SCOPING REPORT

MUSWELLBROOK PUMPED HYDRO ENERGY STORAGE PROJECT

Prepared by Muswellbrook Pumped Hydro Pty Ltd
December 2023

agl idemitsu

Scoping Report

Muswellbrook Pumped Hydro Energy Storage

Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust

E210760 RP#

December 2023

Version	Date	Prepared by	Approved by	Comments
1	1 December 2023	Stuart Galway	Stuart Galway	

Executive Summary

ES1 Overview

Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust (MPH), a joint venture (JV) partnership between AGL Energy Pty Limited (AGL) and Idemitsu Renewable Developments Australia Pty Ltd (Idemitsu) (the Proponent), is proposing to design, construct and operate the Muswellbrook Pumped Hydro Energy Storage (PHES) Project (the project) partially located within the Muswellbrook Coal Company Ltd (MCC) mine site and Bells Mountain, approximately four kilometres northeast of Muswellbrook, New South Wales.

The project would provide up to 500 megawatts (MW) of electricity-generating capacity and up to eight hours of energy storage. The project would comprise a lower reservoir within an existing MCC mine void, an upper reservoir at Bells Mountain and associated electricity generation and transmission infrastructure. The project would connect to the existing Muswellbrook 330 kV substation located approximately 1.5 kilometres due north of the lower reservoir locality.

This Scoping Report has been prepared by MPH JV in accordance with the *State significant development guidelines – preparing a scoping report* (DPIE 2022).

The purpose of this Scoping Report is to support a request for project-specific Secretary's environmental assessment requirements (SEARs) for the preparation of the environmental impact statement (EIS) for the project.

ES2 Strategic context

The project would provide significant scale, deep storage and flexible, dispatchable generation and is aligned with NSW's energy reliability needs and the objectives of the NSW Electricity Strategy and the NSW Electricity Infrastructure Roadmap (Roadmap). The project would support the Renewable Energy Zones (REZs) in NSW and specifically the Hunter Central Coast region. It would also provide significant economic stimulus to the region through construction jobs and associated flow-on benefits.

The project is also consistent with the NSW Government's climate change initiatives promoting energy and infrastructure strategies supporting expansion of renewable energy generation like energy storage capacity to complement other forms of renewable energy like solar and wind that operate intermittently.

ES3 Justification and need for the project

The NSW Electricity Strategy is the NSW Government's plan for a reliable, affordable and sustainable electricity future that supports a growing economy. The strategy acknowledges the constraints imposed by ageing fossil-fuel powered energy generators and congestion within the transmission system. The strategy is intended to respond to these challenges and to support a new affordable and reliable energy system that meets both existing and future generation needs and the NSW Government's emissions reduction target.

The Roadmap was released in November 2020, setting out a 20 year plan to transform the NSW electricity system into one that is cheap, clean and reliable. The Roadmap will support the private sector to deliver at least 12 GW of new renewable electricity generation and 2 GW of long-duration storage (LDS), such as pumped hydro.

The NSW Network Infrastructure Strategy (EnergyCo 2023) was released in May 2023 and is a 20-year strategy for coordination of NSW network infrastructure to connect new generation and storage in NSW's five REZs, and meet the EII Act objectives. The strategy proposes network infrastructure options with a total capacity of 14 GW to be delivered as soon as practicable by 2033, and further options to be considered for delivery beyond that.

AGL has embarked on a strategy to play a critical role in reducing greenhouse gas emissions. AGL's Greenhouse Gas Policy outlines its approach to reducing greenhouse gas emissions, presenting a pathway for the gradual decarbonisation of their generation portfolio by 2035. As part of this decarbonisation strategy, AGL closed its 2000 MW coal-powered Liddell Thermal Power Station (Liddell), located near Muswellbrook, in April 2023. Liddell together with Bayswater Power Station provide approximately 30 percent of the electricity needs for NSW. To meet its commitment to ensure it continues to supply secure and affordable energy for Australia post-closure of Liddell, AGL has developed its NSW Generation Plan (AGL 2017). The plan sets out AGL's preferred option to replace the generating capacity of Liddell.

The need for the project is principally based on:

- the NSW Government strategy to transition energy generation within NSW to renewable energy sources
- the planned closure of Liddell and the associated reduction in generation capacity.

ES4 Benefits of the project

The Proponent would be a key participant in the NSW Government's LDS development pathway.

The project contains a significant transformational element, as it demonstrates the sustainable land use opportunities which can be undertaken at a brownfield coal mine site in order to assist the NSW electricity market with decarbonisation. To not proceed with this project would also mean forgoing the following:

- social and economic benefits locally and regionally
- direct and indirect employment opportunities
- reducing greenhouse gas emissions that would assist both Australian and NSW emission reduction targets
- additional electricity firming capacity for system reliability, stability, and security.

ES5 Statutory context

ES5.1 State

The project would be designated State Significant Development (SSD) through the effect of State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) and assessed under Division 4.7 (State significant development) of Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).The project would be designated State Significant Development (SSD) under Part 4 of the EP&A Act as it meets the definition of "electricity generating works" under the T&I SEPP and has a capital investment value of more than $30 million.

It would be open to the Minister for Planning to declare the project as State significant infrastructure (SSI) or critical State significant infrastructure (CSSI) pursuant to sections 5.12 or 5.13 of the EP&A Act.

ES5.2 Commonwealth

The project would be referred to the Australian Government Department of Climate Change, Energy, the Environment and Water on the basis that it may impact on threatened species and communities and migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999*. There is a bilateral process agreed to with the NSW State Government to streamline this process as part of the overall NSW project assessment.

ES6 Community and stakeholder engagement

Community and stakeholder engagement is a key part of the project and has occurred prior to and during the project scoping phase. The Proponent has met with key stakeholders as part of the scoping phase of the project to provide an overview of the project. The key stakeholders are:

- State and Federal Members of Parliament
- Muswellbrook Shire Council
- First Nation groups including Plains Clans of the Wonnarua People, Wanaruah Local Aboriginal Land Council, Wonnarua Nation Aboriginal Corporation, Hunter Valley Aboriginal Corporation
- owner of the land at the upper reservoir
- near neighbours to the project
- landowners affected by the proposed transmission corridor
- landowners near the Hunter River in relation to the water pipeline.

Should the project progress, proactive engagement with stakeholders and the community would continue throughout the preparation of the EIS with the aim to ensure the community are kept informed of any project updates.

The project will provide both economic and employment opportunities to the local economy and regionally.

ES7 Potential impacts of the project

A preliminary assessment of potential impacts associated with the project has been carried out in accordance with *State significant development guidelines – preparing a scoping report* (DPIE 2022) and informed by preliminary assessments completed for the project. This identified the following key issues:

- terrestrial and aquatic biodiversity
- Aboriginal heritage
- noise and vibration
- air quality
- water resources
- traffic and transport.

Other environmental matters considered less likely to cause significant impact but requiring assessment to determine impact, management and mitigation are visual amenity, non-Aboriginal heritage, soil and spoil management, waste, hazards and risks (e.g. bushfire, contamination risks and waste management) socio economics and land.

A preliminary assessment of potential cumulative impacts related to interactions with major projects in the surrounding and wider area has identified the potential for such impacts.

Environmental assessments for the EIS would be carried out in accordance with the SEARs.

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Project overview

Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust (MPH) is proposing to develop the Muswellbrook Pumped Hydro Energy Storage Project (the project). The Proponent is a joint venture (JV) partnership between AGL Energy Pty Ltd (AGL) and Idemitsu Renewable Developments Australia Pty Ltd (Idemitsu). AGL is a leading integrated service provider, with a proud 186-year history of innovation. AGL operates Australia's largest electricity generation portfolio, with an operated generation capacity of 10,330 megawatts (MW), which accounts for about 20 percent of the total generation capacity within Australia's National Electricity Market (NEM). Idemitsu has been operating in Australia for over 40 years as a subsidiary of Japanese company Idemitsu Kosan Co. Ltd. Idemitsu has a focus on innovation and is currently exploring solar, hydro, wind and battery hybrid alternatives across Queensland and NSW.

The Proponent is proposing to design, construct and operate a pumped hydroelectric energy storage (PHES) facility partly within the Muswellbrook Coal Company Ltd (MCC) mine site and on land on top of Bells Mountain located approximately four kilometres northeast from Muswellbrook, New South Wales Figure 1.1 shows the location of the project. The project will provide up to 500 MW of electricity-generating capacity and up to eight hours of deep energy storage, feeding into the NEM with direct transmission links to Newcastle and Sydney demand centres. The project will also be used to augment existing gaps in the NSW renewable energy market by providing electricity during times of peak needs and grid support services, and otherwise as needed.

The significant scale, deep storage and flexible, dispatchable generation addresses NSW's energy reliability needs and the objectives of the NSW Energy Strategy[1], the NSW Electricity Infrastructure Roadmap[2] (Roadmap) and the *Electricity Infrastructure Investment Act 2020* (EII Act).

