. gypsum, mulch, biosolids, composts) are applied where necessary at the recommended application rate based on soil analysis.
5	**Ecosystem and Land Use Establishment** – this phase includes the process of establishing the final land use following the construction of the final landform. For vegetated areas this will consist of seeding, planting and transplanting plant species. It incorporates management actions such as weed and feral pest control to achieve species establishment and growth to juvenile communities and habitat augmentation.	Ground cover comparable to reference vegetation communities.	Rehabilitation plantings have been planted at the agreed density (plants/ha) to provide sufficient ground coverage once established.
		Community structure/species composition.	A mixture of native trees, shrubs and grasses generally commensurate with that in the appropriate PCT(s) has been planted in accordance with specifications.
		Erosion does not present a safety hazard or compromise the post construction land capability.	No active erosion features (greater than 500 mm depth) that compromise land capability or the final post construction land use.
		Weeds and feral animals do not present a risk to rehabilitation.	No significant weed infestations, and noxious or other weeds do not comprise a significant proportion of the species in any stratum resulting in a risk to rehabilitation area establishment. Plantings have been installed with appropriate vegetation protection implemented.
6	**Ecosystem and Land Use Development** – applying management techniques to encourage an ecosystem to grow and develop towards a desired and sustainable post construction land use outcome. Incorporates features such as species reproduction, nutrient recycling and community structure.	• Rehabilitation areas are healthy, sustainable and comparable with surrounding vegetation community. • Species diversity (fauna). • Erosion does not present a safety hazard or compromise the landform. • Weeds and feral animals do not present a risk to rehabilitation.	• Ground cover (vegetation, leaf litter, mulch) is at least 70% and healthy (health assessed to be similar to analogue/reference sites). • There is evidence of target species. • No significant and active erosion in comparison to analogue sites that compromises the landform or proposed final land use. • No significant weed infestations, and noxious or other weeds do not comprise a significant proportion of the species in any stratum resulting in a risk to rehabilitation area establishment.
7	**Rehabilitation Completion** – completion criteria for rehabilitation are met and the land is determined to be suitable for the intended final land use.	• Rehabilitation areas are capable of supporting and maintaining the designated final land use.	• All relevant completion criteria for rehabilitated land are acknowledged to be met by relevant authorities, as required.

14.6 Conclusion

An assessment on land resources and land uses, both directly within the construction envelope and indirectly in the project locality and wider region, has been completed for the project and shows that potential impacts can be appropriately managed. Key risks to be managed during construction and operation of the project include:

- land use conflict risks due to change in views and visual amenity, recreational activities, water quality, biodiversity impacts, biosecurity risks and proximity to project infrastructure
- steep areas of the construction envelope which exacerbate the risk of erosion impacts
- potential impacts associated with spoil generated by the project.

The project will have negligible impacts on agricultural land and crown lands. The project will have no impact on flood prone land, irrigated lands, travelling stock routes, mining, quarries, mineral or petroleum rights.

Land use impacts will be mitigated through implementation of relevant recommendations and controls specified within the technical assessments undertaken for the project, such as the BDAR. Detailed mitigation measures have been recommended to prevent and minimise potential erosion and sedimentation impacts and will be incorporated into a project SWMP and ESCP.

A Rehabilitation Strategy has been developed and provides the principles and concepts to achieve stable, non-polluting landforms and enable the project to co-exist within its existing setting. Sufficient detail has been provided to act as an overarching standard for decision making in terms of rehabilitated landscape, and guide future development of the Rehabilitation Management Plan which will provide further specific details for implementation, management and monitoring of all aspects rehabilitation and decommissioning for the final design.

Chapter

15

Hazards

Environmental Impact Statement |
Lake Lyell PHES Project

15 Hazards

This chapter presents a detailed summary of potential hazards and public safety risks from the project, including bushfire and flooding, electromagnetic fields, contamination, and any dangerous or hazardous goods. Detailed risk assessments have been undertaken and are provided in Appendix U (Bushfire Assessment), Appendix V (Contamination Preliminary Site Investigation (PSI)) and Appendix W (Electric and Magnetic Fields (EMF) Assessment). These assessments have been informed by relevant design inputs and analysis. The relevant SEARs and where they are addressed are summarised in Appendix A.

15.1 Assessment approach

This hazards assessment consolidates the findings of key technical studies relating to bushfire, flooding, EMF, contamination and design investigations and analysis (such as geotechnical investigations and dam break analysis) to determine any potentially hazardous impacts of the project and any residual public safety risks. The approach to each assessment included the following:

- Bushfire risk assessment in accordance with *Planning for Bush Fire Protection* (PBP) (RFS, 2019), through bush fire hazard identification and assessment, including providing recommendations for the protection of human life and minimising impacts on property from the threat of bush fire, and enabling safe and effective emergency response.

- Consideration of flooding, noting that the proposed operating principles of the PHES have been designed to have no change on the existing flood regime.

- Dambreak and consequence assessment, to investigate the consequence category of the proposed upper reservoir along with the impact that the upper reservoir may have on the consequence category of Lake Lyell. This assessment included a flood hydrology assessment, hydraulic modelling, dambreak modelling, assessment of the population at risk (PAR), potential loss of life (PLL) and severity of damage and loss, and mapping of potential inundation. Consideration was also given to Dam Safety NSW Guidance material, including the *Dam Safety NSW: Dam safety management system (November 2024),* and guidance from Dam Safety NSW.

- Assessment of the proposed grid connection infrastructure against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) *Guidelines for limiting exposure to Timevarying Electric, Magnetic and Electromagnetic Fields.*

- PSI to understand contamination conditions present within the construction envelope and whether remediation may be required. This assessment included a desktop review and site inspection, with consideration of the *Contaminated Land Management Act 1997* and relevant EPA Guidelines.

- A preliminary risk screening in accordance with *State Environmental Planning Policy (Resilience and Hazards) 2021* was also undertaken with regard to proposed transport and storage of dangerous and hazardous materials.

15.2 Existing environment

15.2.1 Bush fire regime and management

The project area is located on land classified as bushfire prone within the Lithgow City Council Bush Fire Prone Land map, with the construction envelope containing Vegetation Category 1, Vegetation Category 3 and Vegetation Buffer zones as shown in Figure 15.1[5].

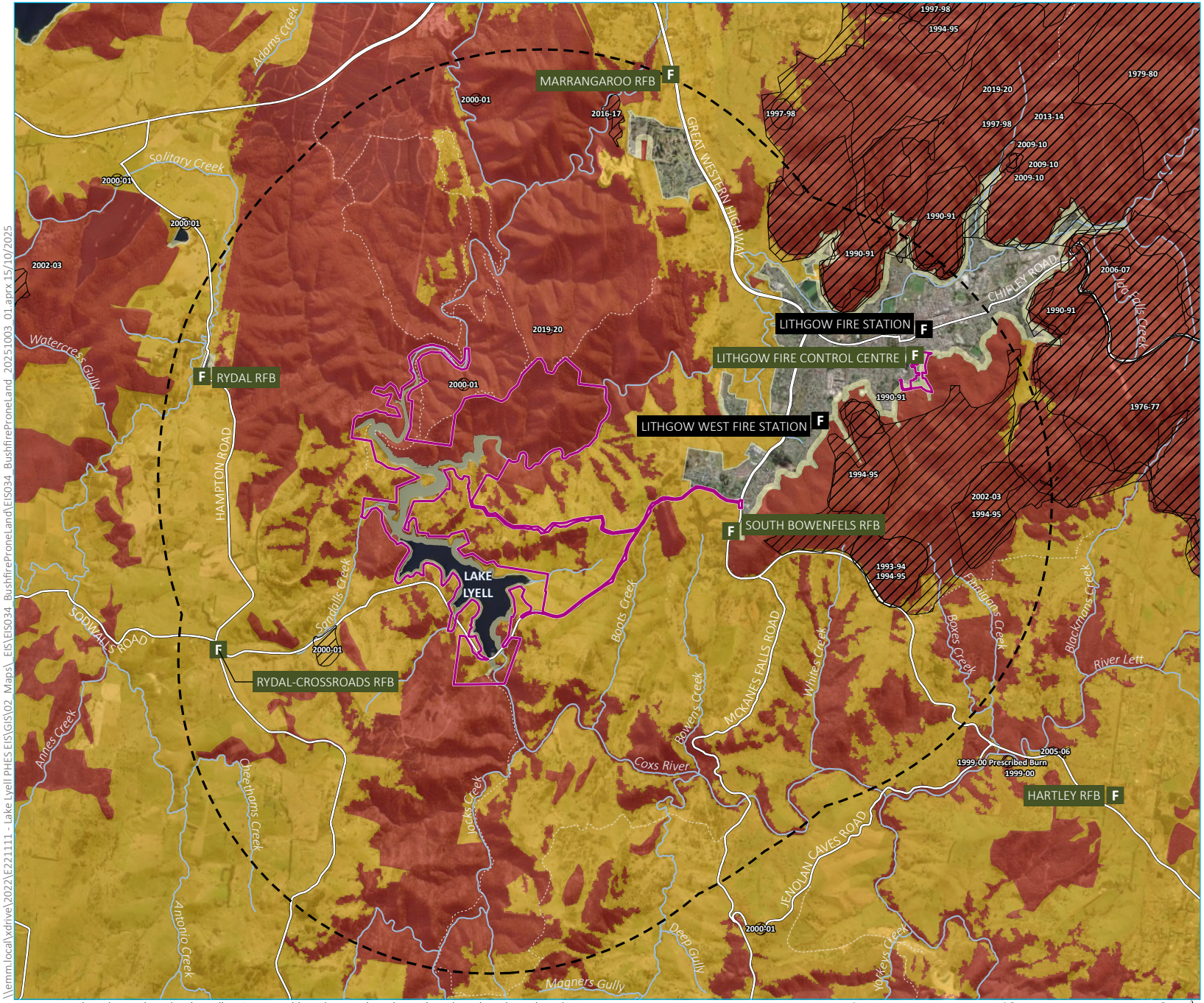
The Lithgow Bush Fire Risk Management Plan (2020) identifies the majority of the project area as a Strategic Fire Advantage Zone (SFAZ). The purpose of an SFAZ is to provide strategic areas of fire protection advantage which will reduce the speed and intensity of bush fires, reduce the potential for spot fire development as well as to aid containment of wildfires to existing management boundaries. The area is also relatively well-served by fire response services, with the nearest services being the South Bowenfels Rural Fire Brigade followed by Lithgow West NSW Fire & Rescue (refer to Figure 15.1).

The bush fire season generally runs from October to March yet has, on occasion, been extended when the weather conditions have created a landscape more susceptible to fire occurrences and expansion. Bush fires within the region are typically started by natural causes (i.e. lightning) mainly associated with late spring and early summer, escaped fires from legal burning activities as well as illegal burning activities by private land owners.

The Lithgow Bush Fire Management Committee area has on average 128 bush / grass fires per year of which three on average are considered a major fire (>20 ha) (BFMC, 2020). A review of fire history data suggests that there have been no fires recorded within the project area. However, two wildfires were recorded within Marrangaroo National Park during 2000-2001 and 2019-2020 (refer to Figure 15.1).

[5] Category 1 - includes areas of forest, woodland, heath, forested wetland and timber plantation. Highest risk category.

Category 3 – includes grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands. Moderate risk category.



KEY

- Project area
- Construction envelope buffer (5 km)
- Fire and rescue
- Rural fire service
- Wildfire history

Bushfire prone land

- Vegetation buffer
- Vegetation category 1
- Vegetation category 3

Existing environment

- Major road
- Classified fire trail
- Named watercourse

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Source: EMM (2025); WBP (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); RFS (2025)

0 2.5 5 km

GDA2020 MGA Zone 56

N

Bush fire prone land, fire history and fire response services

Lake Lyell PHES
Environmental Impact Statement
Figure 15.1

EMM
creating opportunities

15.2.2 Flooding

The existing Lilyvale Dam that impounds Lake Lyell has a spillway with six fusegate control structures. The fusegates are designed so that the first gate will not tip before a 1:20,000 AEP event and the last gate will tip for a 1:200,000 AEP event. This allows controlled overtopping and an incremental downstream impact. The flood levels relevant to Lake Lyell are shown on Figure 15.2 and are:

- 1% AEP (1 in 100 year) flood level is 788.4 m AHD (HARC, 2019)
- 0.05% AEP (1 in 2,000 year) flood level is 789.8 m AHD (HARC, 2019)
- Probable Maximum Flood (PMF) flood level is 795.8 m AHD (HARC, 2019).

An outlet tower and riparian outlets are also located at the existing dam, including a fixed dispersion cone valve (control valve) for water release during flood and emergency conditions.

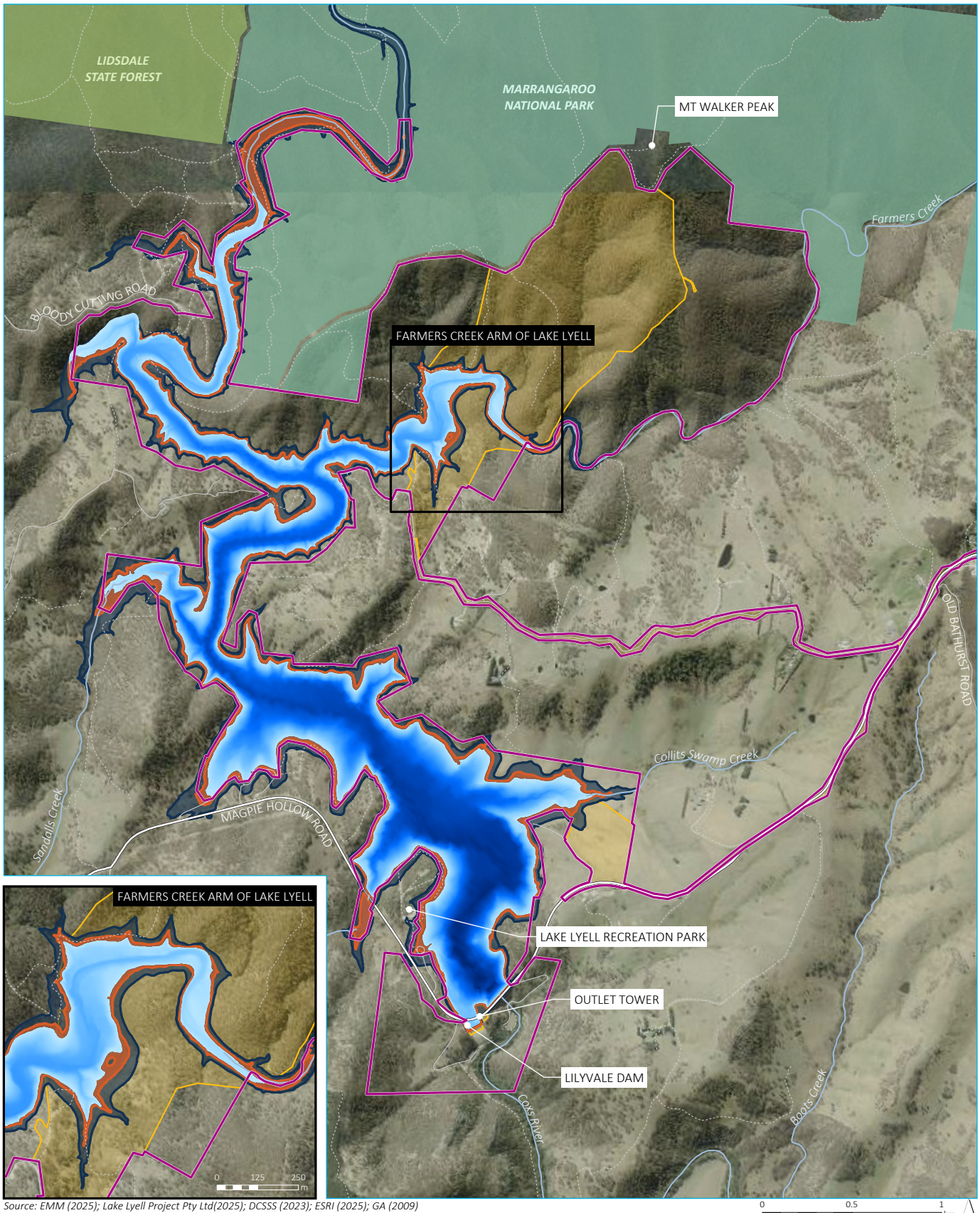
15.2.3 Transmission network and infrastructure

Electric and magnetic fields are generated when any electrical or electronic equipment is in use and can be present around any device or system that relies on electricity, ranging from household appliances to complex industrial machinery.