The primary objective of the project is to transport or store energy (water) in an upper reservoir during times when there is surplus renewable energy or supply of electricity. When electricity is in short supply and demand is high, water will be released from the upper reservoir to flow via a connected pipeline to supply water to hydroelectric turbines to produce electricity. The lower reservoir (the former mine site pit) will be used to collect water that has been used to produce hydroelectricity. During periods of low energy demand where electricity is generated by other renewable sources such as wind and solar, water will be pumped back to the upper reservoir to be used again as future stored energy. Figure 1.2 illustrates the general operation of a PHES[3].

The project is partially located over the current MCC mine site at Muscle Creek Road, Muswellbrook. The mine operator, MCC, intends to close the mine and complete rehabilitation by 2026. The project represents an innovative approach to renewable energy generation and coal mine revitalisation in NSW.

The site for the project was chosen owing to a number of factors including the existence of the mine site void for the lower reservoir, suitable nearby topography (Bells Mountain) for an upper reservoir (providing ideal hydraulic characteristics for a PHES scheme), proximity to a nearby source of water (the Hunter River) for water supply requirements, and proximity to a nearby high voltage transmission line switchyard.

The key elements of the project comprise:

- upper reservoir located at Bells Mountain and lower reservoir at the MCC mine pit 2
- penstock (water pipeline) connecting upper and lower reservoirs
- hydroelectric turbines with up to 500 MW of electricity generation capacity

[1] Source: https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/nsw-electricity-strategy

[2] Source: https:/www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap

[3] Source: https://arena.gov.au/blog/what-is-pumped-hydro-and-how-does-it-work/

- connection to the existing Muswellbrook 330 kV substation
- internal access roads, site office and small workshop buildings
- other ancillary supporting infrastructure
- water offtake pipeline from the Hunter River.

The main elements of the pumped hydro part of the project are shown in Figure 1.3. A more detailed description of the project is provided in Chapter 3.

There is no related development required for the project that would be subject to a separate assessment. The MPH JV will monitor the completion of rehabilitation activities within the MCC mine which are currently underway. Should rehabilitation be delayed, a modification of the MCC mine approval may be required to facilitate the project and ongoing mine closure activities.

Figure 1.1 Location of the project

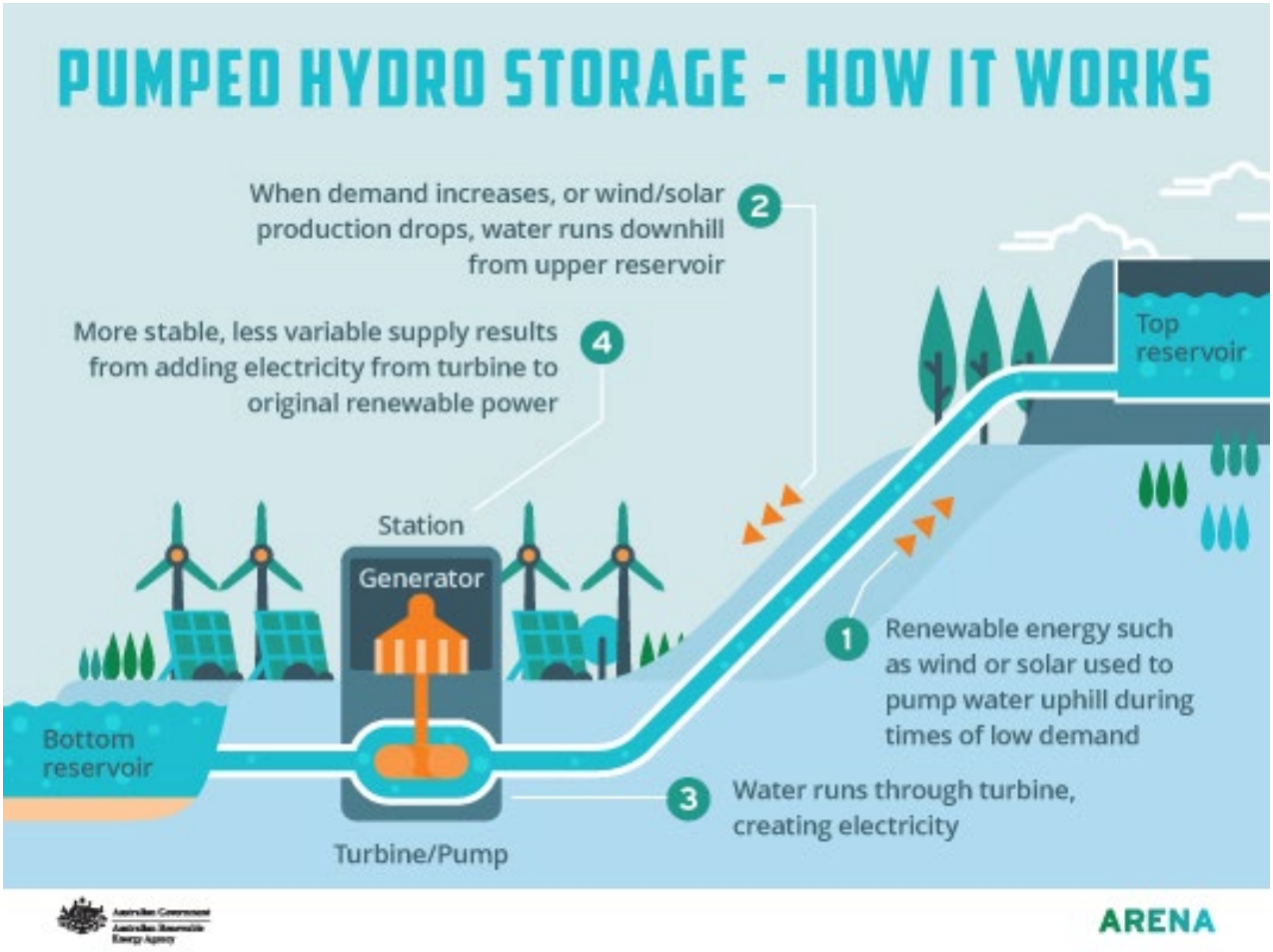

Figure 1.2 Overview of operation of pumped hydro energy storage

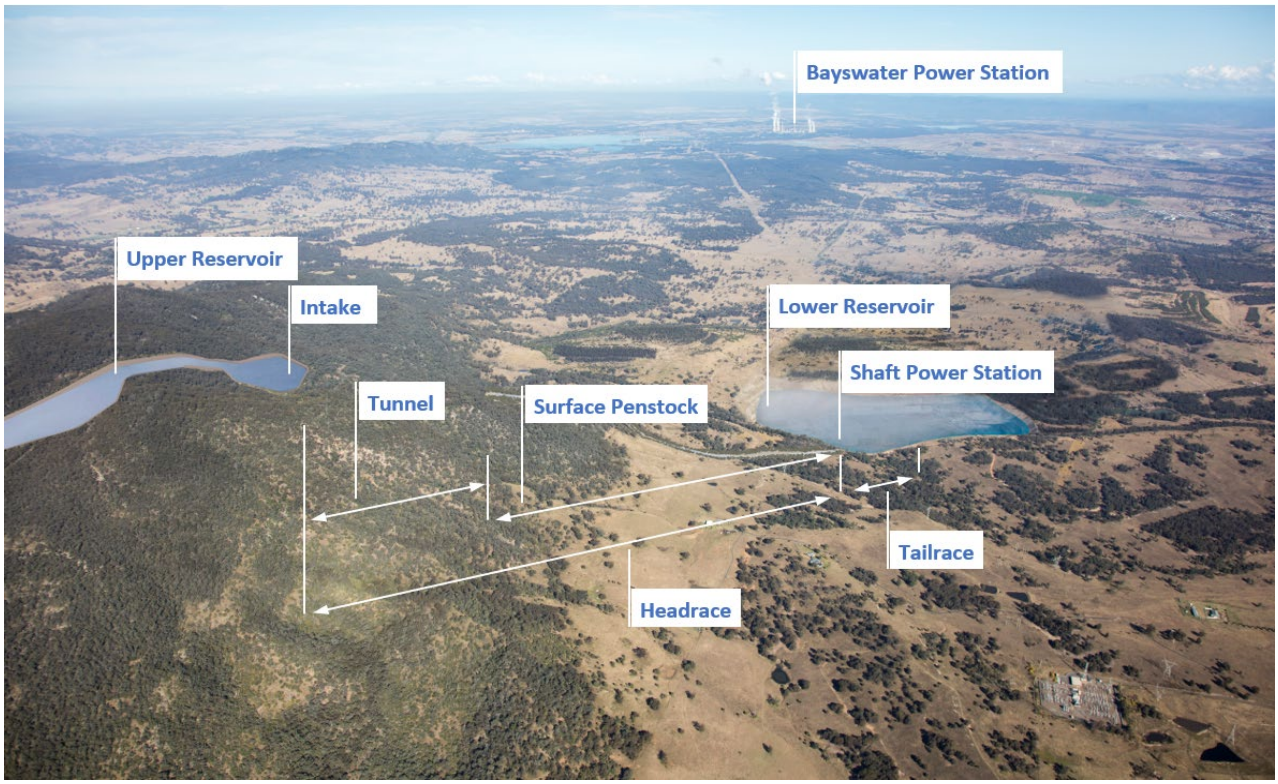

Figure 1.3 Overview of the project

1.2 Proponent details

Details of the Proponent for the project are set out in Table 1.1. Details of the related JV entity are set out in

Table 1.1 Proponent details

Name	Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust
Australian Business Number (ABN)	65 661 980 749
Nominated contacts	Refer Table 1.2
Contact details	Refer Table 1.2

Table 1.2 JV details

JV partner details		
Name	AGL Energy Hub Pty Ltd	Idemitsu Renewable Developments Australia Pty Ltd
Postal address	200 George Street, Sydney, NSW, 2000	Level 9/175 Eagle Street, Brisbane QLD, 4000
ABN	23 105 363 853	65 010 778 711
Nominated contact	Stuart Galway Group Manager – Land, Approvals and Environment	Mitch Cronin Project Lead – Renewables
Contact details	sgalway@agl.com.au	mitchell.cronin@idemitsu.com.au

1.3 Project location

The project is located in the Muswellbrook Local Government Area approximately four kilometres northeast of Muswellbrook, New South Wales (Figure 1.1). The main elements of the project are located partly within the MCC mine site and on land on top of Bells Mountain.