Electric fields are regions where electric charge experiences an invisible force. The strength of this force is related to the voltage of the high voltage conductors. Electric fields are strongest close to the high voltage conductors and reduce quickly with distance from the conductors. Many materials, including metal, bricks and concrete will block electric fields, so they are easily shielded. Because they are related to voltage, the electric fields associated with transmission lines remain constant over time for a given operating voltage.

Magnetic fields are regions where magnetic materials experience a force produced by an electrical current (measured in amps). Since magnetic fields increase as current increases, they fluctuate more than electrical fields. This is because the current in overhead lines and cables typically fluctuates significantly due to changes in generation and loads. Magnetic field strength also decreases with distance from the source of electrical current. Magnetic fields are different to electric fields in that they are not easily blocked by common materials. Consequently, the magnetic fields associated with cables will penetrate outside the cables.

The project includes a short transmission connection that will be constructed to connect the HV switchyard to the nearby Wallerawang to Sydney South 330 kV transmission line.



Source: EMM (2025); Lake Lyell Project Pty Ltd(2025); DCSSS (2023); ESRI (2025); GA (2009)

0 0.5 1 km

GDA2020 MGA Zone 56

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KEY

Project area

Construction envelope

Flood level

1% AEP

Probable maximum flood (PMF)

Depth (m) from full supply level (785.5 m AHD)

0

37.6

Existing environment

Major road

Minor road

Vehicular track

Named watercourses

Named waterbody

NPWS reserve

State forest

Lake Lyell existing water depth and flood levels

Lake Lyell PHES
Environmental Impact Statement
Figure 15.2

EMM
creating opportunities

15.2.4 Contamination

Land use across the site and surrounding areas is varied. The present land use of Lake Lyell and surrounds is characterised by recreational activities. Areas of cleared vegetation have historically been used for agricultural purposes. Land uses within the broader locality and region include a wide range of agricultural industries, urban and residential development, power generation, mining, quarrying, industry, tourism, recreation, and forestry. The dominant land use character of the locality is a combination of pastures for grazing, bushland areas, and urban areas.

The Town camp project area is situated near the centre of Lithgow, off Silcock Street and is bounded by the urbanised environment of Lithgow to the north and west, while the south and east are mountainous dense forest. The Lithgow Pottery Estate forms part of the construction envelope for the Town camp. The Lithgow Valley Colliery Company established a brickworks to exploit waste clay and shale, as well as the unprofitable small coal. The proposed Town Camp would be located on the former brickworks, and later pottery, site.

Based on the review of the existing environment and previous investigations, areas of potential contamination sources identified within the construction envelope were identified to be low risk, except for the following areas which were identified as presenting a moderate contamination risk.

Road upgrade areas:

- The Shell Service Station at the intersection of Magpie Hollow Road and Great Western Highway is a potential contamination source and has been listed as a notified contaminated site by the NSW EPA. Therefore, there is a moderate risk for soil and/or groundwater contamination to exist within the vicinity of the service station.

Town camp:

- Fill material of unknown origin has been used to fill the quarry, covering approximately 2.1 ha, between 1968 and 1975 according to historical aerials, within the northern section of the Town camp. No documentation has been provided stating the origin of the fill material; therefore the contamination status is unknown.

- Several soil stockpiles were identified throughout the town camp with a large stockpile area located within the northern section, estimated to comprise a volume of approximately 21,000 m^3. Two soil stockpiles of unknown origin were also observed within the southern portion of the Town camp.

- A fill emplacement area and associated ground disturbance encompassing an estimated 2.2 ha was observed adjacent to and intersecting the south-western area of the Town camp.

- Intensive market garden activities have occurred within the southern portion of the Town camp which could have resulted in residual contamination of the soil within this area.

Two areas of the town camp, including the northern section and an area to the south-west, were reported as areas of known contamination by Lithgow City Council. No further information was provided by Lithgow City Council regarding the nature of the contamination within any of the documents provided for review.

15.3 Predicted impacts

15.3.1 Bush fire risk

i Bush fire behaviour potential

Bush fire behaviour refers to how bush fires spread and develop and is strongly influenced by weather, vegetation (fuel), topography (slope) and fire weather.

The vegetation within the main works area is predominantly a mixture of forest and woodland and located across some steep slopes. The Lakeside camp is surrounded by predominately grassland vegetation and contains more gentle slopes compared to the main works area. The alternative Town camp is located within Lithgow and is adjacent to extensive bushland (uphill topography) to the east and south.

Topography affects rate of spread with fires moving faster uphill due to preheating of fuel. As such, it would be expected that a fire that starts within the adjoining Marrangaroo National Park to the north or on the lower reaches of the site along Lake Lyell will spread more rapidly and with higher intensity upslope towards the west of the northwest of the construction envelope than a fire impacting from the southeast and spreading downslope.

Bush fire behaviour has been considered when evaluating the combination of bushfire protection measures to be implemented for the project, including measures to further increase bushfire resilience, beyond the minimum requirements. The presence of Lake Lyell immediately adjacent to the project area, together with Asset Protection Zones (APZ) of up to 100 m in the west, south and north of the main works area will mitigate the threat of a bush fire impacting the project. Similarly, the large lot rural residential nature of land and broader road network will provide mitigation to the south-east.

ii Risk assessment

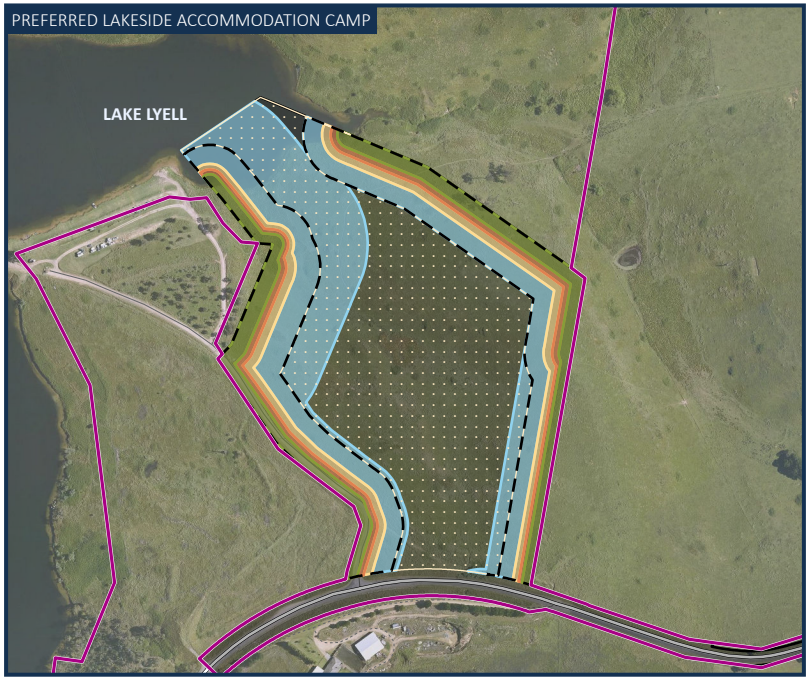
A bushfire hazard assessment for each of the proposed design components was completed to determine the APZ and Bushfire Attack Level (BAL) setbacks to be incorporated into the project's design. The results are shown in Figure 15.3 and commentary provided in Table 15.1.

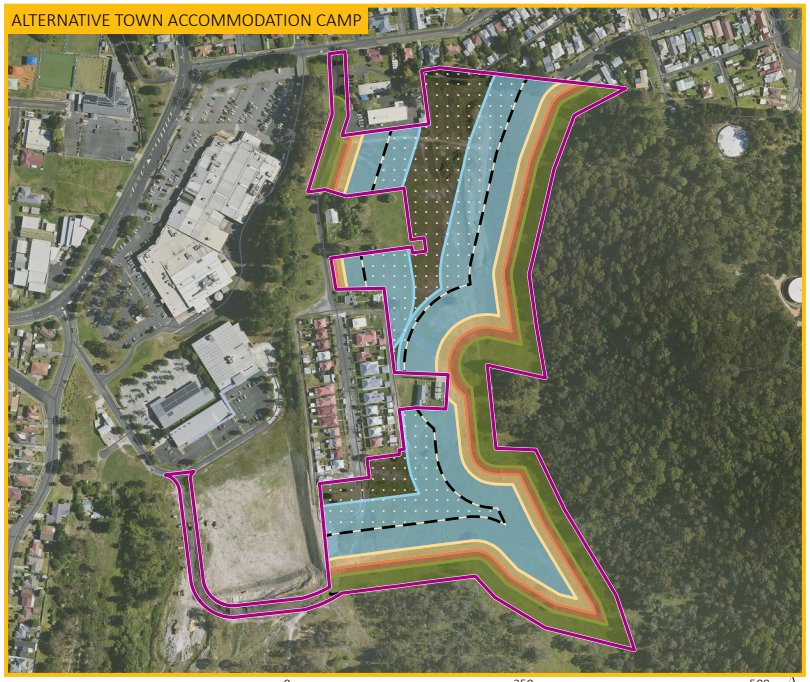
Whilst refuge buildings are currently not included in the concept design, they are recommended to be included as part of the detailed design for the permanent infrastructure (i.e. administration building in the laydown area and control room in the switchyard) due to the site's isolated location and required travel distance (through bushfire prone land).

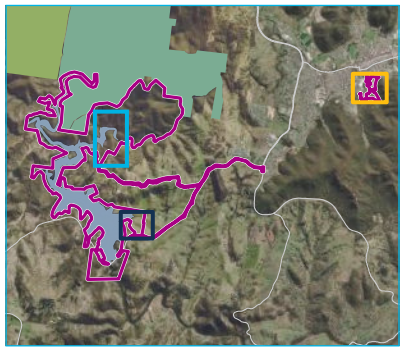
Table 15.1 APZs and BAL for relevant work areas

Project element	Summary of assessment	Additional mitigations
Preferred Lakeside camp	Minimum APZ recommended (BAL 29) can be achieved within the disturbance footprint.	Given the temporary nature of the camp and low overall risk (i.e. grassland, woodland and/or waterbody) a safe refuge building is not considered necessary. However, buildings must be constructed to the relevant BAL rating based on their location.
Alternative Town camp	Minimum APZ recommended (BAL 29) can be achieved within the disturbance footprint.	Given the temporary nature of the camp and its location within the centre of town, a safe refuge building is not considered necessary. However, buildings must be constructed to the relevant BAL rating based on their location.
Laydown	No APZ is required. The nearest unmanaged vegetation is greater than 100 m from the disturbance footprint.	A refuge building is recommended due to the site's isolated location. The available setback of >100 m based on the existing disturbance footprint allows for a safe refuge anywhere within the laydown footprint. It is recommended that the administration building is constructed within the laydown footprint to comply with BAL 29 construction.

Project element	Summary of assessment	Additional mitigations
Switchyard	Minimum APZ recommended (BAL 29) can be achieved within the disturbance footprint.	It is recommended that the control room is constructed within the available area for safe refuge to comply with BAL 29 construction.
MAT & ECVT portal	Minimum APZ recommended (BAL 29) can be achieved within the disturbance footprint.	APZ is required to the north and east where existing forest is present, however no APZ is required to the south and west as there is managed land within the disturbance footprint.







KEY

- Project area
- Disturbance footprint

Asset protection zone

- Available area for safe refuge
- Minimum APZ for safe refuge
- Asset protection zone

Bushfire attack level

- BAL 29
- BAL 19
- BAL 12.5

Existing environment

- Minor road
- Vehicular track
- Named waterbody

INSET KEY

- Project area
- Major road
- Named waterbody
- State forest
- NPWS reserve

0 250 500 m

GDA2020 MGA Zone 56

N

Source: EMM (2025); WBP (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); MetroMap (2025)

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Asset protection zones (APZ) and bush fire attack level (BAL)

Lake Lyell PHES
Environmental Impact Statement
Figure 15.3

EMM
creating opportunities

15.3.2 Flood risk

During construction lake levels will be regulated using riparian releases from the dam and pumping to Thompson Creek Reservoir. One or more fusegates on the Lilyvale Dam spillway will also be temporarily removed to lower the Fully Supply Level (FSL) by 3.2 m to 782.3 m AHD (the construction phase FSL). Removal of the fusegates would result in lower reservoir flood levels as the spillway would be engaged once lake levels exceed the construction phase FSL. The fusegates will be restored at the end of construction. During the initial construction period, lake levels will be reduced to and maintained at around 772 m AHD to enable construction of the coffer dam and other in lake works. Once these initial works are completed the lake levels will be allowed to rise to the construction phase FSL.

To protect the permanent inlet / outlet infrastructure from floods, water borne debris and sedimentation, the Farmers Creek arm of Lake Lyell will be permanently diverted before its junction with the natural extent of Farmers Creek. The diverted path of the Farmers Creek arm will comprise a waterway that will be constructed within the parent bedrock. The invert (i.e. bottom) of the drain will be between 783 to 780 m AHD (several metres below the Lake Lyell FSL of 785.5 m AHD) and will be graded east to west, in the Farmer Creek flow direction. The floor of the diversion will be the parent rock and the walls will be benched rock batters. The diversion will be within the FSL extent of Lake Lyell and will be sized to allow passage of a Farmers Creek PMF.

The PHES facility will be operated based on the electricity market demand. It is anticipated that standard operations will include either full or part cycles on most days. A full cycle will result in pumping and discharging for around eight hours within a day. Pumping will generally occur during the day and generating will generally occur during the morning and evening peaks and overnight. The maximum pump rate is 190 m^3/s and the maximum discharge rate is 210 m^3/s. During a full cycle, 5.3 GL (equivalent to 16% of Lake Lyell total storage volume) will be transferred between Lake Lyell and the upper reservoir.

Lake Lyell will generally be maintained within the target PHES operating range (781.0 to 784.5 m AHD) and will occasionally be within the maximum PHES operating range (780.0 to 786.0 m AHD). The PHES generation and associated discharges from the upper reservoir to Lake Lyell will cease when the lake water level reaches the maximum PHES discharge level of 785.5 m AHD, which is the same as the Lake Lyell FSL or spill level. This will avoid PHES discharges while Lake Lyell is spilling (due to inflows) and any associated downstream flood impacts.

15.3.3 Dam break analysis

Dambreak scenarios were modelled and included a sunny day failure (SDF) event and a probable maximum flood (PMF) event, with and without failure of the upper reservoir, and used to inform a dam break and consequence assessment (HARC, 2024).

Key outputs of the consequence assessment are an estimation of the population at risk (PAR), potential loss of life (PLL), economic damages, and environmental, social and cultural impacts. The definition of PAR includes all people who would be directly exposed to flood waters, assuming they took no action to evacuate. The PLL is estimated based on a graphical relationship between flood severity, dam failure warning times and fatality rates[6], and applied to the PAR. A summary of the dam break consequence assessment (HARC, 2024) is provided in Table 15.2.

[6] Based on Reclamation Consequence Estimating Methodology (RECM) and Australian National Committee on Large Dams (ANCOLD) guidelines

Table 15.2 Summary of dam break consequence assessment

Modelled scenario	Details	PAR	PLL	Total economic cost ($)	Severity of damage and loss (incl. environmental and social impacts)
Sunny day failure	Lake Lyell at typical operating level	3	0.013	Infrastructure cost: $81M Indirect costs: $24M	Major
	Lake Lyell at maximum operating level	31	0.16	Infrastructure cost: $82M Indirect costs: $25M	Major
Flooding – PMF	Breach scenario. Lake Lyell at FSL.	195	10.25	Infrastructure cost: $118M Indirect costs: $35M	Major
	No breach scenario. Lake Lyell at FSL.	195	3.28	Infrastructure cost: $37M Indirect costs: $11M	Major

Note: PAR and PPL are presented as weighted numbers based on totals for daytime and nighttime PAR

A cascade failure was also considered, in the event the two upstream dams on the Coxs River were also to fail, i.e. Thompson Creek Reservoir and Wallerawang Reservoir (Wallace Lake). It is considered in such a flood event:

- Thompsons Creek dam is unlikely to fail, due to small catchment and the dam's ability to pass flow without overtopping
- Wallerawang dam would be overtopped so has the potential to fail. However, previous modelling shows there is little difference in outflows when comparing with and without a dambreak.

In the event of a cascading failure, each of the fuse gates at Lilyvale Dam would be engaged. A failure of the upper reservoir in this event does not result in overtopping at Lake Lyell.

There are no known historical or current exploration or mining activities within the immediate vicinity of the project that could impact on the stability of the dam.

The upper reservoir will be a declared dam subject to the NSW *Dam Safety Regulation 2019*. Under Part 4 of the regulation, a declared dam owner must create operation and maintenance plans and emergency management plans. The operation and maintenance plans describing details such as operating procedures, alarms and trigger levels, and security arrangements, while the emergency management plans must describe the consequence category, dam construction, circumstances which may cause the dam to fail, descriptions of emergency warning systems, and emergency procedures.