The Hunter River offtake pipeline would west run from the MCC mine site in the road reservation along Limestone Road and Sandy Creek Road before crossing the triangular southern end of a parcel of private land (Lot 101, DP 1167081) between Sandy Creek Road and the New England Highway, and then running along the road reserve of Burtons Lane to the Hunter River.

Further details on the locational context of the project are provided in Section 2.4.

Details of properties affected by the project are provided in the following table.

Table 1.3 Property details

Locality	Property details
Lower reservoir	Lot 19 DP16352, Sandy Creek Road Muswellbrook 2333 (access via Limestone Road) Lot 1 DP1004305, Coal Road Muswellbrook 2333 (access via Limestone Road) Lot 1 DP45194, Coal Road Muswellbrook 2333 (access via Limestone Road and MCC mine site) Lot 57 DP752484, (access via Limestone Road and MCC mine site) Lot 58 DP752484, (access via Limestone Road and MCC mine site) Lot 59 DP752484, Coal Road Muswellbrook 2333 Lot 60 DP752484, Coal Road Muswellbrook 2333 Lot 61 DP1113302, Coal Road Muswellbrook 2333 Lot 62 DP752484, Coal Road Muswellbrook 2333 Lot 44 DP1112699, 374 Sandy Creek Road Muswellbrook 2333 Lot 1 DP184481, Coal Road Muswellbrook 2333 Lot 100 DP666041, Coal Road Muswellbrook 2333
Upper reservoir	Lot 126 DP752444, 250 Dolahentys Road McCullys Gap 2333 Lot 5 DP1178473, 250 Dolahentys Road McCullys Gap 2333 Lot 1 DP113760, 250 Dolahentys Road McCullys Gap 2333 Lot 167 DP752444, 250 Dolahentys Road McCullys Gap 2333 Lot 85 DP752484, 250 Dolahentys Road McCullys Gap 2333 Lot 84 DP752484, 250 Dolahentys Road McCullys Gap 2333 Lot 23 DP752484, 250 Dolahentys Road McCullys Gap 2333 Lot 24 DP752484, 250 Dolahentys Road McCullys Gap 2333 Lot 93 DP752484, 250 Dolahentys Road McCullys Gap 2333 Lot 100 DP666041, Coal Road Muswellbrook 2333 Lot 1 DP134665 Muscle Creek Road Muscle Creek 2333 Lot 1 DP398873 Muscle Creek Road Muscle Creek 2333
Transmission line	Lot 180, DP627509, 360 Sandy Creek Road Muswellbrook 2333 Lot 41, DP1112699, 360 Sandy Creek Road Muswellbrook 2333
Hunter River pipeline	Lot 101, DP1167081, 29 St Heliers Road Muswellbrook 2333 Lot 1, DP1135590, Aberdeen Street Muswellbrook 2333

1.4 Purpose of this report

This Scoping Report has been prepared in accordance with *State significant development guidelines – preparing a scoping report* (DPIE 2022) to support a request for the SEARs for the project. The requirements of the guidelines and where they are addressed in this report are provided in the following table.

Table 1.4 Scoping Report requirements

Requirement	Where addressed in this report
Introduction	Chapter 1
Strategic context	Chapter 2
Description of the project	Chapter 3
Statutory context	Chapter 4
Community engagement	Chapter 5

Table 1.4 Scoping Report requirements

Requirement	Where addressed in this report
Proposed assessment of impacts	Chapter 6

2 Strategic context

2.1 Strategic planning framework overview

An overview of the relevant key policies, plans and strategies aligned with the project is provided in Table 2.1. Further details with regard to key policy and strategy documents for the NSW context are provided in Section 2.2.

Table 2.1 Alignment with key strategic planning frameworks

Plan, policy, or strategy	Description	Alignment with strategic framework
International context		
United Nations Framework Convention on Climate Change – The Paris Agreement (March 1994)	The Paris Agreement is a legally binding international treaty on climate change adopted by 196 parties in 2015. As a signatory to the Paris Agreement, the Australian Government has committed to reduce greenhouse gas emissions to 26-28 per cent on 2005 levels by 2030.	The project would contribute to meeting Australia's commitments under the Paris Agreement to reduce carbon dioxide (CO_2) emissions.
National context		
Large-scale Renewable Energy Target (2001)	This Australian Government policy is designed to ensure that at least 33,000 GWh of Australia's electricity comes from renewable sources by 2020 and supports the establishment or expansion of renewable energy stations.	The project supports the Australian Government commitments to reduce carbon dioxide (CO_2) emissions by facilitating third party renewable generation assets.
Integrated Systems Plan 2022 (2022)	This Integrated Systems Plan 2022 is a transformation of the National Energy Market from fossil fuels to firmed renewables. It will replace legacy assets with low-cost renewables, add energy storage and other new forms of firming capacity, and reconfigure the grid to support two-way energy flow.	The project supports the plan which includes new pumped hydro storage located at appropriate parts of the network to enable more effective dispatch of clean electricity on demand, increase resilience and provide critical system security services.
State context		
NSW Pumped Hydro Roadmap (December 2018)	The NSW Pumped Hydro Roadmap aims to encourage private sector investment in pumped hydro projects that will deliver long term, large scale energy storage for NSW's future energy system.	The project is aligned with the NSW Pumped Hydro Roadmap and is a direct response to Action 1 (To bring forward private investment to support the commercialisation of new, on-demand electricity projects).
NSW Electricity Strategy (2019)	The NSW Electricity Strategy is the NSW Government's plan for a reliable, affordable and sustainable electricity future that supports a growing economy. The Strategy identifies that firmed renewables are the cheapest type of new reliable generation.	The project is strategically planned to accommodate for the imminent retirement of coal generators and will reduce the evolving risk of capacity shortfalls highlighted in this strategy.
NSW Energy Security Target	The NSW Energy Security Target was announced as part of the broader NSW Electricity Strategy framework.	The project provides a combination of energy storage and grid support functions.

Table 2.1 Alignment with key strategic planning frameworks

Plan, policy, or strategy	Description	Alignment with strategic framework
Net Zero Plan Stage 1: 2020-2030 (March 2020)	The Net Zero Plan Stage 1: 2020-2030 aims to fast-track emissions reduction and help achieve the State's objective to deliver a 50% cut in emissions by 2030 compared to 2005 levels.	The project would support the development of additional generation of renewable energy, assisting the NSW Government to achieve Stage 1 of the Net Zero Plan.
NSW Electricity Infrastructure Investment Roadmap (November 2020)	The Roadmap is the NSW Government's plan to transform the NSW electricity system into one that is cheap, clean and reliable. It is expected to attract up to $32 billion of private investment in regional energy infrastructure by 2030 and support over 9,000 jobs, mostly in regional NSW.	The project supports the Roadmap approach in transmission, generation, storage and firming infrastructure as ageing coal-fired generation plants retire by providing energy storage and critical services.
Electricity Infrastructure Investment Act 2020 (NSW)	The purpose of the Act is to coordinate investment in new generation, storage and network infrastructure in NSW. The Act represents a fundamental shift in policy towards the encouragement of renewable energy projects.	The project aligns with framework to alleviate issues with NSW's energy supply, by replacing closing coal power stations and providing grid support services that may reduce constraints in the transmission system.
State Infrastructure Strategy 2022-2042 (June 2022)	The State Infrastructure Strategy 2022-2042 sets out Infrastructure NSW's independent advice to the NSW Government on the State's needs and strategic priorities for infrastructure over the long term. The Strategy is framed around nine objectives and makes 57 recommendations to the NSW Government aimed at improving outcomes and living standards for the people of NSW.	The project supports the objective to achieve an orderly and efficient transition to net zero by 2050. The project would also support the objective to boost economy-wide productivity and competitiveness.
NSW Network Infrastructure Strategy (May 2023)	The NSW Network Infrastructure Strategy is a 20-year strategy for coordination of NSW network infrastructure to connect new generation and storage in NSW's five Renewable Energy Zones (REZs) and meet the EII Act objectives.	The project is consistent with this strategy. Further details are provided in Section 2.2.6 of this report.
Local and regional context		
Hunter Regional Plan 2041	The Hunter Regional Plan 2041 is a 20-year blueprint for the future of the Hunter. It guides land use, planning and decision making in the Hunter to 2041. One of the Place Strategy Outcomes for 'former mining regionally significant areas' is to 'repurpose voids where possible to support renewable energy generation or as resource that supports employment uses elsewhere on the site.	The project is consistent with this outcome as it would use the mine void on the MCC mine site for the lower reservoir of the project.
Muswellbrook Local Strategic Planning Statement 2020 – 2040	The Muswellbrook Local Strategic Planning Statement 2020 – 2040 identifies key outcomes Council aims to achieve when developing policies and making land use decisions. Renewable energy generation is encouraged.	The project aligns with the local strategic vision of the Muswellbrook Shire becoming NSW's major innovative energy centre by contributing to the development of the renewable energy sector.