Consideration will also be given to all future Dam Safety NSW guidance on how to ensure compliance with the regulation and standards.

15.3.4 Electric and magnetic fields

From the switchyard, a single circuit transmission line approximately 150 m long will be constructed to connect with the existing 330 kV lines that pass through the project area. Due to the relatively short length of the transmission connection, up to six monopole towers are anticipated.

EMF limits for this study are taken from the ICNIRP. The limit of electric field strength and magnetic field strength to protect human health as determined by the ICNIRP are as follows:

- General public: 5 kilo volts per metre (kV/m) and 2000 milligauss (mG).
- Occupational Personnel: 10 kilo volts per metre (kV/m) and 10 000 milligauss (mG).

The results of the EMF assessment indicate that the predicted field strength levels from the proposed electrical infrastructure are within the allowable limits for occupational exposure. The electric field strength is above the ICNIRP limits for public exposure but passes TransGrid's limits. The proposed transmission lines are contained within the project site, which is inaccessible to the general public, therefore the predicted electric field strength is acceptable.

15.3.5 Contamination risk

The project has the potential to interact with existing contamination and introduce new sources during construction. Key risks include:

- excavation and handling of spoil from the upper reservoir, diversion channel, tunnelling works and road upgrades. This material would be tested and characterised prior to reuse in dam embankments, laydown pads and other infrastructure, or disposed off-site at a facility approved to receive such spoil if unsuitable for reuse on site
- temporary and permanent spoil storage, including the potential release of nitrates from drill and blast residues. Stormwater management (refer Chapter 6, Appendix F and Appendix I) would be installed to contain and test leachate to ensure k and non-pollution
- new contamination sources introduced through construction activities, such as storage and handling of fuel, oils and chemicals, refuelling of plant and equipment, and generation of construction waste.

Potential exposure pathways for workers include direct contact with spoil or contaminated water, inhalation of dust or fibres, and incidental ingestion. Ecological receptors may also be exposed via uptake or ingestions.

Based on the review of the existing environment and previous investigations, areas of potential contamination sources identified within the construction envelope were identified to be low risk, except for the areas outlined in Section 15.2.4 which were identified as presenting a moderate contamination risk.

Potential transport mechanisms include surface run-off into local waterways, disturbance and relocation of spoil, vertical seepage into soil and groundwater, and dust dispersion. Receptors include construction workers, nearby residents and recreational users, and ecological systems in surface water bodies.

Potential contamination risks during operation are low. The main pathway relates to disturbance or reuse of spoil and sediment that may contain NORM or anthropogenic contaminants. Other potential risks are minor and relate to small leaks or spills during maintenance of pumps, valves and other mechanical infrastructure. Only minor quantities of oils and greases would be used, and spill containment facilities would be installed in permanent operational areas.

The risk of contamination is assessed as low to moderate, with management measures outlined in Section 15.4 and in Appendix E.

15.3.6 Dangerous or hazardous materials - preliminary risk screening

The Resilience and Hazards SEPP defines potentially hazardous industry as:

> a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality—
>
> (a) to human health, life or property, or
>
> (b) to the biophysical environment,

and includes a hazardous industry and a hazardous storage establishment.

A 'hazardous industry' is one which, when all locational, technical, operational and organisational safeguards are employed, continues to pose a significant risk in relation to the locality.

The risk screening process in the *Hazardous and Offensive Development Application Guidelines – Applying SEPP 33* (DoP 2011) (SEPP 33 guideline) considers the type and quantity of hazardous materials to be stored on site, distance of the storage area to the nearest site boundary, as well as the expected number of transport movements.

An assessment of the project against SEPP 33 guideline potentially hazardous development criteria is provided in the following sub-sections.

i Hazardous materials stored, processed or handled

The storage conditions, quantities and hazardous properties of the materials that will be stored and used onsite are provided in Table 15.3. The storage and use of hazardous materials will be in accordance with AS 1940:2004 *The Storage and Handling of Flammable and Combustible Liquids*.

Table 15.3 Material storage details

DG Class	Material stored	Area	Approximate Qty (t)	Notes / Storage conditions
Construction				
Class 1.1	Packaged explosives and detonators	Explosives Magazine Storage Area	Up to 10 tonne (t)	Stored within a magazine located near the upper reservoir spillway Storage is over 400 m from nearest boundary – Below threshold
Class 2.1 Flammable gases	Acetylene	Various	<100 kilograms (kg)	Stored in cylinders for maintenance or welding at various worksites within the project boundary (>10 m)
Class 2.2 Non-flammable, non-toxic gas (2.2)	Inert gas for fire suppression system, oxidising gas	Various	Unknown at current design stage	Fire extinguishers, stored at various locations
Class 3 Flammable Liquid PG II (3PGII)	Fuel/Various	Switchyard and upper reservoir soil pad #5 / #6	400 litres (L)	
Class 3 Flammable Liquid PG III (3PGIII)	Diesel fuel	Switchyard and upper reservoir soil pad #5 / #6	~5,000 L	Stored in self-bunded tanks
Class 5.1 PGIII	Emulsion (Ammonium Nitrate)	MAT/ECVT Portal	Up to 1 t	Bulk emulsion will be stored in containers at the tunnel portal
Class 8 PG III (8PGIII)	Batteries/corrosive substances (including acidic and caustic chemicals, coagulants, flocculants)	Workshop, accommodation camp (water treatment plant)	~3,500 L	Stored in separate drums and tanks, bunded where required

DG Class	Material stored	Area	Approximate Qty (t)	Notes / Storage conditions
Class 9 (Miscellaneous Dangerous Goods)	Lithium ion electric vehicles (light vehicles) (above ground)	Accommodation camp, main project site	>1,000 kg	A ventilation study will be undertaken in a subsequent phase which may result in a requirement for an electric fleet to be used.
	Lithium ion electric plant/heavy vehicles (above ground)	Switchyard and infill pad areas	>1,000 kg	
	Lithium ion electric plant/heavy vehicles (underground)	Underground workings	>1,000 kg	
Operation				
Class 3 Flammable Liquid PG II (3PGII)	Fuel/Various	Switchyard	0.4	

Notes: *The Dangerous Goods Code states that diesel is not subject to the code as it has a flash point of more than 60°C.

Other hazardous materials to be stored onsite in low quantities at the workshop, laydown areas and/or administration building include cleaners (brake clean, parts cleaner, truck wash), lubricants (engine oil, transmission oil, hydraulic oil, drive oil), anti-seize/rust prevention, paint spray cans, sealants, batteries (for tools) and aerosols, as well as dishwashing liquid, window cleaner, Glen20, etc.

A screening for dangerous goods against the thresholds in SEPP 33 guideline is provided in Table 15.4.

Table 15.4 Applying SEPP 33 screening test

DG Class	Total quantities	SEPP 33 screening method	SEPP 33 screening threshold (t)	Potentially hazardous?
1.1	Up to 10t	Figure 5 if more than 100 kg	100 kg 300 m	No – site magazines are located over 400 m away from project boundary
Class 2.1	< 100 kg	Table 3	0.1 t 6 m (sensitive land use) 8 m (other land use)	No – cylinders are stored 10 m or more from project boundary
Class 2.2	Unknown at current design stage	Excluded from screening in accordance with SEPP 33		
Class 3 Flammable Liquid PG II (3PGII)	400 L	Figure 9 graph	Greater than 5 t at specified distance	No
Class 3 Flammable Liquid PG III (3PGIII)	~5,000 L	Figure 9 graph	Greater than 5 t at specified distance	No
5.1	Up to 4t	Table 3	5 t	No
Class 8 PG III (8PGIII)	3,500 L	Table 3	50 t	No
Class 9 (Miscellaneous Dangerous Goods)	>1,000 kg	Excluded from screening in accordance with SEPP 33		

Based on the dangerous goods screening test, the development is not classified as potentially hazardous.

ii Transport of hazardous materials

The applicable SEPP 33 guideline also sets threshold limits for the transportation of hazardous materials to and from a site. The approximate quantities per load, and the number of weekly and annual deliveries for the project are below the SEPP 33 guideline transport screening thresholds (refer to Table 15.5). Based on the dangerous goods screening test, the development is not classified as potentially hazardous.

Table 15.5 Applying SEPP 33 guideline transportation screening test

DG Class	Project		Screening thresholds		Potentially hazardous?
	Movements (weekly, peak)	Quantities per load (average, t)	Movements (weekly, peak)	Quantity (bulk / packages)	
Class 1.1 (explosives)	2	2	DPHI to provide advice – per screening guideline		
Class 2.1	1	< 0.1	>30	2 / 5	No
Class 2.2	Excluded from screening – per screening guideline				
Class 3PGII	2	1	>45	3 / 10	No
Class 3PGIII	8	1	>60	10 / no limit	No
Class 5.1 (bulk emulsion)	2	1	>30	2 / 5	No
Class 8	20	<0.5	>30	2 / 5	No
Class 9	40	1	>60	No limit	No

iii Other risk factors

Application of the Resilience and Hazards SEPP requires an assessment of other hazards / risk factors outside the scope of the risk screening method. An assessment of other types of hazards associated with the project is provided in Table 15.6.

Table 15.6 Other types of hazards

Type of hazard	Comments
Any incompatible materials (hazardous and non-hazardous materials)	No
Any wastes that could be hazardous	No
The possible existence of dusts within confined areas	No
Types of activities the dangerous goods and otherwise hazardous materials are associated with (storage, processing, reaction, etc).	No
Incompatible, reactive or unstable materials and process conditions that could lead to uncontrolled reaction or decomposition	No
Storage or processing operations involving high (or extremely low) temperatures and/or pressure	No
Details of known past incidents (and near misses) involving hazardous materials and processes in similar industries	No known incidents involving hazardous materials / processed at pumped hydro developments.

15.4 Management and mitigation

Management measures have been developed specific to each hazard requiring control, and for each of the relevant phases of the project. These are provided in detail in the supporting technical studies and consolidated in Appendix E. Management and mitigation measures include:

- Detailed design – road design for emergency vehicle access, incorporating the required APZs and recommended safe refuge buildings for bushfire protection, compliance with transmission design standards, and compliance with Dams Safety NSW requirements. Should the Town camp be selected for the project or excavation within the curtilage of the Shell Service Station is required, then further intrusive investigations will be undertaken during detailed design, to define the presence of contamination and identify any remediation requirements.

- Construction – hazard control and management measures will be included within the project's CEMP / Safety Management Plan, including compliance with the storage and handling of dangerous or hazardous materials, and including development of relevant sub plans such as:

    - an Emergency Management and Evacuation Plan

    - a Fire Management Plan, developed in consultation with the NSW RFS District Office and Fire and Rescue NSW

    - a Soil and Water Management Plan (SWMP) and Spoil Management Plan, detailing safety and environmental controls and procedures, a site-specific Asbestos Management Plan (should asbestos containing material be encountered during construction) and an unexpected finds protocol for contaminated materials.

- Operation – operational controls will be included in the project's OEMP, including provision for the management of environmental incidents (leaks and spills), firefighting and bushfire protection and emergency response protocols. Operation and maintenance plans, and emergency plans, will be required to be submitted to Dams Safety NSW and approved prior to operation.

15.5 Conclusion

An assessment of potential hazards and public safety risks from the project has been completed for the project and shows that potential impacts can be appropriately managed.

The project is located within a bushfire prone area and can be designed to comply with APZ, emergency access and safe refuge requirements. A Fire Management Plan and Emergency Management and Evacuation Plan will be developed and implemented for the project to manage bush fire risk and response.

A dam break and consequence assessment was carried out to determine risks to the downstream population and the upper reservoir will be subject to the safety requirements of the *Dam Safety Regulation 2019* and Dam Safey NSW guidance. This will require operation and maintenance plans as well as emergency management plans and procedures, developed in consultation with Dams Safety NSW.

An assessment of the project against the Resilience and Hazards SEPP determined that the project is not a potentially hazardous development or a potentially offensive industry and compliance with the storage and handling of dangerous or hazardous goods will form part of the project's CEMP. Similarly, potential contaminants of concern have been identified and can be appropriately managed through mitigation measures and protocols There is no EMF risk to the public as the switchyard and transmission connection will be on private land and inaccessible to the public.

Chapter

16

Climate change

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16 Climate change

The project is intended to operate over a long period of time, with an approximate 80 to 100-year design life. Over this same time period, changes to local and regional climate are expected. The project therefore needs to consider opportunities for climate change adaptation, to ensure resilience to future climatic variability.

A detailed climate change risk assessment (CCRA) was prepared to determine the resilience of the construction and operation of the project to the likely future impacts of climate change and is provided in Appendix X. A summary of this assessment is presented in this chapter.

16.1 Climate review and projections

The project is in the Central Tablelands region of NSW. Both historical climate data and future climate projections from relevant data sources were used to characterise climate variables for the project.

The past climate in the area around the project was characterised using long-term temperature and rainfall data from the Bureau of Meteorology (BoM) monitoring station at Lithgow (Cooerwull) (ID: 63226). The Lithgow monitoring station is approximately 4.6 km to the east-north-east of the centre of the project area, and at a similar elevation to the project (around 900 m). For the near future (2030 – considered representative of the construction and early operational phases of the project) and far future (2070 – considered representative of the long-term operation of the project), climate parameters were taken from both the AdaptNSW website and the NSW Climate Data Portal, including projection data from the NSW and Australian Regional Climate Modelling (NARCliM) project.

Changes in climate variables in the area of the project can be broadly summarised as follows:

- **Temperature**: Increases in average and maximum temperatures, as well as the number of hot days per year. The changes are more severe in the far future than in the near future. The confidence in the temperature predictions is very high.
- **Rainfall**: The rainfall projections from different data sources are variable. Based on the NARCliM 2.0 data for the project location:
  - a decrease in seasonal and annual rainfall in the near and far future for both emission scenarios
  - increased intensity of extreme rainfall events in the near and far future.

  The confidence in the rainfall projections is generally low, although there is high confidence of an increased intensity.
- **Drought**: More frequent and prolonged droughts, with a low-to-medium level of confidence.
- **Fire danger**: Increase in high fire danger days. The confidence level is high for harsher fire-weather in general, but low for the actual magnitude of the change.
- **Storms**: Decrease in frequency of east coast lows and tropical cyclones, but with increase in intensity in warmer months. The predictions for tropical cyclones have a medium confidence level.

16.2 Risk assessment

16.2.1 Climate risks

The effects of future changes in climate were considered in relation to potential impacts on project assets or functions, including areas such as physical structures, transport, and worker safety. In total, 10 potential construction impacts and 28 potential operational impacts were identified.

Construction risks (unmitigated) were only assessed for a near-future scenario, given the timescale and duration of when construction would occur. A mixture of low, medium and high-risk ratings were initially identified. High initial risks were associated with delays to construction due to bushfires and flooding.

Operational risks were assessed for the near-future and far-future scenarios, given the longer timescale and duration. All of the initial risk ratings (unmitigated) were either 'low' or 'medium'.

16.2.2 Measures to mitigate, adapt or build resilience

Measures to mitigate, adapt or build resilience to the identified risks identified were assessed through a climate risk and adaption workshop. These include measures that have already been considered within the project's design and management, or additional measures proposed where those already considered were identified as ineffective or partially effective at reducing the risk. Measures identified through the risk assessment include:

- Design:
  - designing dam components in accordance with Australian Standards, which account for temperature variability and extreme rainfall events
  - incorporation of an ability to move water within the broader system (e.g. Upper Coxs River Water Supply Scheme, including Thomsons Reservoir)
  - establishment of APZs for buildings, with fire-resistant materials used for structures
  - debris and trash screens on water inlets
  - geotechnical stability embedded into the dam design
  - lightning protection systems.
- Operation:
  - regular maintenance and monitoring, including clearing of vegetation.
- Plans and schedules:
  - compliance with water extraction licences, dam safety requirements and WSP
  - incorporation of an emergency response procedure and flood forecasting into operating procedures, to mitigate the risk of flooding during extreme rainfall events
  - implementation of a Bushfire Emergency Management and Operations Plan
  - work health and safety policies
  - contractor policies (to include strategies to mitigate identified risks).

16.2.3 Residual risks

For most potential climate change impacts during construction, and all potential climate change impacts during operation, the residual risk (i.e. risk after mitigation measures are applied) was determined to be 'low'. Three potential climate change risks during construction received a 'medium' residual risk rating, as no further mitigation or adaption measures were considered reasonable and feasible to apply (refer to Table 16.1).