2.2 NSW Government

2.2.1 NSW Electricity Strategy

The NSW Electricity Strategy[4] is the NSW Government's plan for a reliable, affordable and sustainable electricity future that supports a growing economy. The strategy acknowledges the constraints imposed by ageing fossil-fuel powered energy generators and congestion within the transmission system. The strategy is intended to respond to these challenges and to support a new affordable and reliable energy system that meets both existing and future generation needs and the NSW Government's emissions reduction target.

This will be achieved by:

- delivering Australia's first coordinated REZ in the Central-West Orana region
- saving energy, especially at times of peak demand via the Energy Security Safeguard
- supporting the development of new electricity generators
- setting a target to bolster the state's energy resilience
- making it easier to do energy business in NSW.

The strategy encourages an estimated $8 billion of new private investment in NSW's electricity system over the next decade, including $5.6 billion in regional NSW. It will also support an estimated 1,200 jobs, mostly in regional NSW. The strategy closely aligns with the NSW Government's *Net Zero Plan Stage 1: 2020–2030*.

The strategy identifies the following actions to secure NSW's energy future[5] by supporting an efficient, competitive and low cost electricity market:

- adopting a case management approach for reliability critical infrastructure
- project funding through the Emerging Energy Program
- making it easier to do business
- rolling out NSW REZs
- reconstituting the Energy Savings Scheme as the Energy Security Safeguard
- supporting the deployment of utility scale generation in NSW
- setting an Energy Security Target
- ensuring there are actionable options to address a capacity shortfall
- powers to gather information
- robust emergency response powers and processes.

Specific details for each of these actions are provided in the NSW Electricity Strategy (DPIE 2019).

4 https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/nsw-electricity-strategy

5 https://www.energy.nsw.gov.au/sites/default/files/2022-08/2019_11_NSW_ElectricityStrategyDetailed.pdf

2.2.2 NSW Electricity Infrastructure Roadmap

The Roadmap[6] was released in November 2020, setting out a 20 year plan to transform the NSW electricity system into one that is cheap, clean and reliable. The Roadmap is enabled by the EII Act.

Figure 2.1[7] identifies the various parties that are collaborating to deliver the Roadmap. The intention of this is to facilitate coordination of investment in transmission, generation, storage and firming infrastructure as ageing coal-fired power plants are retired from 2023.

The Roadmap will support the private sector to deliver at least:

- 12 GW of new renewable electricity generation
- 2 GW of long-duration storage (LDS), such as pumped hydro.

The Roadmap will give industry and investors the certainty they need to invest in the infrastructure needed, with more than $32 billion of private sector investment to be injected into the NSW economy by 2030 (NSW Climate and Energy Action, 2023).

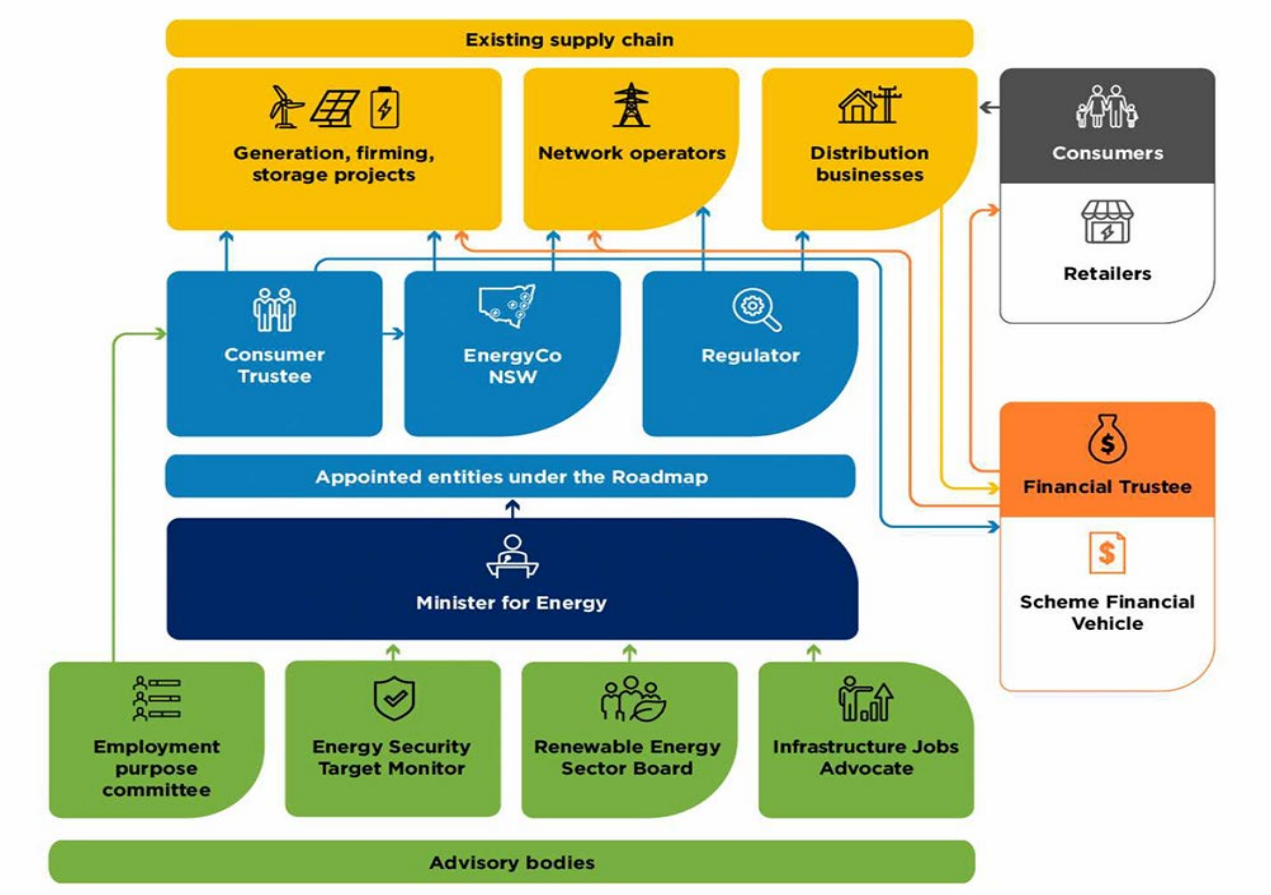

Figure 2.1 NSW Electricity Infrastructure Roadmap stakeholders

6 https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap

7 Source: https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap/entities-delivering

2.2.3 NSW Network Infrastructure Strategy

The NSW Network Infrastructure Strategy[8] (EnergyCo 2023) was released in May 2023 and is a 20-year strategy for coordination of NSW network infrastructure to connect new generation and storage in NSW's five REZs and meet the EII Act objectives. The strategy proposes network infrastructure options with a total capacity of 14 GW to be delivered as soon as practicable by 2033, and further options to be considered for delivery beyond that.

The strategy presents network infrastructure options in the context of three timeframes:

- Deliver Now: progress as quickly as possible for delivery by 2033 at the latest.
- Secure Now: act now to secure, as likely to be needed in the 2030s.
- Plan for the Future: may be needed in the 2030s to support electrification.

The proposed network infrastructure options aim to support the EII Act infrastructure investment objectives and deliver the declared intended network capacities for each REZ.

2.2.4 Regulatory framework

Part 7 of the EII Act provides for the establishment of the Electricity Infrastructure Fund that will be used to manage costs associated with network investment required to support infrastructure projects under the EII Act, the establishment of Long-Term Energy Service Agreements, and administration of the EII Act by its appointed entities.

The NSW Office of Energy and Climate Change (OECC) and the Australian Energy Regulator (AER) have published the following two papers to support the implementation of the Roadmap:

- Electricity Infrastructure Roadmap: Electricity Infrastructure Fund (Part 7 of the EII Act) Exemptions Administration Process (OECC 2022a).
- NSW Electricity Infrastructure Fund – Contribution Determination Guideline (AER 2022a).

The following documents relating to the regulatory framework have also been released:

- Regulatory framework for the Transmission Efficiency Test and Regulator's determinations for network infrastructure projects (OECC 2022b).
- *Network Authorisation Guidelines* (draft) (EnergyCo & AEMO Services 2022).
- Revenue determination guideline for NSW contestable network projects (AER 2022b).

The regulatory process for REZ infrastructure projects is set out in Figure 2.2 below[9].

[8] Source: https://www.energyco.nsw.gov.au/sites/default/files/2023-05/network-infrastructure-strategy.pdf

[9] Source: https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap/regulatory-framework

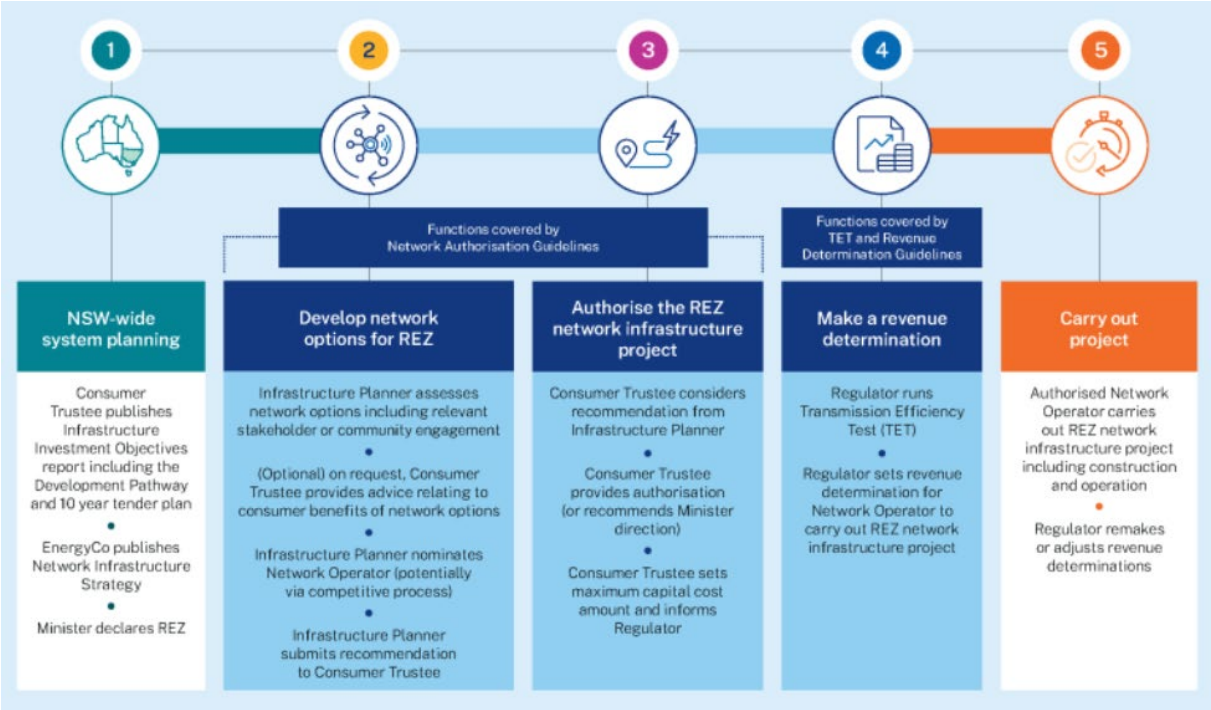

Figure 2.2 Regulatory process for REZ infrastructure projects

2.2.5 Energy Corporation of NSW

The Energy Corporation of NSW (EnergyCo) is a statutory authority established under the *Energy and Utilities Administration Act 1987.* EnergyCo is responsible for leading the delivery of REZs as part of the Roadmap[10].

The key responsibilities of EnergyCo include:

- strategic planning, technical and regulatory design
- community and stakeholder engagement
- infrastructure and investment.

Further details relating to these responsibilities are provided on EnergyCo's website[11].

2.2.6 Renewable Energy Zones

As stated on EnergyCo's website[12]

> Five [REZs] have so far been identified and will keep NSW electricity reliable as coal-fired power stations retire, delivering large amounts of new energy to power our regions and cities.
>
> These REZs will help deliver lower wholesale electricity costs and place downward pressure on customer bills through increased competition, while also supporting new local jobs and business opportunities during construction and operation.

10 https://www.energyco.nsw.gov.au/

11 https://www.energyco.nsw.gov.au/about-energyco/our-purpose

12 https://www.energyco.nsw.gov.au/renewable-energy-zones

REZs will reduce carbon emissions by delivering a greater mix of renewable energy to the National Electricity Market (NEM), supporting NSW and Australia's net-zero ambitions.

In addition to providing reliable clean energy for NSW consumers, the REZs will help service the growing energy needs of emerging green manufacturing, energy intensive agriculture and export market opportunities. This makes REZs the ideal place to both generate and use renewable energy and affords the regional communities hosting these zones with substantial opportunities to capitalise on and share in the benefits of the energy transformation.

An REZ is functionally equivalent to a power station that combines:

- new renewable energy infrastructure, including generators (such as solar and wind farms)
- storage (such as batteries and pumped hydro)
- high-voltage transmission infrastructure.

The REZs are intended to capitalise on economies of scale to deliver cheap, reliable, and clean electricity for homes and businesses in NSW.

The NSW Network Infrastructure Strategy (EnergyCo 2023) identifies REZs as the most cost-effective approach to deliver clean, reliable and affordable energy to NSW household and businesses.

The project is strategically located in the Hunter-Central Coast REZ (Figure 2.3). The Hunter-Central Coast REZ was formally declared by the Minister for Energy under section 19(1) of the EII Act and published in the NSW Government Gazette on 9 December 2022.

Between December 2021 and February 2022, EnergyCo ran a Registration of Interest (ROI) process for the Hunter-Central Coast REZ. This attracted a significant response with commercial interest in renewable generation and storage projects representing almost 40 GW and more than $100 billion of potential investment.

The declaration sets out the intended network capacity for network infrastructure in the Hunter-Central Coast REZ of 1 GW. The ROI for the Hunter-Central Coast REZ identified over 2 GW of generation from onshore wind and solar generation projects located in the Upper Hunter near Muswellbrook. The initial intended network capacity of 1 GW would be sufficient to cater for the expected generation in this area given the variable nature of wind and solar energy generation.

The capacity of the Hunter-Central Coast REZ is likely to increase over time with the retirement of coal-fired power stations, re-purposing of mining land and the growth of offshore wind.

Figure 2.3 Hunter-Central Coast Renewable Energy Zone

EnergyCo's LDS development pathway is outlined in the *2021 Infrastructure Investment Objectives Report* (AEMO Services 2021) and maintained in the Draft 2023 Infrastructure Investment Objectives Report (AEMNO Services 2023). This sets out a plan for the construction of LDS with a registered capacity that can be dispatched for at least eight hours (by financial year) over a 20-year period. This development pathway seeks to meet the minimum objectives of 2 GW of LDS (excluding the Snowy Hydro 2.0 project) to have completed construction by the end of 2029 (Figure 2.4; Source: Figure 12, AEMO Services 2021). The project will be a key participant in the LDS development pathway for the NSW Government. Subject to approval, construction is planned to begin in 2026 and to be completed by the end of 2029.

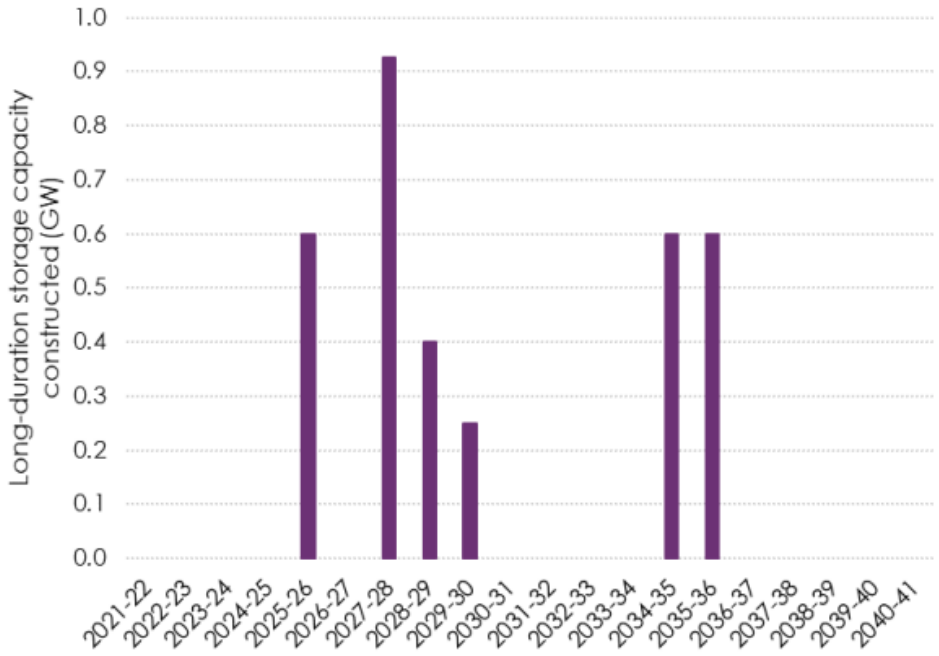

Figure 2.4 Long-duration storage development pathway

2.3 Justification for the project

2.3.1 Pumped hydro energy storage

Pumped hydro is an integral component of the Roadmap as noted in Section 2.2.2. Pumped hydro generation is considered a high-efficiency power source because it can convert a large proportion of the potential energy stored in water into electricity. The efficiency of pumped hydro generation is typically between 70 percent and 85 percent, which is much higher than many other forms of energy storage.