Table 16.1 Climate change impacts with residual risk above 'low' (construction)

Risk ID	Climate hazard	Potential impact	Residual risk (2030)
CON-R-01	Increased intensity of extreme rainfall events	Delays to construction. Heavy downpours damage unsurfaced roads, cause slope instability that blocks roads, or cause flooding.	Medium
CON-R-02		Delays to construction. Physical damage to works due to inundation. Safety. Environmental consequences – reduced water quality.	Medium
CON-S-02	Increased severity of storms	Delays to construction. Increased severity (and possibly frequency) of lightning strikes prevent work on site due to safety risk.	Medium

Based on the measures identified and generally low overall residual risks for the project, it is considered that further, additional measures would not need to be considered.

16.3 Conclusion

The residual risk of climate change-related impacts is generally low for the project. The effectiveness of site management strategies and design will be reviewed on an ongoing basis throughout the life of the project, in line with annual environmental reporting requirements for the site.

Chapter

17

Waste

Environmental Impact Statement |
Lake Lyell PHES Project

17 Waste

17.1 Assessment approach

A waste assessment has been prepared that identifies, quantifies and classifies the likely waste streams to be generated during construction and operation of the project, and is provided at Appendix Y. The assessment considers the requirements of the POEO Act, methods in the *NSW EPA Waste Classification Guidelines,* and management per the waste hierarchy (2021) and the circular economy principles described in the *NSW Waste and Sustainable Materials Strategy 2041: Stage 1 (2021–2027)*.

17.2 Existing waste facilities

There are several existing licensed waste management and waste transfer facilities in the broader region (i.e. Lithgow, Oberon, Bathurst and Blue Mountains) that accept a wide range of wastes, including construction and demolition waste, domestic waste and recyclables. The project's surrounding local area is served by Lithgow City Council's municipal and commercial waste infrastructure.

17.3 Waste generated by the project

Waste generated from the project will include a mixture of general solid waste (non-putrescible and putrescible), general liquid waste, hazardous waste and special waste. The most significant contributor will be spoil generated from excavation of the upper reservoir, waterway tunnels, and powerhouse cavern, with an estimated 7.6 Mm^3 of material. Approximately 97% of this spoil will be reused on-site, primarily for dam wall construction, site recontouring, and permanent road embankments, significantly reducing off-site disposal requirements (which will be needed for the remaining 3% of spoil that is not suitable for re-use).

Other key waste streams will result from vegetation clearing for temporary and permanent infrastructure construction, wastewater from concrete batching operations and tunnel construction, sewage and greywater from the temporary workforce accommodation facility (accommodation camp), and packaging and maintenance waste from construction and operation of the site. Smaller volumes of hazardous waste may arise from blasting residues (e.g. ammonium nitrate), fuel or chemical storage, and special waste such as lead-acid batteries and asbestos-containing material.

A breakdown of quantities of each waste stream is provided in the waste assessment at Appendix Y, including estimated volumes and quantities of re-use on site and estimated quantities requiring offsite disposal.

Preliminary consultation with Lithgow City Council indicates that its facilities have capacity to manage the anticipated project waste requiring offsite disposal. This will be re-confirmed during detailed design, including with specific facilities closer to the commencement of construction. Engagement with privately operated waste facilities will also be undertaken as required.

17.4 Management and mitigation

Waste management across the project will align with the waste hierarchy to firstly avoid and reduce waste, reuse waste, and dispose of waste as a last resort. The project has actively applied the waste hierarchy in the development of its design and construction strategy, as the most significant waste stream (excavated spoil) will be reused on-site to the greatest extent practicable. Further, other approaches to waste management for the project include the mulching or processing of vegetation for re-use, the treatment and reuse of wastewater, construction water and stormwater runoff, and segregation of waste at the construction accommodation camp.

A construction waste management plan (CWMP) will be developed prior to works commencing, incorporating the project's waste management approach and measures.

Chapter

18

Cumulative impacts

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18 Cumulative impacts

This chapter provides an assessment of the project's potential to generate cumulative impacts in the region. The assessment has been completed with reference to the *Cumulative Impact Assessment Guidelines for State Significant Projects* (Cumulative Guidelines) (DPIE 2022).

18.1 Overview

A range of renewable energy, transmission and extractive industry developments are proposed within the Lithgow region and surrounding localities (refer to Figure 18.1). The potential for the project to contribute to cumulative impacts in combination with these projects has been assessed in accordance with the Cumulative Guidelines.

A cumulative impact scoping assessment was initially completed in 2023 to support the scoping report for the project. It identified six nearby developments but found no potential impacts that warranted detailed cumulative assessment. As part of this EIS, the assessment has been reviewed and updated to reflect current project information and additional proposed developments within the region. Several of the previously identified projects now have revised construction timelines or further environmental assessment information available, indicating the potential for overlap with the project.

18.2 Other state significant projects

Recently approved and proposed SSD and SSI projects within approximately 25 km of the project, and approved within the last five years, were identified through DPHI's Major Projects Planning Portal (as of November 2025). The 25 km radius captures the developable land within the Lithgow basin, extending to the south-western border of Wollemi National Park and the Lithgow LGA boundary to the east, south and west. Projects beyond this distance are sufficiently separated and are not expected to contribute to cumulative impacts. An indicative construction period of 2026–2030 (approximately five years) has been assumed for this assessment. These projects are listed in Table 18.1, with the relevant cumulative impacts with the project identified.

Table 18.1 Cumulative impacts with future projects

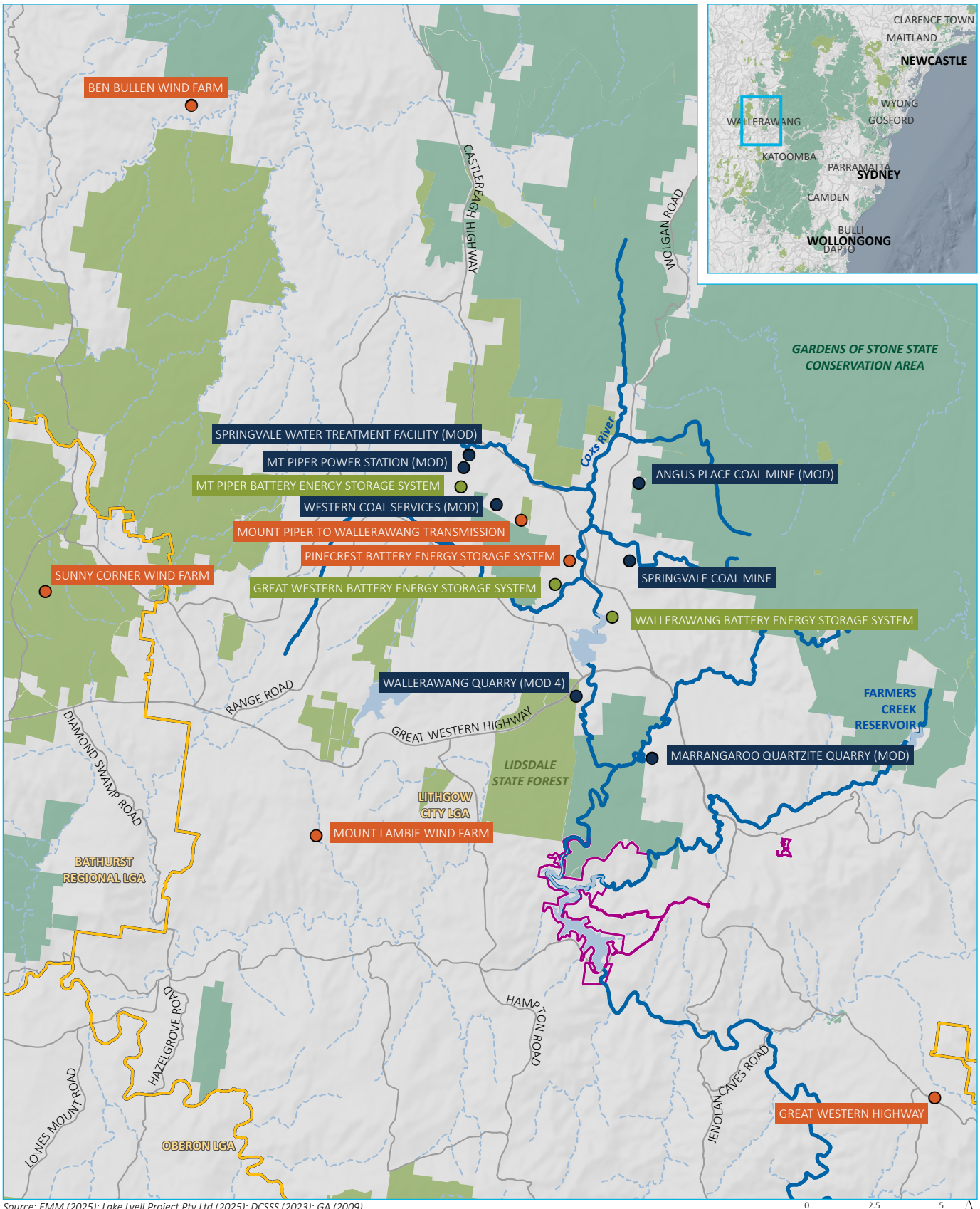
Project	Distance from project (nearest point)	Project status	Indicative timing	Local government area	Relevant cumulative impacts
Wallerawang Battery Energy Storage System (SSD-14540514)	6.2 km north	Approved – MOD submitted	• Construction: 12–24-month period from Q2 2026 (overlaps project construction) • Operation: 2028–2053 (overlaps project construction and operation)	Lithgow City Council	• biodiversity • visual • social and economic
Great Western Highway Blackheath to Little Hartley (SSI-22004371)	10.4 km south-east	On hold	• Project on hold with no forecasted timeframe for recommencement	Lithgow City Council, Blue Mountains City Council	• not considered further

Project	Distance from project (nearest point)	Project status	Indicative timing	Local government area	Relevant cumulative impacts
Mount Piper Battery Energy Storage System (SSD-50903958)	13.4 km north-west	Approved – not yet constructed	• Construction: 18–24-month period from 2026 (overlaps project construction) • Operation: 2028–2053 (overlaps project construction and operation)	Lithgow City Council	• biodiversity • social and economic
Great Western Battery Energy Storage System (SSD-12346552)	8.3 km north	Approved—not yet constructed	• Construction: 12–16-month period (overlaps project construction) • Operation: 2028–2048 (overlaps project construction and operation)	Lithgow City Council	• biodiversity • social and economic
Wallerawang Quarry (MOD 4) (DA344-11-2001)	4.4 km north	Operational – Modification under assessment	• Operation: current–2050 (overlaps project construction and operation)	Lithgow City Council	• biodiversity
Mount Piper to Wallerawang Transmission Line Upgrade Project (SSI-70279722)	8.5 km north	Proposed – response to submissions	• Construction: 20–month period from 2026 (overlaps project construction)	Lithgow City Council	• biodiversity • social and economic
Ben Bullen Wind Farm (SSD-79294216)	24 km north-west	Proposed – EIS in preparation	• Construction: 12–24-month period from 2028 (overlaps project construction) • Operation: 2030–2065. (overlaps project construction and operation)	Lithgow City Council	• biodiversity • social and economic
Sunny Corner Wind Farm (SSD-80027992)	15.2 km north-west	Proposed – EIS in preparation	• construction: 36–month period from 2027 (overlaps project construction) • Operation: 2032–2062 (overlaps project operation)	Lithgow City Council	• biodiversity • social and economic
Mount Lambie Wind Farm (SSD-86097208)	4.9 km west	Proposed – EIS in preparation	• construction: 18–month period from 2027 (overlaps project construction) • Operation:2029–2034 (overlaps project construction and operation)	Lithgow City Council	• biodiversity • visual • social and economic
Pinecrest Battery Energy Storage System (SSD-83308708)	9.7 km north	Proposed – EIS in preparation	• Construction: 18–month period from Q4 2026 (overlaps project construction) • Operation: 2028–2053 (overlaps project construction and operation)	Lithgow City Council	• social and economic
Marrangaroo Quartzite Quarry Extension	2.8 km north	Operational – EIS in preparation for extension of operations	• Operation: current–2056 (overlaps project construction and operation)	Lithgow City Council	• groundwater

Project	Distance from project (nearest point)	Project status	Indicative timing	Local government area	Relevant cumulative impacts
Angus Place Coal Mine (MP06_0021)	10.7 km north	Operational – MOD submitted	• Operation: current–2046 (overlaps project construction and operation)	Lithgow City Council	• biodiversity • water
Mount Piper Power Station (DA80/10060)	13.2 km north-west	Operational – MOD submitted	• Operation: current–2040 (overlaps project construction and operation)	Lithgow City Council	• water
Springvale coal mine (SSD-5594)	10.17 km north-east	Operational	• Operation: current–2040 (rehabilitation thereafter) (overlaps project construction and operation)	Lithgow City Council	• water
Springvale Water Treatment Facility (SSD-7592)	9.4 km north	Operational – MOD submitted	• Operation: current–unknown (overlaps project construction and operation)	Lithgow City Council	• water
Western Coal Services (SSD-5579)	12.8 km north-west	Operational – MOD submitted	• Operation: current–2040 (consent end date) (overlaps project construction and operation)	Lithgow City Council	• water

The timing and progression of projects listed in Table 18.1 will depend on a range of factors, including final investment decisions and infrastructure delivery sequencing within the Lithgow region.

Transmission infrastructure upgrades to support energy generation and storage projects in the area (such as the Mount Piper to Wallerawang Transmission Line Upgrade) are currently in planning or early assessment. This supporting infrastructure will influence the construction timing of future developments. As it is unlikely that all nearby projects will be approved and built concurrently, this assessment of cumulative impacts is considered conservative.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); GA (2009)

0 2.5 5 km
GDA2020 MGA Zone 56

N

KEY

- Project area
- Key river and creek
- Reservoir

Nearby project

- Proposed
- Approved
- Operational

Existing environment

- Major road
- Named watercourse
- NPWS reserve
- State forest
- Local government area

Nearby developments within the Lithgow region

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Figure 18.1

EMM
creating opportunities

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18.3 Assessment of cumulative impacts

18.3.1 Biodiversity

i Terrestrial

The BDAR (refer to Appendix J) identified that similar PCTs, threatened ecological communities (TECs) and threatened species are likely to be affected by other major projects within the Lithgow LGA and surrounding localities. Consequently, biodiversity impacts from the project will be similar in nature to those predicted for other renewable energy generation, transmission and extractive industry developments in the region. Key biodiversity values that may be affected by cumulative impacts of nearby projects include habitat for the Gang-gang Cockatoo, Glossy Black-cockatoo, Koala, Powerful Owl and Purple Copper Butterfly.

While the Cumulative Guidelines recommend limiting the assessment to species listed in the NSW DCCEEW threatened biodiversity profile data collection (TBDC) (BCS 2025b) as being SAII entities, the project has taken a more conservative approach. Although the Sooty Owl and Large Bent-winged Bat occur within the broader project area, the project will not affect the specific habitat types that support their SAII status. Instead, the Cumulative Impact Assessment (CIA) focuses on threatened species most likely to experience cumulative impacts in combination with other developments in the region.

Projects considered relevant to the CIA are those currently under assessment or approved within the last five years where native vegetation clearing is proposed. Six projects were identified as likely to contribute to cumulative biodiversity impacts in the future:

- Wallerawang Quarry Modification 3 (DA344-11-2001-Mod-3)
- Wallerawang Battery Energy Storage System (SSD-14540514)
- Great Western Battery Energy Storage System (SSD-12346552)
- Great Western Highway Blackheath to Little Hartley Upgrade (SSI-22004371)
- Mount Piper Battery Energy Storage System (SSD-50903958)
- Mount Piper to Wallerawang Transmission Line Upgrade Project (SSI-70279722).

No additional projects were identified that would substantially affect biodiversity values within the 25 km CIA study area. A search of EPBC Act Public Portal on controlled actions did not identify any further relevant projects beyond those already captured on the NSW Major Projects Portal.

Cumulative impacts for the five key threatened species are predicted to occur through the combined clearing of habitat within the CIA study area. Based on available data, total direct impacts associated with all projects (including Lake Lyell PHES) range from approximately 114.36 ha to 206.41 ha across the five species. When compared to the estimated 69,662 ha to 86,417 ha of suitable habitat available within the CIA study area, the cumulative loss equates to about 0.16% to 0.25% of available habitat for key threatened species.

Large areas of intact native vegetation are formally protected within the Marrangaroo National Park and Gardens of Stone State Conservation Area, which provide ongoing refuge and connectivity for these species. Accordingly, cumulative impacts from approved and proposed developments are not expected to cause a measurable decline in habitat availability or integrity for these species at a regional scale.

The potential for cumulative effects on habitat connectivity was also assessed. No approved or proposed projects were identified that, in combination with the project, would inhibit movement or dispersal of the five key species. The closest relevant project, Wallerawang Quarry, is located approximately 6 km north of project. While the quarry will result in a small incremental loss of native vegetation, the separation distance and extensive intervening habitat mean it will not materially reduce habitat connectivity for any of the key species.

Impacts on native vegetation and TECs for projects listed in Table 18.1 that are early in the planning process (i.e. pre-EIS lodgement) cannot be quantified. Several other developments in the broader region, such as the Ben Bullen, Sunny Corner, and Mount Lambie renewable energy proposals remain in the scoping phase with limited publicly available environmental information. These projects are expected to share similar key threatened species (particularly Gang-gang Cockatoo, Glossy Black-cockatoo, Koala, Powerful Owl and Purple Copper Butterfly) and will likely contribute to cumulative habitat loss and fragmentation if progressed. Their potential contributions will be better understood as detailed assessments are released.

All projects would have biodiversity offsetting requirements to compensate for these impacts. Extensive efforts have been made to avoid and minimise impacts to biodiversity values present within the project area. Mitigation measures will also be implemented to enhance local habitat quality, including habitat augmentation and research initiatives such as creating cave-like bat habitat, reusing felled tree trunks to establish nest supports, and contributing to research on the local population of the Purple Copper Butterfly. The residual impacts to biodiversity values mitigated and offset through the retirement of biodiversity credits.

ii Aquatic

Lake Lyell is currently operated to supply water to the Mount Piper power station and the existing operational guidelines include impacts to aquatic ecology values within Lake Lyell as a result of fluctuating water levels. The operation of the project will alter the frequency of changes in water level within the existing operation guidelines of Lake Lyell. No other projects or uses are known to be considered to contribute to cumulative impacts. As such no cumulative aquatic impacts are predicted.

18.3.2 Water

18.3.3 Groundwater

Cumulative groundwater impacts have been assessed in Appendix G. The assessment considered potential watertable drawdown resulting from the project in combination with the nearby Marrangaroo Quarry. As discussed in the GIA (Section 9.3.1 of Appendix G), the maximum drawdown is expected to occur during construction of the project, representing the period of greatest potential for groundwater-related impacts.

Model results (Figure 9.6 of Appendix G) predict watertable drawdown exceeding 0.2 m (the practical limit of model accuracy) as small, isolated areas separated by approximately 3 km around the project and Marrangaroo Quarry. The potential for cumulative drawdown impacts between these two projects is therefore considered negligible, with no overlap in the zones of influence and no expected interaction of groundwater depressions.

18.3.4 Surface water

The project is located within the Coxs River system, where treated discharges from upstream mining and water treatment operations flow through Thompsons Creek, Pipers Flat Creek and Lake Wallace before entering Lake Lyell, from which the Coxs River continues downstream (refer to Figure 6.2). Upstream operations include Springvale Coal Mine, Angus Place Coal Mine, Western Coal Services and the Springvale water treatment facility. Regulated discharges from these operations have increased baseflows in the Coxs River and influence the volume and quality of water entering Lake Lyell.

The project interacts with the same system during both construction and operation. During construction, discharges will be limited to treated stormwater and contaminated water from the water management system, which will meet the project's minimal-harm water quality criteria. During operation, the project will cause controlled fluctuations in Lake Lyell water levels as part of the pumped hydro storage cycle, promoting mixing and destratification within the lake and maintaining water quality consistent with natural processes.

The project and upstream mining and water treatment operations will continue inflows and hydrological variation in Lake Lyell. However, as existing discharges are regulated under strict environmental licences and the project will be subject to equivalent controls and ongoing water quality monitoring, no adverse cumulative impact on water quality, hydrology or the functioning of the Coxs River–Lake Lyell system is anticipated.

18.3.5 Social and economic

i Employment and workforce

The cumulative construction workforce demand in the Lithgow region for the construction of the project (2026–2030) is estimated to be in the order of 2,000 to 2,600 workers. This figure is based on approved and proposed projects in proximity to the project area for which workforce estimates are available (Mount Piper BESS, Wallerawang BESS, the Great Western Highway upgrade, Ben Bullen Wind Farm, Great Western BESS, Mount Piper to Wallerawang Transmission Line Upgrade, Sunny Corner Wind Farm, Mount Lambie Wind Farm and Pinecrest BESS).

Peak construction activity is expected between late 2026 and 2028, with the maximum concentration in 2027, when up to around 2,000 workers may be engaged concurrently across multiple renewable energy and transmission and infrastructure projects. This estimate is conservative, as it assumes each project would reach its peak workforce simultaneously and sustain that level throughout its construction period. The peak period aligns with the main construction phase of the project and several overlapping BESS, wind farm and road upgrade works, representing the greatest potential for cumulative strain on local accommodation, services and workforce availability.

The regional study area includes communities and infrastructure likely to experience indirect social impacts associated with increased use of roads, accommodation and utilities, as well as cumulative effects from other projects in the area. Indirect impacts are expected from the movement of goods, materials and equipment, use of supply chains and the travel of workers, some of whom may operate on a drive-in drive-out (DIDO) basis.

For the project, it is expected that approximately 35% of the construction workforce (around 120 workers) will be recruited locally, with 65% non-local hires. Of the total workforce, around 80% (480 workers at peak) will require accommodation, including 15% of local hires, while the remaining 20% are expected to travel daily from within the regional area. Travel between the accommodation camp and the construction site will be managed via shuttle bus services, reducing private vehicle use and potential congestion. Local workers will commute daily, with adequate on-site parking provided to prevent any use of public roads for worker parking.

A Workforce Management Plan will be implemented to coordinate workforce transport, parking and site access arrangements, reducing potential strain on local roads and traffic conditions during construction.

ii Housing and short-term accommodation

The cumulative construction workforce will also increase demand for short-term and long-term accommodation in the Lithgow region. This may place upward pressure on housing prices and rents and lead to shortages in short-term accommodation, particularly during the 2026–2028 peak. The extent of these effects will depend on the number and timing of concurrent projects, the proportion of workers housed in purpose-built facilities, and the ability of the local housing market to adjust to increased demand. The inclusion of the project's accommodation camp and transport arrangements will help mitigate housing and rental pressures by reducing reliance on existing short-term accommodation and private rentals within Lithgow and surrounding townships.

iii Regional economy

Broader development activity across the Lithgow region is expected to generate both direct and indirect economic benefits through increased demand for goods, services and materials. Businesses supplying construction, transport and accommodation services are likely to benefit from the cumulative economic activity associated with concurrent projects. In the short term, however, excess demand for construction labour could lead to higher wage rates and the movement of workers from other sectors of the regional economy, particularly manufacturing, mining and civil contracting. The extent and duration of such effects will depend on the ability of the local labour and housing markets to adjust to the increased demand.

iv Demand for services

While cumulative workforce demand will benefit those seeking employment in the region and may help address job-growth imbalances between metropolitan and regional areas, it also presents challenges. Long-term socio-economic benefits could be achieved if training and skills development programs are implemented early to build local capability and retain benefits within the community. For example, mitigation measures proposed including increasing the number of locally hired workers through upskilling and training, in both construction and operations, with a suggested target range of more than 20% local procurement during the construction phase of the project. However, the elevated regional labour demand could also impact the viability of existing businesses by drawing skilled workers away from industries that rely on construction labour and trades.

Temporary population growth associated with the combined construction workforces may also increase demand for essential services, including health care, retail and recreation. These effects are expected to be short-term and reversible once the construction phases of the major projects are complete.

18.3.6 Visual

Cumulative visual impacts can occur where multiple projects are visible within the same viewshed, resulting in an increased overall visual effect compared to individual projects viewed in isolation. Cumulative visual impacts were identified as a potential concern during engagement with neighbours and the community.

The LVIA (refer to Appendix N) considered potential cumulative visual impacts with two nearby approved battery projects and one proposed wind farm project within the Lithgow region that were within the theoretical zone of influence for the project (Great Western Battery, Wallerawang BESS and Mount Lambie Wind Farm). Due to their distance from the project and relatively small scale, no significant cumulative visual impacts with the BESS projects are predicted. There is a potential for overlap in the sensitive receivers of the project with those identified as potentially impacted by the Mount Lambie Wind Farm, however these receivers are located at the furthest extent of the project's visibility and it is considered there is very limited to no potential for simultaneous cumulative visual impacts. Potential cumulative impacts from sequential viewing, such as for motorists travelling along the Great Western Highway and Castlereagh Highway, are expected to be negligible with all projects.

18.3.7 Traffic

Cumulative traffic impacts were assessed in the TIA (refer to Appendix Q), which considered approved and proposed SSD and SSI projects within the Lithgow region. The assessment found that no significant cumulative traffic impacts are anticipated with other major developments, including nearby SSD or SSI projects.

The most notable potential cumulative traffic effect in the area relates to the proposed Bunnings store on Valley Drive. These impacts would only be realised if the project proceeds with the Town camp accommodation option. The TIA prepared for the Bunnings development estimated a trip generation of 173 trips per hour during the weekday PM peak and 387 trips per hour during the Saturday midday peak. This development was under construction at the time of the traffic surveys for the Project and therefore its operational trip generation was not captured.

The project's TIA assessed the combined performance of key intersections (Magpie Hollow Road / Lockyers Line, Magpie Hollow Road / Sir Thomas Mitchell Drive, and Great Western Highway / Magpie Hollow Road). These intersections are not expected to be materially affected by additional traffic generated by the Bunnings store due to the distance from the site.

Poor intersection performance was identified at the Lithgow Street / Kirkland Link intersection under existing give-way control, where vehicles from Valley Drive experience insufficient gaps to turn right onto Lithgow Street during the PM peak. The TIA recommended signalisation of this intersection to improve operational performance under both project and cumulative traffic scenarios.

Overall, cumulative traffic impacts associated with the project and other developments are expected to be minor and can be effectively managed through the implementation of the recommended intersection upgrades and traffic management measures outlined in the TIA (refer to Appendix Q).

18.4 Conclusion

A range of renewable energy, transmission, and extractive developments are proposed or approved within the Lithgow LGA, several of which may be constructed within a similar timeframe to the project. The successful delivery of these projects will depend on individual approvals, construction sequencing, supporting transmission infrastructure and market factors influencing regional infrastructure demand.

When considered collectively, the combined effect of cumulative impacts on key matters is expected to be **minor, short-term and manageable**. With implementation of the proposed environmental management and mitigation measures such as the accommodation camp, the project is not anticipated to result in any material long-term adverse cumulative impacts on the environment or regional community.

LLP will maintain communication with TfNSW to remain informed of any newly proposed or recommencing works on the Great Western Highway near the project area, to ensure awareness of potential construction timing overlap with the project.

Chapter

19

Environmental risk management

Environmental Impact Statement | Lake Lyell PHES Project

19 Environmental risk management

19.1 Environmental risks

19.1.1 Preliminary assessment

During the early planning stages of the project, a scoping assessment (EMM, 2022) was conducted to determine the key issues for the project requiring further assessment in the EIS. The scoping assessment was guided by the Scoping Report Guidelines (DPIE, 2021) and was informed by preliminary assessments and the design information available at the time. The key issues requiring detailed assessment were determined to be:

- water (surface and groundwater)
- visual amenity
- biodiversity (terrestrial and aquatic)
- Aboriginal heritage
- social impacts.

Other issues requiring standard assessment were land, traffic, air quality, noise and vibration, historic heritage, hazards and risks and economic impacts.

Since this time, SEARs for the project have been issued, baseline studies have been conducted, further community engagement has been completed, and the design has progressed using a design integration and assessment approach (refer to Section 3.3.1).

A review of the key issues requiring assessment was undertaken (with reference to the SSI Guidelines and Australian Standard for Risk Management ISO3000) to determine whether the changes in design, or advancement of environmental investigations, revealed any other matters to be further addressed or prioritised in the EIS. This review is provided in Table 19.1 and presents the unmitigated impact as well as the mitigated impact, following the implementation of design and management measures. Only those specific matters relevant to the project have been considered.

19.1.2 Additional assessments and mitigation in design

Based on the review of unmitigated impacts in Table 19.1, the key issues identified during the scoping phase remain consistent with the priorities for the EIS, with the addition of noise, traffic, land (soils and land use) and hazard and risks elevated for further detailed assessment. Technical studies have been completed as part of the EIS for all key issues, with additional investigations prepared where required to provide more robust assessment. This includes, but is not limited to, detailed platypus survey and monitoring, a tourism and recreation study, Aboriginal cultural values mapping, and an excavated rock management strategy. Further, the design has incorporated mitigation measures to reduce potential impacts, such as:

- operating principles of the PHES. The PHES will not operate during flood events or where water levels are below 780 mAHD
- design principles for the lake infill and diversion to maintain connectivity between Farmers Creek and Lake Lyell during operation of the inlet. This also creates physical separation from the inlet structure to reduce risk of entrainment. A floating boom also forms part of the design to deter platypus from swimming toward the inlet structure

- blast doors will be installed at the entrance to tunnel adits to limit noise emissions from underground blasting activities
- design principles for permanent spoil emplacements to be maintained onsite as stable, non-polluting landforms, significantly minimising the amount of spoil to be disposed off site
- a workforce accommodation camp is proposed to avoid placing pressure on local accommodation and service providers and would reduce traffic impacts associated with workers travelling to/from site
- road upgrade designs are proposed and would improve road safety and provide long-term benefits.

19.2 Environmental management

19.2.1 Approach

The mitigation measures identified in this EIS will be captured by the CEMP and associated sub-plans, as well as long-term management commitments. The proposed environmental management approach is shown in Figure 19.1. A description of each management plan and all mitigation measures are listed in Appendix E.

It is anticipated that environmental management for the project delivery will be governed by:

- **Conditions of approval** and the environment protect licence (EPLs) for construction and operation of the project.

Relevant management plans prepared to guide the construction and operation of the project will be determined by the conditions of approval however, based on the recommendations of the EIS, are expected to include:

- **Early Works Environmental Management Plan** to mitigate risks from the early works construction activities, including geotechnical drilling, road access works, limited site establishment works, and establishment of the accommodation camp.
- **Construction Environmental Management Plan** to provide the overall framework for managing construction environmental impacts.
- **Communication and Stakeholder Engagement Plan** for engagement and notification processes associated with construction of the project, ensuring landowners and affected community are kept informed and have clear communication pathways during construction.
- **Worker Health and Safety Plan** prepared to manage hazards and risks during construction, including emergency management.
- **Operations and Maintenance Plan** to provide operational parameters and impact management, as well as worker health and safety measures, to meet Dams Safety requirements.

Relevant sub plans and protocols would be prepared and implemented within these management plans.

19.2.2 Responsibility for environmental management

LLP as the owner and proponent of the PHES will be responsible for overseeing the construction of the project to ensure it is delivered in line with the conditions of approval, if granted. LLP will appoint a construction contractor(s) to build the project, who will be responsible for the implementation of a CEMP and all other activities relevant to managing construction impacts.

Once constructed, LLP will be responsible for the operation and maintenance of the project, including the implementation of compliance with all ongoing design, safety and environmental requirements.