The high efficiency of pumped hydro generation is due to the fact that the system is essentially a closed-loop system, where water is pumped from a lower reservoir to an upper reservoir during times of low demand, and then released back down through turbines to generate electricity during times of high demand. This closed-loop system allows the system to capture and reuse the potential energy stored in the water.

The technological characteristics that make pumped hydro power generation a preferred technology in a grid mostly dominated by renewable energy include:

- **High energy density:** Pumped hydro power generation has a high energy density, meaning it can store large amounts of energy in a relatively small space. This makes it well-suited for use in urban or densely populated areas where land is at a premium.
- **Long duration storage:** Pumped hydro power generation can provide LDS, with some facilities capable of storing energy for several days or even weeks. This makes it well-suited for use with intermittent

renewable energy sources like wind and solar, which may not produce energy consistently throughout the day or year.

- **Fast response time:** Pumped hydro power generation can respond quickly to changes in demand, making it a good choice for grid operators who need to balance supply and demand in real time. This fast response time can help to maintain grid stability and reliability, even during periods of high demand or unexpected events.

- **High efficiency:** Pumped hydro power generation has a high efficiency, meaning it can convert a high percentage of the energy stored in the system back into usable electricity. This efficiency can help to reduce the cost of electricity and improve the overall economic viability of the system.

- **Low operating costs:** Pumped hydro power generation has relatively low operating costs compared to other forms of energy storage. This is because it does not require expensive materials or equipment, and it has a long lifespan with minimal maintenance requirements.

- **Scalability:** Pumped hydro power generation is highly scalable, meaning it can be easily expanded or contracted to meet changes in demand. This scalability can help to reduce the need for fossil-fuel-based peaking power plants, which can be expensive and have high emissions.

- **Proven technology:** Pumped hydro power generation is a well-established technology that has been used for decades around the world. This makes it a reliable and proven technology that is well-understood by grid operators and engineers.

2.3.2 Need for the project

AGL has embarked on a strategy to play a critical role in reducing greenhouse gas emissions. The AGL Greenhouse Gas Policy (AGL 2015) outlines its approach to reducing greenhouse gas emissions, presenting a pathway for the gradual decarbonisation of their generation portfolio by 2035. As part of this decarbonisation strategy, AGL has closed the 2000 MW coal-powered Liddell Thermal Power Station (Liddell), located near Muswellbrook, in April 2023. Liddell together with Bayswater Power Station provide approximately 30 percent of the electricity needs for NSW[13].

To meet its commitment to ensure it continues to supply secure and affordable energy for Australia post-closure of Liddell, AGL has developed its NSW Generation Plan (AGL 2017). The plan sets out AGL's preferred option to replace the generating capacity of Liddell (rather than carrying out further upgrades at Liddell). The NSW Generation Plan identifies that the weighted levelised cost of energy (real $2017 pre-tax) for an equivalent level of energy production is lower for Liddell replacement ($83/MWh) compared to Liddell lifetime extension ($106/MWh).

This option to replace the generating capacity of Liddell includes a series of investments in new, low-emissions generation including this PHES project being jointly proposed by AGL and Idemitsu.

In summary the need for the project is principally based on:

- the NSW Government strategy to transition energy generation within NSW to renewable energy sources

- the planned closure of coal fired generation across NSW and the associated reduction in generation capacity.

Consideration of the 'do nothing' option is provided in Section 3.1.3.

[13] https://www.agl.com.au/about-agl/how-we-source-energy/agl-macquarie#:~:text=Liddell%20power%20station%20produces%20around,needs%20of%20New%20South%20Wales

2.3.3 Project benefits

The project would provide significant scale, deep storage and flexible, dispatchable generation to serve NSW's energy reliability needs and the objectives of the Roadmap and the EII Act.

The benefits of pumped hydro energy generation and LDS in a market dominated by intermittent variable renewable generation are significant.

This technology can help to address the challenges posed by the intermittency and variability of wind and solar power, while also improving grid flexibility, reliability and resiliency.

By reducing the need for fossil fuel-based peaking power plants and improving overall system efficiency, pumped hydro and LDS can also help to lower the cost of electricity and greenhouse gas emissions.

The direct benefits of the project include:

- ability to store excess electricity from renewable resources for later use
- increased flexibility in operation of the electricity grid
- improved reliability and resiliency
- cost savings
- environmental benefits related to reducing demand on fossil fuel-based sources of energy and associated reductions in other greenhouse gas emissions.

Further details are provided as follows.

i Energy storage

One of the primary benefits of pumped hydro generation and LDS is the ability to store excess electricity generated by wind and solar for later use. This helps to address the intermittency and variability of wind and solar power, which can be a challenge for grid operators. By storing excess energy when available and releasing it when needed, pumped hydro and LDS can help to ensure that the grid has a stable and reliable supply of electricity.

ii Increased grid flexibility

The ability to store excess electricity and release it when needed can also make the grid more flexible and responsive to changes in demand. This can help to reduce the need for fossil-fuel-based peaking power plants, which are typically only used during periods of high demand. With pumped hydro and LDS, excess renewable energy can be stored and used to meet demand during these periods, reducing the need for peaking power plants and improving overall grid flexibility.

iii Improved reliability and resiliency

Pumped hydro generation and LDS can also help to maintain grid stability and reliability, even during times of high demand or unexpected events such as natural disasters. By providing a stable and reliable source of electricity, pumped hydro and LDS can reduce the likelihood of power outages and blackouts, which can have significant economic and social impacts.

iv Cost savings

By reducing the need for peaking power plants and improving grid flexibility, pumped hydro generation and LDS can help to lower the overall cost of electricity. In addition, the storage of excess renewable energy can reduce curtailment of wind and solar power, which can result in additional cost savings. Curtailment occurs when wind

and solar power generation exceeds the demand for electricity, leading to a situation where excess energy is wasted. By storing this excess energy for later use, pumped hydro and LDS can help to reduce curtailment and improve overall system efficiency.

v Environmental benefits

The increased use of renewable energy sources such as wind and solar, along with pumped hydro generation and LDS, can help to reduce greenhouse gas emissions and mitigate the impacts of climate change. By displacing fossil-fuel-based power generation, renewable energy and energy storage technologies can help to reduce the emissions of greenhouse gases such as carbon dioxide and methane, which are major contributors to climate change. In addition, closed loop pumped hydro storage systems present minimal environmental impact as they are not connected to existing river systems.

2.3.4 Key strategic issues

Key strategic issues that are likely to be relevant to the justification and evaluation of the project include:

- transition of electricity generation capacity in NSW away from fossil fuel sources, a critical need for the State
- AGL's decarbonisation strategy, which is related to the above bullet point
- selection of the location of the project.

These will be investigated in more detail in the EIS.

2.4 Project location context

2.4.1 Project area

The project is within the locality of Muswellbrook in the Muswellbrook local government area (LGA). Part of the project is located within the MCC mine on land owned by MCC, a subsidiary company of Idemitsu, and the balance of the project is located on Bells Mountain, being freehold land owned by one landowner (refer Figure 3.2).

Key land uses within the project area include agriculture, mining activities and associated infrastructure.

Land uses surrounding the site include agricultural activities, light industrial land uses and residential areas. Agricultural activities are located on properties surrounding the MCC mine and primarily include grazing of beef cattle.

Light industrial and special land uses include Muswellbrook Quarry to the north-west (owned by MCC and leased to Daracon), St Heliers correctional centre to the north-west, and the Muswellbrook Waste Management Facility to the south-west.

The Muswellbrook township is to the west, with other notable rural-residential areas along Sandy Creek Road to the north, Woodland Ridge Estate to the south and along Muscle Creek Road to the south-east. Other significant features surrounding the MCC mine include the Main Northern Rail Line and the New England Highway, which run to the west through Muswellbrook township and to the south towards Singleton. Numerous other mining operations and power-generating facilities exist between Muswellbrook and Singleton.

2.4.2 Local community

Muswellbrook, as the nearest population centre to the project, has a population of 16,357 (Australian Bureau of Statistics 2021). Mining is the largest employment sector for Muswellbrook. Other economic drivers include agriculture, power and energy generation, retail, accommodation and food services.