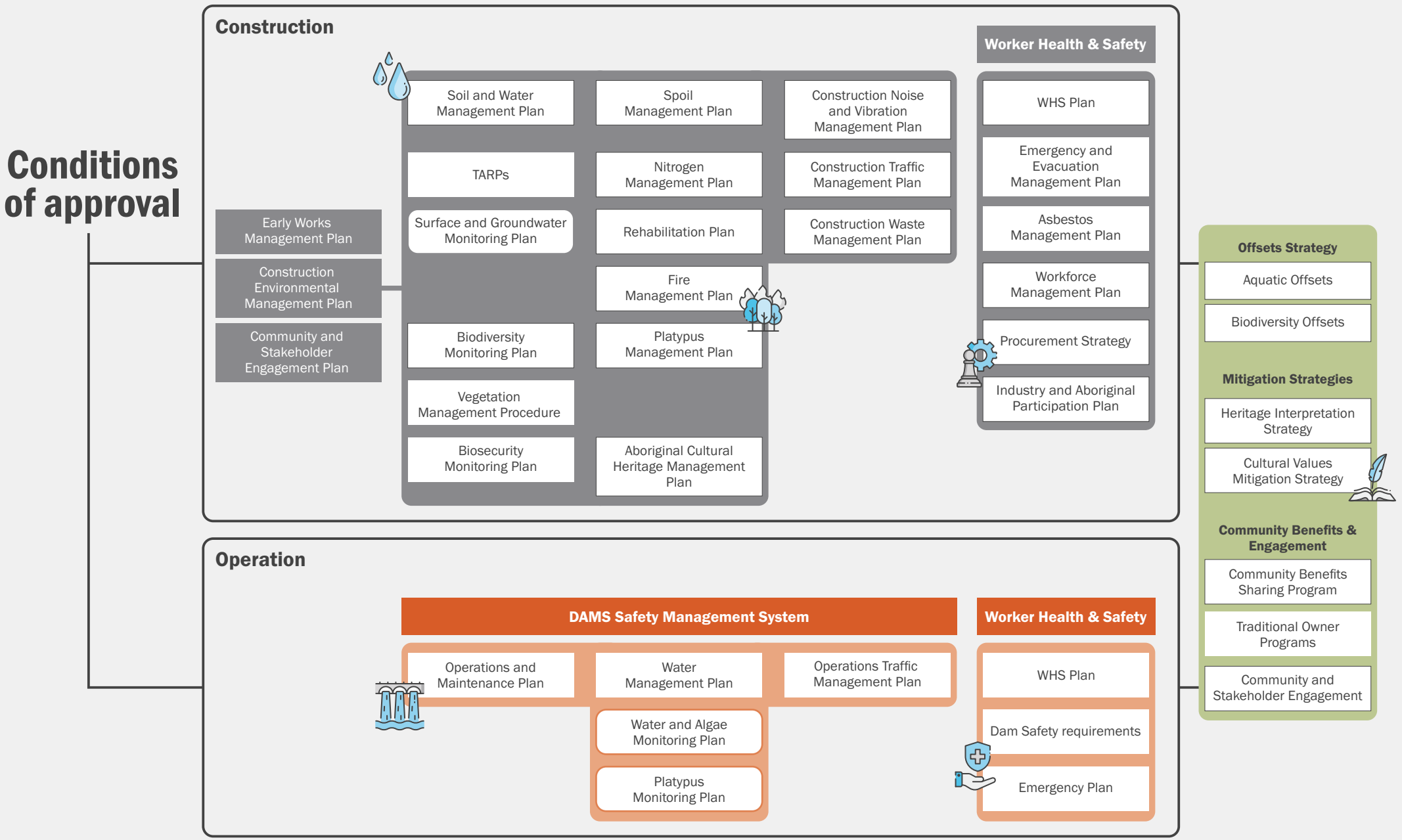

Figure 19.1 Environmental management framework

19.3 Residual risk

A residual risk rating has been derived for the key issues of the project considering the application of mitigation measures. This means, once standard best practice management measures are applied, in addition to mitigation in design, and the specific mitigation and management measures recommended for the project (refer to Appendix E). The residual risk ratings are provided in Table 19.1.

This EIS has assessed the potential impacts of the project and identified the key risks requiring mitigation and management. Mitigation and management measures have been developed proportionately to the risk of impacts, and where reasonable and feasible to implement. In most instances, potential impacts have been reduced (as shown in Table 19.1) and are considered acceptable. In some instances, mitigation is limited such as for visual impacts where the rockfill embankment is unable to be revegetated, or where clearing of vegetation is necessary for permanent infrastructure. Where possible, LLP will explore opportunities to further mitigate residual risks through the detailed design and construction phase of the project. This includes adaptive management approaches, long term monitoring and/or other bespoke approach to mitigation and offsetting. Negotiated agreements will also be pursued as part of the Neighbour Agreement Guide.

Ultimately, the environmental management of the construction and operation project will be guided by conditions of approval and the approved environmental management framework. However, ongoing risk identification and management will form part of the environmental management framework to allow for continual review and improvement.

Table 19.1 Key matters and residual risks

Assessment matter	Specific matter	Potential impacts	Likelihood (without mitigation)	Consequence (without mitigation)	Risk level (without mitigation)	Likelihood (with mitigation)	Consequence (with mitigation)	Residual risk level (with mitigation)
Access	• Roads • Traffic	Traffic generation impacting surrounding road network	Likely	Moderate	High	Possible	Minor	Medium
Air	• Particulate matter • Emissions • Greenhouse gases	Dust and fugitive emissions impacting sensitive receivers	Likely	Minor	Medium	Unlikely	Minor	Low
Amenity	• Noise and vibration	Airborne noise emissions and vibration impacts on sensitive receivers	Likely	Major	High	Possible	Moderate	Medium
	• Visual	Visual impacts to sensitive receivers	Likely	Major	High	Likely	Moderate	High
Biodiversity	• Terrestrial	Vegetation, habitat clearing and impacts to threatened and native fauna	Almost certain	Major	Very High	Likely	Major	High
	• Aquatic	Direct impacts to aquatic fauna, loss and/or changes to aquatic habitat	Almost certain	Major	High	Possible	Major	High
Built environment	• Private property • Public land	Direct or indirect impacts to land use	Unlikely	Minor	Low	Unlikely	Minor	Low
Economic	• Opportunity cost	Impacts (positive) to local and regional economy	Possible	Moderate	Medium	Likely	Moderate	High

Assessment matter	Specific matter	Potential impacts	Likelihood (without mitigation)	Consequence (without mitigation)	Risk level (without mitigation)	Likelihood (with mitigation)	Consequence (with mitigation)	Residual risk level (with mitigation)
Hazards and risks	• Biosecurity	Spread of weeds and/or pests	Possible	Moderate	Medium	Unlikely	Minor	Low
	• Bushfire	Impacts to/from bushfire	Possible	Moderate	Medium	Unlikely	Minor	Low
	• Dams safety	Potential for dam break	Possible	Catastrophic	High	Rare	Catastrophic	Medium
	• Dangerous goods	Impacts from transport and storage of dangerous goods	Possible	Catastrophic	High	Rare	Catastrophic	Medium
	• Flooding	Increased flooding	Unlikely	Moderate	Medium	Rare	Moderate	Low
	• Contamination	Disturbance or cause of contaminated lands	Possible	Moderate	Medium	Unlikely	Minor	Low
	• Waste	Reuse, management and disposal of waste	Possible	Moderate	Medium	Unlikely	Minor	Low
	• Climate change	Risks from climate change	Unlikely	Minor	Low	Unlikely	Insignificant	Low
Heritage	• Aboriginal	Impacts to recorded and unrecorded Aboriginal sites	Likely	Major	High	Likely	Moderate	High
	• Historic	Impacts to items of heritage significance	Possible	Moderate	Medium	Unlikely	Minor	Low
Land	• Soil chemistry • Topography • Land capability • Stability	Erosion risks of work areas (during construction) and permanent landforms (post construction)	Likely	Moderate	High	Unlikely	Moderate	Medium

Assessment matter	Specific matter	Potential impacts	Likelihood (without mitigation)	Consequence (without mitigation)	Risk level (without mitigation)	Likelihood (with mitigation)	Consequence (with mitigation)	Residual risk level (with mitigation)
Social	• Way of life • Community • Accessibility • Culture • Health and wellbeing • Surroundings • Livelihoods • Decision-making systems	Influx of workers placing pressure on local services and community cohesion Amenity impacts Recreational user impacts Impacts to health and wellbeing during planning phase	Almost certain	Major	Very High	Possible	Major	High
Water	• Hydrology • Water quality • Water availability	Potential impacts to water quality and quantity	Likely	Major	High	Unlikely	Moderate	Medium

Chapter

20

Justification and evaluation of the project

Environmental Impact Statement |
Lake Lyell PHES Project

20 Justification and evaluation of the project

This chapter provides a justification and evaluation of the project as a whole, having regard to its economic, environmental and social impacts and the principles of ecologically sustainable development.

20.1 Project objectives

PHES is deployed extensively across the world with medium - and long-duration large-scale grid-connected systems considered commercially competitive (CSIRO, 2023). A strong portfolio of projects is needed for meeting the ISP 2024 and NSW Electricity Infrastructure Roadmap utility storage needs and pumped hydro projects such as Lake Lyell PHES will play a key role in NSW's contribution in firming the grid during peak times. The project will provide services to the wholesale 'spot' market on the NEM, and support ancillary services used by AEMO to manage the power system reliably. This need has been recognised by the Minister with the project being declared CSSI, as it is essential for economic, environmental and social reasons.

The key objectives of the project are to:

- deliver a reliable energy system for the future and contribute to Australia's goal to achieve net zero emissions by 2050
- support a more affordable, secure and diverse NEM for NSW electricity consumers
- plan and design the pumped hydro facility with the aim of avoiding or mitigating environmental impacts wherever possible
- re-purpose existing power generation assets for long term support of NSW energy storage needs while ensuring the project can coexist with lake users and can create wider benefits for the Lithgow community.

The project aims to respond to the need to transition away from coal fired power generation and supports the NSW and Commonwealth Government's plans for the provision of reliable and clean electricity. The nature of the project will synergise effectively with other renewable energy generation technologies such as wind and solar and will compliment other storage technologies such as large-scale batteries.

With an operational life of approximately 80 to 100 years, the project offers a long-term solution that maintains its storage capacity (without progressive degradation compared to Lithium Ion BESS), thereby supporting grid reliability, system strength, and decarbonisation goals well into the future. Its operational flexibility and strategic location will allow it to serve as a dispatchable backbone for NSW's clean energy future, ensuring resilience as the State transitions away from coal and toward a high-renewables grid.

20.2 Consistency with strategic context

The AEMO ISP and NSW Electricity Infrastructure Roadmap highlight the need for a mix of storage capacities to meet rising energy needs, including shallow (less than four hours), medium (four to 12 hours) and deep storage (12 hours or more). The project is a medium storage PHES, providing 385 MW for up to 8 hours or 440 MW for a shorter duration.

The draft 2026 ISP forecasts 33 GW of utility storage is needed by 2050 and includes a requirement for 6 GW of pumped hydro storage. To date, battery-based solutions have been the major contributor in providing shallow and medium storage. With the ability to generate at up to 440 MW and to store up to 3,080 MWh, the project would provide meaningful contribution to the remaining capacity needed. It is recognised that pumped hydro alone cannot meet this need within the required timeframe, however it can support the portfolio of energy storage technologies by providing large quantities of electricity when it is needed most.

The project has been partly funded in development by the *Pumped Hydro Recoverable Grants Program* (an action consistent with the Electricity Infrastructure Roadmap) and is consistent with government policy and strategic plans. It enables greater renewable energy penetration into the NEM, replacing the need for more carbon-intensive sources of electricity, thereby supporting overall reduction in carbon emissions to meet Australia's commitment to the Paris Agreement. The project aligns with the objectives of the NSW climate change policy framework, ISP and Electricity Infrastructure Roadmap by investing in renewable energy and specifically responding to the need for medium storage pumped hydro development.

At a local and regional level, the project would support the specified goals of Lithgow City Council's strategic plans by:

- delivering new renewable energy infrastructure
- providing employment opportunities for local people
- contributing to the local economy, both directly and indirectly.

The project is critical to the State for economic, environmental or social reasons, as determined by the Minister in declaring the project CSSI under the EP&A Act.

20.3 Compliance with statutory requirements

As CSSI, the project requires assessment and approval under Part 5, Division 5.2 of the EP&A Act and is permissible only with the Minister's approval under section 5.19 of the EP&A Act. The project is also a controlled action under the Commonwealth EPBC Act and therefore requires assessment and approval under that Act. The project will be assessed under the Bilateral agreement between the Commonwealth and NSW Governments via accredited process.

A single EIS has been prepared to address both the State and Commonwealth requirements for the project. The EIS has been prepared in accordance with the requirements of the SEARs, section 5.17 of the EP&A Act and Part 8 of the EP&A Regulation. Compliance with the SEARs issued for the project has been provided in Appendix A, and compliance with statutory compliance has been provided in Appendix C.

20.4 Advantages of Lake Lyell PHES

The alternatives of the project have been considered in Section 2.3 of this EIS and included alternatives to PHES, other PHES sites that could provide medium to large generation and storage capacity to the NEM, and a 'do-nothing' option where LLP does not proceed with the project.

The project has been developed to work within known economic, environmental and social constraints, and adapt the design, construction methods and environmental management framework to avoid and minimise impacts as far as practical whilst delivering considerable positive outcomes.

20.4.1 Location

The locational context of a given storage system can affect the risk and cost of its development. The Lake Lyell PHES capitalises on a unique opportunity with direct access to an existing reservoir and existing high voltage transmission line. While the Lake Lyell PHES may not have the same height differential as other PHES projects under development, there are many advantages of the location that make it technically and economically favourable. This includes:

- the presence and use of Lake Lyell, which is currently owned and managed by EnergyAustralia and can readily be repurposed from providing water to coal-fired power stations to storing water for a PHES. Using the existing reservoir also avoids the need to build a new lower reservoir, which would otherwise lead to greater disturbance and impacts. Lake Lyell also has high water security through its integration with Coxs River catchment and the off-river storage of Thompsons Creek Reservoir
- favourable terrain and geological characteristics within the project area, which provides a satisfactory height differential between Lake Lyell and the upper reservoir to provide for pumped hydro energy generation
- the small distance between Lake Lyell and Mount Walker, reducing the length of tunnels that would be required and therefore avoiding the need for expensive tunnel boring machines and reducing the volume of spoil generated and needing disposal
- the presence of an existing 330 kV electricity transmission line that passes through the project area, on land owned by EnergyAustralia. This means no other landowners will need to host new transmission infrastructure. Further, the existing line has sufficient capacity for the proposed connection, without requiring upgrade.

The land on which permanent infrastructure would be located is suitably zoned for energy generation and owned by EnergyAustralia. It is also in close proximity to Lithgow and the Great Western Highway, providing suitable access for the delivery of materials to site and access to workforce.

It is considered Lake Lyell PHES has an advantageous locational context which is highly suitable for the construction of a PHES scheme. A significant portion of the infrastructure necessary to enable the operation of a pumped hydro project is already present, and there are clear pathways through which the remaining infrastructure can be constructed (see Section 20.4.2). For this reason, the project site has been concluded to be uniquely suited to its proposed purpose.

20.4.2 Confidence in design and constructability

PHES projects are complex developments and take time to design and build. However, they are also a mature technology and supply about 95% of all existing storage installed globally (CSIRO, 2023). The project has had an advantage and benefited from carrying out an ECI process concurrent with the studies carried out for the EIS.

The ECI contractor appointed to the project has been involved in design iterations and provided the basis for the construction methods and feasible mitigations to be assessed in the EIS. While there are some elements of the project that will continue to be refined, the ECI process means there is a level of confidence in the constructability of the project, as any flexibility needed for future design optimisation has been anticipated and allowed for in the design and EIS preparation and construction envelope. There has been detailed consideration and evaluation of construction staging, logistics, availability of plant and equipment, environmental risks and limitations (based on feedback to avoid and minimise impacts) and social licence.

EnergyAustralia's partnership with EDFA as the proponent, as LLP, also provides confidence to the project's delivery. EDFA provides extensive experience in the entire life cycle of PHES developments globally and can apply this experience in a local context with EnergyAustralia.

20.5 Community support and opposition

20.5.1 Positive sentiment

The project is located in the Lithgow LGA which has an economy that has largely relied on coal mining and associated industries. The community understand that this industry is declining however have differing views of the transition to renewable energy. Positive sentiment exists for the project, particularly regarding the potential for local job creation during construction. Pumped hydro is also seen as favourable over other renewable sources, notably wind energy projects. It is understood that most of the local community will not be directly affected by the physical impacts of the project, and this has generally been reflected in the feedback received from engagement activities conducted for the project with positive sentiment. This is different to those near neighbours who are likely to be physically impacted or disrupted by the project's construction or operation, who have expressed their concerns or opposition to the project.

20.5.2 Community views and feedback

The Consultation and Engagement Report (refer to Appendix D) has documented the journey of community and stakeholder engagement since the project was conceptualised in 2021. Given the nature and scale of the project, concerns raised by the community are expected. The project team has been proactive in incorporating early feedback that would reduce impacts where feasible to do so. It is noted that some impacts are unavoidable and in some instances, impacts are unable to be reduced, due to limitations around design or materials.

Near neighbours are those living or operating businesses in closest proximity to the proposed infrastructure that are likely to experience the most tangible day-to-day impacts during construction and operation. The project has considered near neighbour feedback alongside the broader community feedback as they are closely related. The community feedback highlights collective values, aspirations, and regional considerations, while neighbour feedback captures the individualised effects, sensitivities, and adaptation needs of those most directly affected. Both have been considered in the summary of community views in Table 20.1.

Table 20.1 Community views and how they have been addressed

Theme and feedback	Summary
Strategic context: • Regional transition and energy transformation • Understanding of alternative pumped hydro sites • Local character, identity and future plans	There are mixed views on the transformation of the energy network with some local values still aligned to traditional energy generation (i.e. coal), and uncertainty on why the project and pumped hydro is needed and at Lake Lyell. Chapter 2 of this EIS provides an overview of the relevant government policies that demonstrate why the project is needed. The rationale for the selection of the project's location has also been provided, noting that the site provides significant advantages for pumped hydro development, namely an existing lower reservoir with long term water security, an existing high voltage transmission line that runs through the site, close proximity to transport routes and the land that would host permanent infrastructure is owned by EnergyAustralia and is zoned for energy generation. These aspects assist in the projects ability to minimise overall impacts and provide reliable, long term energy generation and storage.
Project design: • Understanding the technology of how pumped hydro works and the scenarios for its operation • Selection of the preferred accommodation camp location	Questions were raised about how pumped hydro works as a renewable energy technology. In response, fact sheets and other information were prepared and made available to the community (included in Appendix D) and a summary of how the pumped hydro would work for Lake Lyell is provided in Chapter 3. When the need for an accommodation camp was identified and proposed at Lake Lyell, there was feedback recommending an alternative site closer to Lithgow to improve benefits to local businesses. As a result, the Town camp was identified and has been presented as an alternative option in this EIS. Two accommodation camp locations have been presented in the EIS and community and feedback will inform which will ultimately be built.

Theme and feedback	Summary
Community engagement, including: • Need for engagement to be conducted with transparency and responsiveness • Access to information and communication of impacts • Complaints handling	Concerns were raised regarding community engagement and the need for adequate feedback loops. Many near neighbours were dissatisfied with the level of information provided about project impacts, and also requested assurances for early notifications and transparency during construction. A Community and Stakeholder Engagement Plan has been prepared for future phases of the project and provided with Appendix D. Mitigation measures for noise impacts have also incorporated requirements for early notification and a complaints handling process (refer to Appendix E).
Environmental, social and economic impacts, including: • Dust, air quality, noise and vibration, including blasting • Visual and amenity • Tourism and visitor amenity, including recreational impacts • Water access and quality • Biodiversity impacts, including threatened species and platypus • Property access, road safety and traffic management • Community safety and cohesion • Access to health and community services • Community investment benefits • Procurement, employment and training	Feedback has highlighted a wide range of issues directly related to the project's construction and operation. A key issue commonly raised early in community feedback was interest in the presence, impact and management of platypus. LLP commissioned a platypus study lead by experts from UNSW to identify platypus population and their movements, to inform the assessment of how they might be impacted and how mitigation measures could be developed to be effective. This has provided valuable information on the species and the management approach proposed in the EIS (as documented in Appendix K). Other examples of how feedback has been incorporated include: • Feedback relating to visual impacts were incorporated into the selection of viewpoints for the assessment and development of mitigation measures. • Feedback on recreational values have been documented in a tourism and recreation study accompanying the SIA (refer to Appendix O) and opportunities for improved recreation identified as a focus for a Shared Benefits Program. • Feedback on understanding water level changes has been incorporated by providing explanations in the EIS and including mitigation measures for hazard warnings and access notifications. • Feedback on biodiversity impacts and making sure offsets are meaningful have been considered in the approach outlined in the offsetting strategy and identification of additional measures that could be implemented should the project proceed. • As identified for project design, two accommodation camp options have been included in the EIS in response to community feedback. The EIS has responded to feedback through project design, detailed technical studies prepared in accordance with NSW Government guidelines, and/or through development of mitigation measures and minimisation strategies.
Cultural heritage and engagement, including: • Impacts to cultural heritage • Cultural heritage management, including long-term management of Country • Engagement	Feedback from the RAPs was less supportive of the project, with ongoing concerns over the impacts of the project on intangible cultural values and specific flora and fauna. As consultation with the RAPs has progressed, increasing support (with a few exceptions) has been vocalised towards the end of the assessment process as a result of ongoing efforts in impact avoidance, proposed mitigation measures and broader opportunities for the Aboriginal community. Who speaks for Country and who participated in the field work has also formed the basis of focused discussions throughout the assessment. The ACHA prepared for the project (refer to Appendix L) has documented the feedback and incorporated measures to allow for a cultural values mitigation strategy to be developed with Traditional Owners, in addition to management measures identified for impacts to archaeological resources.
Project justification, including: • Land ownership • Whether benefits justify or outweigh impacts • Whether the project is justified at this location • Concern on the timing of the project and relevance of pumped hydro technology	The justification of the project has been presented in this chapter and considers the concerns raised by the community. It considers the strategic context of the project and the projects role in the energy transition to renewable energy and a need for reliable, firming capacity in the NEM. The location of the project has been considered in the context of alternatives to pumped hydro (such as batteries), and alternative locations for pumped hydro. It is considered that the project is in an advantageous location for pumped hydro, and provides reliable, medium duration storage capacity that will operate for a longer lifespan and have a greater investment in goods, services and resources produced, manufactured, or supplied within Australia and New Zealand, when compared to other renewable energy projects. Pumped hydro is needed in addition to battery and other medium and long duration storage technologies, not instead of.

20.6 Biophysical, social and economic impacts

20.6.1 Avoidance and minimisation

Due to the nature and the scale of the project, environmental and social impacts will occur. However, early engagement, the ECI process, and iterative environmental assessment through the DIAA process, has informed the concept design to ensure it has incorporated measures to avoid and minimise impacts as much as practical. Avoidance and minimisation measures adopted include the following:

- Relocation of the upper reservoir from the Mount Walker southern ridge to the west, within a gully and below the ridge. The relocation means that views of PHES infrastructure from Lithgow, Bowenfels and South Bowenfels are avoided.
- Selection of a rockfill embankment dam within the gully. This utilises a cut fill balance as far as possible to maximise reuse and minimise the need for disposal or transport of material off site. Reuse options considered throughout the design, including using won material for the protection of the inlet/outlet structure and excavated rocks for concrete aggregates.
- Using existing access roads where possible, such as for geotechnical investigations and early works.
- Wherever possible, aligning construction haul roads and permanent access roads within the same disturbance footprint to minimise overall clearing of native vegetation and habitat. Northern haul road and permanent roads kept outside of major visual impact areas.
- Switchyard area used for construction laydown area to minimise construction footprint.
- Powerhouse and waterways located underground to minimise impacts to flora and fauna as well as noise and visual impacts.
- Project northern area focused in gully area to reduce visual impacts.
- Switchyard located low in the least hilly site to reduce cut and fill and in doing so reducing the footprint of the pad.
- Construction methods for the inlet and its protection (i.e. cofferdam, floating boom) developed to avoid and minimise impacts to an Aboriginal site on northern bank of the Farmers Creek arm of Lake Lyell.
- Temporary accommodation camp locations are located close to the project to minimise travel distances as well as minimise impacts and improve benefit opportunities to the community.
- Development of operational principles for the PHES that allow continued public recreation and access.

These aspects have been considered as part of the assessment. Where impacts could not be fully avoided, they have been minimised where possible. Unavoidable impacts are discussed in the following sections.

20.6.2 Key impact pathways

Construction of the project will require the following activities that will result in potential impacts to the environment and/or the community:

- Vegetation clearing, ground disturbance and surface excavations – earthworks are needed to establish work areas to build the permanent infrastructure and for access roads to connect these work areas to the external road network so the plant, equipment and other materials can be delivered and transported.
- Tunnelling and underground excavations – tunnelling is needed to build the underground power waterways, MAT and ECVT tunnels, and to reach the underground powerhouse cavern for excavation and fit out. Tunnelling will also result in the generation of spoil, requiring reuse or disposal.
- Lowering of lake water level during construction and installation of lake diversion – lowering of the lake is needed to create a dry, safe working environment for the construction of the inlet. The diversion will be constructed first to allow continued water flow and fish passage from Farmers Creek to the lake.
- Water take – water is needed during construction and for the initial fill of the reservoir.

These activities on their own or in combination will generate noise, dust, visual and traffic impacts. It will also require the removal of biodiversity habitat and impact some Aboriginal heritage sites. Water management is a key consideration for the project with the need to manage erosion and sedimentation and contamination risks.

Operation of the project involves permanent changes to views and the landscape and ongoing changes to water level of Lake Lyell as the PHES cycles through generation and storage modes. The pumping and release of water from and into Lake Lyell has been considered.

The potential biophysical, social and economic impacts of the project have been assessed. They are described in the following sections.

20.6.3 Key biophysical impacts

The project would result in the disturbance of up to 137 ha during construction. About 74 ha will be progressively rehabilitated to an operational footprint of 47 ha. The key biophysical impacts associated with construction of the project include the following:

- Loss of approximately 130 ha of native vegetation in varying condition (of which approximately 102 ha requires offset), and loss of threatened species habitat including breeding habitat for Gang-gang Cockatoo and Glossy Black Cockatoo. Assessments of Significance for threatened and migratory EPBC Act listed species concluded that the project is likely to have a significant impact on the Gang-gang Cockatoo, Glossy Black Cockatoo and Koala. No habitats associated with SAII candidate species (mapped important habitat or cave habitat) are found in or adjacent to the construction envelope and the species are therefore unlikely to be at risk of SAII from the project.
- Loss of approximately 11.88 ha of key fish habitat and loss of macroinvertebrate assemblages within Lake Lyell. This includes impact to platypus burrowing and feeding habitat. No threatened aquatic species occur in the lake.
- Erosion and sedimentation, controlled discharges and overflows of stormwater, and controlled discharge of treated contaminated water, however the water management system and ESCPs will mitigate impacts and water quality discharged to the environment is expected to be similar to minimal harm criteria.

Potential operational impacts of the project on the biophysical environment include the following:

- Loss of both native and introduced fish species through the PHES inlet. The pumping and dispersion of water from the inlet structure also has potential to result in some scouring of the shoreline, which could be managed by shoreline armouring, if required.

- Stormwater runoff from infrastructure areas and potential for seepage from PSEs during operation and/or dilution with lake water. Active management (treatment) will be carried out where required based on the results of proposed monitoring of water quality against minimal harm criteria.

- PHES will fluctuate water levels and promote mixing and destratification of the water column in Lake Lyell (with anticipated beneficial impacts).

Due to the proposed water management systems and proposed operating principles, impacts to the downstream environment are considered negligible. Both the construction and operation of the project has been assessed to have a neutral or beneficial impact on water quality in the Coxs River downstream of Lake Lyell.

Potential land use and other impacts on Marrangaroo National Park have been considered in line with the *Guidelines for Development adjacent to National Parks and Wildlife Services Lands* (DPIE, 2020) and concluded that impacts will be mitigated by the implementation of controls specified in the relevant technical assessments, including the BDAR (refer to Appendix J), SWA (refer to Appendix F) and NVIA (refer to Appendix R).

20.6.4 Key social and cultural impacts

i Social

Social impacts and benefits have been identified as part of this EIS (refer to Appendix O), and were considered in the context of near neighbours (those most likely to be directly impacted by the project), the local community (Lithgow) and regional community (Lithgow LGA), as well as other stakeholders such as businesses and special interest groups.

Key social impacts include alteration of community and composition, loss of community cohesion, impacts to sense of place and rural lifestyle, community safety and wellbeing, impacts to scenic values, recreation and public access. These impacts are due to influx of workers for construction, visual impacts associated with the upper reservoir, amenity impacts (dust, noise and traffic), and uncertainty on recreational use of Lake Lyell and Mount Walker. Management of these impacts would be through the implementation of controls specified in the relevant technical assessments as well as a suite of management plans focused on construction management and in particular, workforce management.

Key social benefits identified include continued recreational access to Lake Lyell and economic and employment opportunities for residents in the regional area, including training and business opportunities. These opportunities will be enhanced through setting targets for local procurement and employment, working with Lithgow City Council, education providers and local suppliers.

A key aspect for managing both social impacts and benefits of the project is the proposed implementation of a Shared Benefits Program.

ii Aboriginal cultural heritage

Aboriginal participation throughout the project has included consultation activities, site survey and archaeological test excavation and cultural values mapping, as part of development of the ACHA (refer to Appendix L). Additional engagement has also been undertaken by LLP (refer to Appendix D).

Construction activities, specifically earthworks and excavation, would result in the localised removal of the upper soil profile across portions of the construction envelope. Five Aboriginal sites / places within the project area will be directly impacted, of which three are considered of high significance (LL AS3, LL AS4 and LD 13). These are primarily found either on the periphery of the upper reservoir construction footprint or on the banks of Farmers Creek arm of Lake Lyell near the lower inlet. Avoidance of these sites would be problematic and is unlikely to be possible given their location in relation to key infrastructure needed for the project, although potentially elements of LL AS4 may be avoided during detailed design. Archaeological mitigation, especially of subsurface cultural materials to further inform our understanding of the past, is proposed to mitigate direct archaeological impacts.

Operational activities would be limited to indirect impacts to cultural values, as there would be no further ground disturbance within the project area. Indirect impacts anticipated are visual and aesthetic changes of view-lines to/from Mount Walker. The project would also partially impact two places of cultural value: the peak of Mount Walker and a Platypus Dreaming story encompassing portions of the Coxs River and its tributaries. The opportunity for avoidance given the nature of the project is limited. While specific activities on the peak of Mount Walker would remain unaffected, visual and aesthetic values would be adversely affected by the project. Discussions have been undertaken with Elders and knowledge-holders to explore suitable non-archaeological mitigation in relation to impacts to contemporary cultural values.

iii Historical heritage

There are no heritage items within the construction envelope for the PHES or Lakeside camp. Historical heritage values are limited to the Town camp option, which is located over the Lithgow Valley Colliery and Pottery Site (SHR#00078). The SoHI prepared for the project (refer to Appendix M) recommends avoidance of the site and/or the areas of high archaeological significance, and where avoidance is not possible then further archaeological research and design is required in consultation with Heritage NSW.

20.6.5 Economic impacts

The Economic Assessment completed for the EIS (Appendix P) determined that the project is estimated to make up to the following annual direct and indirect contributions to the regional economy:

- $400 million in annual direct and indirect regional output during construction and $290 million during operation
- $72 million in annual direct and indirect household income during construction and $4 million during operation
- $166 million in annual direct and indirect regional value-added during construction and $237 million during operation
- 658 direct and indirect local jobs during construction and 50 during operation.

It is estimated that between 60 to 70% of the capital cost of the project will be invested in goods, services, and resources produced, manufactured, or supplied within Australia and New Zealand. The project will also provide economic activity to a region that has only been experiencing modest growth over time. In particular, it will create a demand in the region for a suitably qualified construction workforce.

20.6.6 Cumulative impacts

The greatest potential for cumulative impacts of future projects and the Lake Lyell PHES project are related to existing mining projects and approved and/or proposed renewable energy projects within the Lithgow LGA. Chapter 18 of this EIS considers cumulative impacts in further detail. The key environmental aspects that could result in cumulative impacts with the project are biodiversity (cumulative clearing of threatened species habitat), water (groundwater drawdown and interaction of Coxs River catchment with STP and mining operations), social impacts (due to workforce requirements) and visual (potential overlap in project visibility at some distant receivers).

When considered collectively, the combined effect of cumulative impacts on key matters is expected to be minor, short-term and manageable. With implementation of the proposed environmental management and mitigation measures, the project is not anticipated to result in any material long-term adverse cumulative impacts on the environment or regional community. The Surface Water Assessment (refer to Appendix F) concluded there would be a neutral or beneficial effect on the downstream environment.

20.6.7 Mitigation, offsetting and other strategies

i Long term management

A detailed list of mitigation measures is provided at Appendix E and will be implemented to mitigate and minimise the environmental risks of the project. To manage and offset key biophysical, cultural and social impacts that cannot be mitigated or minimised, and to enhance social and economic benefits of the project, the following long-term strategies are proposed to be implemented should the project proceed:

- A biodiversity offset package that will be staged to meet the offset liability for each stage of the project, in accordance with the BC Act. Consideration of nature positive initiatives that could be developed in addition to offsets would be discussed with CPHR.
- An aquatic offset package focused on local / catchment level initiatives and re-stocking, as agreed through consultation with DPI Fisheries.
- A cultural values mitigation strategy to be developed in discussion with Elders and knowledge-holders to mitigate adverse impacts to Mount Walker and the Platypus Dreaming story (where required), and the development of an Interpretation Strategy and Plan to explore Aboriginal interpretive opportunities from the project.
- A suite of plans to encourage and align workforce management with the local and regional community, including procurement, skills and training opportunities. This includes a Workforce Management Plan, Procurement Strategy and Industry and Aboriginal Participation Plan.
- A Shared Benefit Program to be co-designed with the local community to provide access to funding grants, delivery of direct benefits to those most impacted by the project, including Traditional Owners, local residences and tourism, providing legacy benefits from re-purposing of infrastructure, and exploring opportunities to offset and/or enhance recreational values.

ii Associated receivers / Neighbour agreements

The Neighbour Agreement Guide would continue to be enacted, providing access to additional mitigation measures secured through neighbour agreements. At the time of the EIS, no neighbour agreements have been executed, however negotiations are ongoing. The agreements will demonstrate that relevant impacts and mitigation measures at those receivers have been accepted.

iii Ongoing community and stakeholder engagement

Should the project proceed, LLP has outlined an approach to community and stakeholder engagement focused around construction readiness, and a plan to guide engagement through construction and operation of the project in conjunction with the construction contractor selected to deliver the project.