National parks near the project area include Scone Mountain National Park, Mount Royal National Park, Barrington Tops National Park, Goulburn River National Park and Wollemi National Park. Nearby parks include Lake Glenbawn State Park, Brushy Hill Nature Reserve and Manobalai Nature Reserve.

2.4.3 Regional community

The New England Highway passes through Muswellbrook, connecting it as part of the inland Sydney to Brisbane National Land Transport Network and the primary route connecting the Upper Hunter with Maitland and Newcastle.

Other towns near the project include Aberdeen (about 10 km north-west with a population of 2,051), Scone (about 20 km north with a population of 6,035), Denman (about 27 km south-west with a population of 1,821) and Singleton (about 40 km south-east with a population of 24,577) (Australian Bureau of Statistics 2021).

2.4.4 Potential interactions with other projects

The Hunter region contains a number of major developments including several operational coal mines, the former Liddell Power Station and the operational Bayswater Power Station. Renewable energy generation is a growing activity in the region with several projects in planning including the Muswellbrook Solar Farm, Bowmans Creek Windfarm, the Muswellbrook Battery Energy Storage project and the Maxwell and Hunter River Solar Farms. Major projects in the surrounding area are shown in Figure 2.5. A preliminary cumulative impact assessment for this scoping report is provided in Section 6.15.

Of these projects, the project area for Muswellbrook Solar Farm is adjacent to the project area for the PHES project, with large parts of both projects being located on MCC land. Idemitsu has developed a draft masterplan for the MCC mine site in collaboration with several industry partners (including AGL) to coordinate future development of the mine site following cessation of mining activities.

i MCC mine interactions

The MCC mine is operated under the condition of development consent for development application number DA 205/2002 (Consent), determined by Muswellbrook Shire Council. MCC holds the following mining leases and coal tenements:

- CCL713 is a consolidated coal lease and includes the historical underground mine.
- ML1562 and ML1304 provide for the mine tenure required for the Consent boundary. These mining leases are expected to remain in place until completion of mine rehabilitation activities.

The project overlaps with the Consent boundary for the MCC mine and includes the northern pit void which will act as the lower reservoir. A rehabilitation and closure strategy (EMM 2016), and a rehabilitation management plan (MCC 2022) have been developed for the MCC mine. The regulatory requirements for the rehabilitation for the mine are outlined in the rehabilitation management plan.

The pit void will be rehabilitated in accordance with the conditions of the Consent as safe, stable and non-polluting, fit for purpose for the intended post-mining land use(s). The intention for the pit void in the final landform is to allow it to fill with water.

Currently rehabilitation activities occurring at the MCC mine are being undertaken consistent with the requirements of the rehabilitation and closure strategy (EMM 2016), and the rehabilitation management plan (MCC 2022). Under these, the rehabilitation is expected to be completed by 2026, following which MCC will seek relinquishment of the site in accordance with the Consent and the requirements of the *Mining Act 1992.*

As such, it is expected that at the time of the commencement of the project, post 2026 pending necessary approvals, the MCC mine will be rehabilitated and activities proposed under the project will be undertaken on the rehabilitated and relinquished landform. In this way the project would have no interaction with existing approvals for the MCC mine. Should rehabilitation of the MCC mine be delayed or a change to the approved final landform under the Consent be required, MPH and JV parties may seek to modify the Consent in consultation with Muswellbrook Shire Council and NSW Department of Planning and Environment (DPE). MPH will regularly review the progress of MCC mine rehabilitation to ensure that should delays occur or changes be required this identified early and appropriate approvals sort as to ensure both the project and MCC mine can operate effectively under relevant approvals.

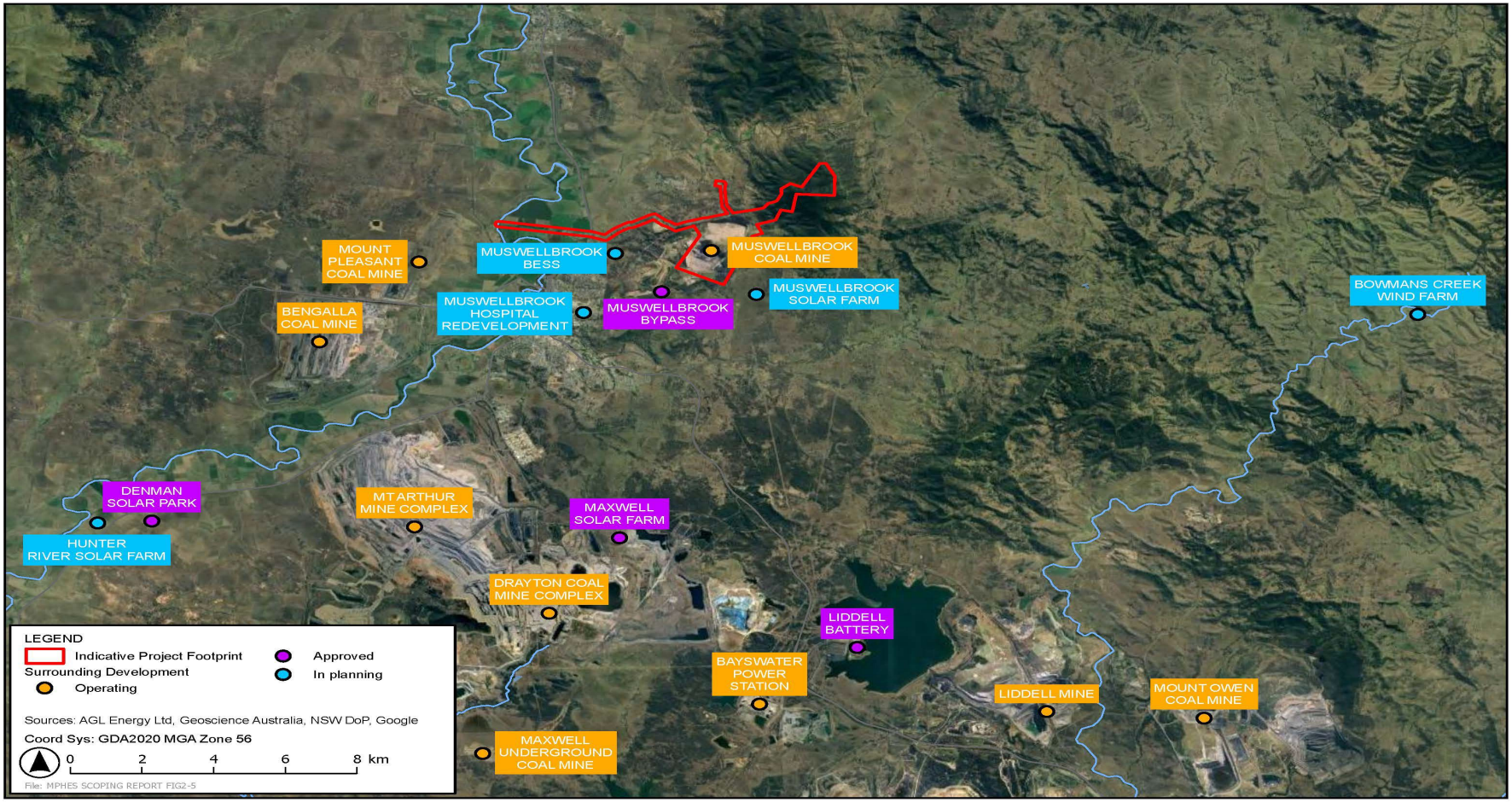

Figure 2.5 Major projects in the surrounding region

3 Project description

3.1 Overview

The project would comprise a pumped hydroelectric energy storage facility at Bells Mountain, Muswellbrook. The project will include upper and lower water reservoirs with the lower reservoir utilising an existing mine pit void within the MCC property that is no longer required for operations.

A hydroelectric power station would be constructed between the two reservoirs connected by a tunnel and a surface penstock. The project would include a high voltage transmission line connecting to TransGrid's existing Muswellbrook 330 kV substation located approximately 1.5 km to the north for connection to the existing transmission network.

The project will be a closed loop system where water from the lower reservoir is pumped back to the upper reservoir to be reused at times when prices are low and renewable solar and wind generation is at a maximum. Once filled, the project will have low annual water needs over an operational life of up to 100 years.

The project includes a pipeline from the Hunter River to the west to provide for initial filling of the lower reservoir at the beginning of operation. The pipeline would also be used for supplementary filling as required where volumes were not able to be maintained by rainfalls.