The next phase of engagement will focus on ongoing local government and agency engagement, ongoing First Nations engagement, and carrying out targeted regional and business engagement as part of workforce planning. A key activity will also be to further develop the Shared Benefit Program, establishing its governance and preparing for its implementation.

20.7 Ecologically sustainable development

The principles of ESD are set out in Schedule 2 of the EP&A Regulation and in Clause 3A of the EPBC Act. The project has taken into account these ESD principles as summarised in Table 20.2.

Table 20.2 Principles of ecologically sustainable development

Principle	Project outcome
the precautionary principle	A level of scientific certainty has been achieved through detailed research and field studies to establish a good understanding of the existing environment. These studies were also informed by consultation with government agencies, landowners and the community and conducted according to relevant legislation, guidelines and policy. To take into account limitations in the assessments, this EIS has been prepared with technical methodologies supporting a conservative approach to impact assessment. This includes assessing worst-case impacts and scenarios, such as considering worst-case air quality and noise events modelled under worst-case meteorological and noise enhancing conditions. Further, where there was lack of certainty on the presence or absence of a threatened species (as it was not detected during surveys but suitable habitat exists), the precautionary principle has been applied in assuming presence of that species. This EIS and technical studies have assessed the impacts of a disturbance footprint within a broader construction envelope. The disturbance footprint will be refined during detailed design within the limits of the construction envelope, with the intended outcome to further reduce impacts where possible. The project has been designed to avoid environmental impacts where practicable, and mitigation measures are proposed to mitigate and manage the impacts where unavoidable. No mitigation measures have been deferred due to a lack of scientific certainty. Any project-related decisions would be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment.
inter-generational equity	The project is needed to provide reliable, renewable energy into the NEM as part of the energy transition to reduce carbon emissions. It will operate for over 80 years. Future generations will benefit from sustainable, energy generation and storage supported by the project. A climate change risk assessment completed for the project demonstrates the projects' ability to be resilient to predicted far future climatic conditions. This EIS has identified the potential environmental impacts that may occur and appropriate protection, mitigation and/or management has been identified to ensure the health, diversity and productivity of the environment would be maintained. This includes an offset approach focused on delivering local / catchment based initiatives for aquatic habitat improvement and fish re-stocking, and offsets and long-term management strategies for terrestrial biodiversity and cultural heritage, to ensure these values remain available to future communities. The project is committing to a Shared Benefits Program to provide community benefits including funding First Nations programs that will be co-designed during engagement should the project proceed.

Principle	Project outcome
conservation of biological diversity and ecological integrity	Detailed survey and assessment of biodiversity was completed in accordance with relevant legislation and guidelines. Findings have informed iterations to the design to avoid impacts where possible and have informed the detailed mitigation measures required to minimise impacts where avoidance has not been possible. An offsets strategy has been developed for residual biodiversity impacts and for impacts to key fish habitat. Additional opportunities for local nature positive outcomes have also been identified and would be investigated and considered by LLP as measures above and beyond the requirements of the Biodiversity Offset Scheme should the project proceed.
improved valuation, pricing and incentive mechanisms	The project has been designed through an iterative design integration and assessment approach, so that environmental impacts have been considered, avoided and minimised where possible. A key technical, environmental and economic decision relevant to the project is to re-use excavated material from the project as much as possible, in the design and construction of the project and with detailed and appropriate mitigation measures. Wherever possible, the impacts of the project have been mitigated as far as reasonable and feasible. Offsets and other long term management strategies have been developed for unavoidable residual impacts. Any project-related decisions would consider environmental factors in a cost-effective way and be guided by the whole of life costs of providing goods and services.

20.8 Key uncertainties and actions to address them

This EIS has been prepared on the basis of a concept design and using available information at the time. Optimisation of the concept design is ongoing and will be followed by a detailed design phase. Further geotechnical investigations are planned to be completed during the early works stage of the project. The results of these investigations will further inform design and construction decisions, as part of a detailed design process. The detailed design process will involve the appointment of a construction contractor, and details of the project may change or be refined. For example, this may include changes to the orientation, arrangement or depth of the underground powerhouse cavern, or re-alignment of internal roads.

Other uncertainties in the design or mitigation would be resolved through ongoing and future consultation. This includes with Lithgow City Council and TfNSW for specifications and upgrade requirements of existing external roads and intersections.

Uncertainties in assessment have been limited or resolved through applying the precautionary principle, such as (but not limited to):

- where the presence of a threatened species has not been accurately verified it has been assumed to be present
- mitigation and monitoring measures have been applied to allow for an adaptive management approach as impacts are uncertain, such as platypus response to fluctuating water levels
- conservative model assumptions to provide a worst-case scenario with regard to modelling of air quality, noise and traffic impacts.

Where possible, this EIS has allowed for some flexibility by following a conservative assessment. Any deviations from the project as described in this EIS would be subject to a consistency assessment and if required, subject to further environmental assessment and approval process.

20.9 Evaluation and conclusion

The project has been declared CSSI by the Minister, as it is essential for economic, environmental and social reasons, as the project would:

- provide reliable and dispatchable energy when solar or wind are unavailable and contributes to NSW Government's aim to establish a pipeline of up to 3GW of pumped hydro
- take advantage of existing infrastructure associated with Mount Piper power station, offering a lower impact alternative to a greenfield project
- inject capital expenditure into the region of around $2 billion and the creation of hundreds of construction and ongoing jobs in regional NSW
- assist NSW (and Australia) in meeting its target of net zero emissions by 2050
- contribute to the substantial economic and social benefits for NSW that will be delivered by the NSW Government's Electricity Infrastructure Roadmap.

The project's construction will result in vegetation clearing, habitat loss, dust and noise generation, visual alterations and traffic impacts. Most of these impacts will not extend beyond the project's construction phase however, long term visual impacts will be experienced by a limited number of residences for the duration of operation. Offsets and long-term management strategies are needed to compensate for residual biodiversity impacts and impacts to cultural heritage values. Soil and water impacts during construction and operation will be appropriately managed through the water management system described in this EIS, including long term monitoring, and water take will be appropriately licensed with a feasible licensing pathway established for the project. Not proceeding with the project would prevent the direct negative environmental impacts that the project will incur if it proceeds. However, not proceeding would also result in foregoing the many benefits of the project.

The project and this EIS has demonstrated that potential impacts can be managed through the implementation of mitigation measures and ongoing design refinements to continue to avoid and minimise impacts where feasible. The project has incorporated avoidance where possible, noting limitations due to the nature and scale of pumped hydro requiring certain technical parameters to be met first and foremost. Careful siting of project elements has been carried out as much as possible, while balancing these parameters.

The project's locational context provides direct access to an existing lower reservoir (Lake Lyell), direct access to an existing high voltage transmission line (with existing capacity), suitable elevation for generation, is on land zoned for 'electricity generation' and is on land owned by EnergyAustralia. These factors provide significant economic advantages to make the project feasible. The project also has feasible access to water supply for construction and operation of the project as demonstrated by the water licensing strategy.

Lake Lyell PHES has the potential to deliver considerable benefits if it proceeds. The option to not proceed with the project has been considered. However, this option would result in forgoing numerous potential project benefits. The project would provide certainty in:

- contribution to State and Commonwealth emissions reductions policies and commitments for a more affordable, secure and diverse NEM
- crucial medium-duration energy storage, leading to improved energy security for NSW electricity consumers
- certainty in the ongoing, long-term use of Lake Lyell, including continued public access for recreation
- direct and indirect economic benefits that would arise from the project, including numerous employment opportunities and increased demand for local goods and services.

The failure to realise these potential benefits would have a detrimental impact on the proposed governmental climate change targets, the NEM and its users, the local economy, and would neglect a project that has been determined by the NSW Minister for Planning to be critical for the State for economic, environmental or social reasons.

Ultimately, a holistic assessment of economic, environmental, and social outcomes indicates that, on balance, the project can deliver considerable positive outcomes that outweigh the mitigated project impacts. The project is therefore considered justified and in the public interest.

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Lake Lyell PHES Project

Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
µm	micrometres
Accommodation camp	Area used for temporary housing and facilities for construction personnel
ACHA	Aboriginal cultural heritage assessment
ACHMP	Aboriginal Cultural Heritage Management Plan
Adit	Temporary access tunnel for access to underground construction areas
AEA	Aquatic ecology assessment
AEMO	Australian Energy Market Operator
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AIP	NSW *Aquifer Interference Policy*
AMP	Asbestos management plan
Analyte	a substance whose chemical constituents are being identified and measured
Ancillary construction facilities	Facilities required to support construction activities such as concrete batching plants, crushing plants, warehouses, stockpiles, and laydown areas
Ancillary operational facilities	Facilities required to support operating activities such as office area, heating, ventilation and air conditioning (HVAC), backup generators, etc.
ANU	Australian National University
APZ	Asset protection zone
AQIA	Air Quality Impact Assessment
ARD	Archaeological Research Design
ASC	Australian Soil Classification
ASS	Acid sulphate soil
BAL	Bushfire attack level
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BCF	Biodiversity Conservation Fund
BDAR	Biodiversity development assessment report
EEMP	Emergency and Evacuation Management Plan
Blasting	The controlled use of explosives and other methods to excavate, break down or remove rock
BMP	Biodiversity management plan
BoM	Bureau of Meteorology
CALMET/CALPUFF	Air quality modelling software

Term	Definition
CC Act	Commonwealth *Climate Change Act 2022*
CCRA	Climate change risk assessment
CEMP	Construction environmental management plan
CIA	Cumulative impact assessment
CLP	China Light and Power Group
CNVMP	Construction Noise and Vibration Management Plan
CO_2-e	Carbon dioxide equivalent
CPHR	Conservation Programs, Heritage and Regulation Group
CSEP	Community and Stakeholder Engagement Plan
CSSI	critical State significant infrastructure
CTMP	Construction Traffic Management Plan
Cumulative Guidelines	*Cumulative impact assessment guidelines for State significant projects*
CWMP	Construction waste management plan
CWO	Central-West Orana
dbh	diameter at breast height
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
Commonwealth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DIAA	Design integration and assessment
DIDO	drive-in-drive-out
Drawdown	The lowering of water levels in a surface water or groundwater storage resulting from the loss or take of water from the storage
Drill and blast	The controlled use of explosives to break rock for excavation
DS Act	*Dams Safety Act 2015*
Earthworks	All works involving the loosening, excavating, placing, shaping and compacting of soil or rock
EC	electrical conductivity
ECI	Early contractor involvement
ECVT	Emergency egress, cabling and ventilation tunnel
EDF	Électricité de France
EDFA	EDF power solutions Australia
EII Act	NSW *Electricity Infrastructure Investment Act 2020*
EIS	Environmental Impact Statement
EMF	Electric and magnetic fields
EMM	EMM Consulting Pty Limited
ENM	Environmental Noise Model

Term	Definition
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021*
EPA	Environment protection authority
EPL	Environment protection licence
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically sustainable development
EST	Energy security target
Excavated rock	Hard, compacted, or cemented materials that have been removed using blasting or other excavation methods
Firming capacity	Energy available within the network to respond to demand when other energy sources, such as intermittent renewables are not operating (due to low wind or low sunlight)
FM Act	*Fisheries Management Act 1994*
FSL	full supply level. The normal maximum operating water level of a reservoir. This water level corresponds to 100% capacity
GDE	Groundwater dependent ecosystem
Generating mode	When water flows from the Upper Reservoir to the Lower Reservoir, providing on-demand energy generation
GHGA	Greenhouse Gas Assessment
GL	gigalitres
GW	Gigawatt
Hectares	ha
HV	Heavy vehicles
HV Switchyard	High voltage switchyard
IAIA	International Association for Impact Assessment
IAPP	Industry and Aboriginal Participation Plan
IBRA	Interim Biogeographic Regionalisation of Australia
ICNG	Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IFC	International Finance Corporation
Inlet structure	Located at each end of the power waterway, the structure which draws/expels water from/into the reservoirs from the power waterway. The design of the upper and lower inlet structures will differ
ISP	Integrated System Plan
IWD	instream woody debris
kt	kilotonne
kV	kilovolt

Term	Definition
kV/m	kilo volts per metre
Laydown area	An area for laydown and maintenance of construction plant, equipment and materials storage
LCZ	Landscape character zones
Lithgow LGA	City of Lithgow local government area
LLP	Lake Lyell Project Pty Ltd
LOS	Level of Service
LRET	Large-scale renewable energy target
LSC	Land soil capability
LVIA	Landscape and visual impact assessment
Macrophytes	Aquatic plants large enough to be visible to the naked eye.
MAT	Main access tunnel
mG	milligauss
Minimum operating level	The lowest level to which a reservoir can be drawn down under normal operating conditions and is the lower limit of active storage
MIV	main inlet valves
MOL	minimum operating level
MW	megawatt
MWhrs	megawatt hours
NARCliM	NSW and Australian Regional Climate Modelling
National Electricity Market	The wholesale exchange of electricity operated by AEMO under the National Electricity Rules (NER). It is the wholesale market for the supply of electricity in all states of Australia except Western Australia and the Northern Territory
NEM	National Energy Market
Nox	Nitrogen oxide
NPfI	Noise Policy for Industry
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NVIA	Noise and Vibration Impact Assessment
ODP	Optimal development path
OEMP	Operational environment management plan
Open cut	Method of excavating a trench from the surface and building the structure within the trench
OSOM	Oversize overmass
OTMP	Operations Traffic Management Plan
PAR	Population at risk
PBP	Planning for Bushfire Protection

Term	Definition
PCT	plant community type
PHES	Pumped Hydro Energy Storage
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
PLL	Potential loss of life
PM_{10}	particulate matter less than 10 µm in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 µm in aerodynamic diameter
PMF	Probable maximum flood
PMP	Platypus management plan
POEO Act	NSW *Protection of the Environment Operations Act 1997*
Portal	Location of surface connection with underground access tunnels
Power station	The cavern adjacent to the power waterway that houses the turbine-generator and associated machinery and infrastructure
Project	The Lake Lyell Pumped Hydro Energy Storage project is referred to as the 'project' in this Environmental Impact Statement
PSI	Preliminary site investigation
RAP	Registered Aboriginal Party
RBL	Rating Background Level
Residual impact	Those effects that remain following the application of mitigation measures to reduce adverse impacts from the project
REZ	renewable energy zones
Riparian	An area or zone within or along the banks of a stream or adjacent to a watercourse or wetland; relating to a riverbank and its environment, particularly to the vegetation
SAII	serious and irreversible impact
SDF	Sunny day failure
SEARs	Secretary's Environmental Assessment Requirements
SEPP 33 Guideline	*Hazardous and Offensive Development Application Guidelines – Applying SEPP 33*
SFAZ	Strategic Fire Advantage Zone
Shaft boring	Excavating a shaft downwards, usually from the surface
SIA Guideline	*Social Impact Assessment Guideline*
SIDRA	Traffic engineering software
SLRA	Soils, Land Use and Rehabilitation Assessment
SMP	Spoil management plan
SoHI	Statement of Heritage Impact
Solar Guidelines	*Large-scale solar energy guideline; Large-scale solar energy guideline: Technical supplement for landscape character and visual impact assessment*

Term	Definition
SPAL	special purpose access licence
SR	Sensitive receptors
SSI	State significant infrastructure
Streamflow	The flow of water in streams, rivers and other channels
Stygofauna	Fauna that live in groundwater systems or aquifers.
Surge shaft	A hydraulic structure designed to control pressure and flow fluctuations in the tunnel
SWMP	Soil and Water Management Plan
SWMS	Safe work method statement
Tailrace tunnel	The downstream tunnel between the underground power station and the Lower Reservoir
TARP	Trigger action response plans
TfNSW	Transport for New South Wales
The Electricity Roadmap	*NSW Electricity Infrastructure Roadmap*
The Electricity Strategy	*NSW Electricity Strategy*
TIA	Traffic impact assessment
TN	Total nitrogen
TP	Total phosphorus
Transformer	An electromagnetic device used to change the voltage of electricity
Transmission	The conveyance of electric energy
TSP	Total suspended particulates
Turbidity	The resultant opacity, cloudiness, or thickness of water arising as a result of the presence of suspended matter
UNSW	University of New South Wales
VA Bulletin	*Wind Energy: Visual Assessment Bulletin*
Variable renewable generation	Intermittent renewable wind and solar energy sources that are non-dispatchable and fluctuating in nature
VPAs	voluntary planning agreements
VPP	virtual power plants
VRE	variable renewable energy
WM Act	*Water Management Act 2000*
WMP	Water management plan
WWTP	waste-water treatment plant
ZVI	Zone of Visual Influence

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