3.1.1 Key project elements

The key project components are as follows:

- an upper reservoir and lower reservoir that would provide for up to 500 MW capacity storage for eight hours of electricity generation; the lower reservoir would utilise an existing mine void on the MCC mine site
- treatment (such as installation of a liner) of the reservoirs to minimise the risk of seepage
- up to four hydro-electricity generation units with associated infrastructure, water and access tunnels, surge tanks and inlet and outlet structures
- approximately 2.1 km of waterway consisting of a combination of tunnel and surface penstocks (both above-ground and below-ground infrastructure)
- switchyard, transformers, auxiliary electrical and mechanical buildings, control room and laydown areas
- a transmission line approximately 1.5 km in length connecting the PHES switchyard to TransGrid's existing Muswellbrook 330 kV substation (for connection to the existing transmission network)
- permanent access roads and other ancillary infrastructure
- a pipeline (approximately five km in length) to take water from the Hunter River; this would be used for initial filling of the lower reservoir and then for 'top ups' during operation as required
- ancillary development, including access roads, utilities and communications infrastructure, construction laydown areas, compounds, and construction power supply
- permanent post-construction surface infrastructure may include control buildings, workshops, administration buildings along with permanent above or below ground power and communications, water, and wastewater drainage infrastructure.

Details relating to construction of the project are provided in Section 3.6.

3.1.2 Capital project investment

The capital cost estimate for the project has been determined to be in the order of A$650-700 million. The capital project investment costs would be refined during the detailed design phase with selection of type and number of hydroelectricity turbines and supporting infrastructure.

3.1.3 Project alternatives considered

From a state-wide perspective with regard to generating capacity, various opportunities are being pursued by private sector parties including AGL. As part of its NSW Generation Plan (AGL 2017) relating to closure of Liddell Power Station, AGL identified the following opportunities for new low emissions generation and upgrades to existing generation:

- Newcastle gas peaker (250 MW or other sites)
- NSW gas peaker (500 MW)
- Renewables (1600 MW)
- Demand response (up to 150 MW)
- Bayswater upgrade (100 MW)
- Liddell battery (250 MW)
- Pumped hydro
- Liddell synchronous condenser.

i Site selection

The project site location was chosen considering several factors such as the existence of an end of operation mine site void for water storage being adjacent to a mountain, location of nearby electricity generation infrastructures and transmission networks and a local community located about five kilometres from the project site that could support employment for energy projects like this PHES project.

The close proximity of Bells Mountain to the MCCMCC mine void and elevation of the mountain provides the physical parameters to allow a project of this nature which makes it unique in the Hunter region and therefore the only likely option considered for the location of the project in the Upper Hunter region.

ii Upper reservoir options

An options assessment was commissioned by the MPH JV to investigate pumped hydro storage options for the MCC CC mine using Pit 2, the pit closest to Bells Mountain. The initial target concept was a 250 MW installed capacity facility with storage sufficient for eight hours generation. Initial layout options for 1.8-1.9 Mm^3 was targeted based on the target generation capacity and the head range available at the site (450-550 m elevation difference between the bottom of Pit 2 and Bells Mountain). Further investigations have identified that the Upper reservoir is capable of supporting a 500 MW installed capacity facility which the project proposes discussed below.

Three areas of interest on Bells Mountain were identified and three options for the configuration of the upper reservoir were considered. The dam construction options included:

1. Traditional dam construction – Bells Mountain does not have incised valleys, except in one location.

2. Turkeys nest reservoir – the steep sides of Bells Mountain largely preclude the ability to construct embankments to enclose a reservoir without large fill sections which risk slope failure.

3. Excavated pit – excavation is costly but less risky with respect to dam failure and less likely to be visible from surrounding areas.

In consideration of these constraints, the option assessment identified three options for further consideration, known as Dam, Trig and Spur, and these are shown on Figure 3.1 and outlined in Table 3.1.

As noted in Table 3.1, the Spur option is considered the most appropriate, and has been subject to further refinement as outlined in the following section.

Table 3.1 Upper reservoir options

Reservoir option	Description	Considerations
Dam	Shallow valley with a concrete face rockfill dam. Valley unable to hold required reservoir volume so excavation into reservoir footprint required. Excavation of approx. 710,000 m^3 of rock. Gross head between 445 m to 505 m.	• Challenging construction methodology. • Unlikely to provide required reservoir volume. • Less favourable hydraulic characteristics. • Underground power station required due to topography. • Visible from surrounding areas.
Trig	Excavated reservoir at the summit of Bells Mountain. Excavation of approx. 4.02 Mm^3 of rock. Gross head between 480 m to 534 m.	Increased construction timeframe due to underground works requirement. • Removed from consideration due to issues with location and intersecting trig station. • Visible from surrounding areas • Penstock likely too long.
Spur	Excavated reservoir along an elongated spur to the north of the Bells Mountain summit. Excavation of approx. 3.89 Mm^3 of rock. Gross head between 450 m to 500 m.	• Closest to lower pit and therefore has the best hydraulic characteristics. • Less likely to be visible from surrounding areas. • Underground and surface arrangements provide flexibility. • **Preferred option**. Progressed further to consider six options as discussed below.

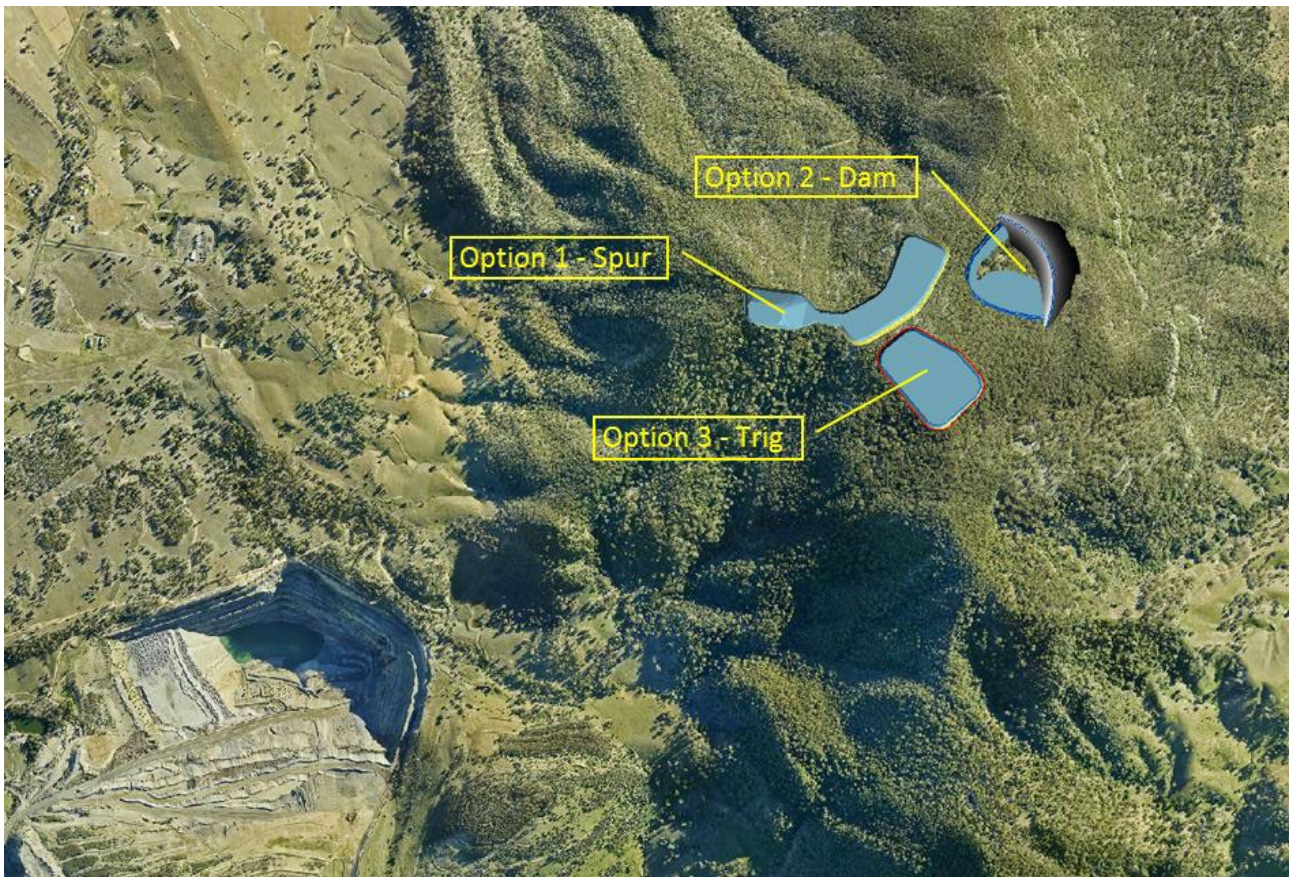

Figure 3.1 Options assessment – upper reservoir alternative locations

a Spur alignment options

The spur option identified in the initial options phase included a predominantly excavated reservoir with a full supply level (FSL) of 610 mAHD. Key topographical constraints were considered for the spur option, including:

- the relatively steep decent to the north and south-west of the proposed storage, limiting the extent of the reservoir footprint whilst maintaining an FSL of 610 mAHD
- the steep ascent to summit of Bells Mountain at the south-east of the proposed storage, resulting in the need for excavation
- a low height saddle approximately in the middle of the spur, with an elevation of about 608 mAHD (2 m below the proposed FSL) potentially preventing complete closure of the reservoir at the FSL of 610 mAHD.

Six options were considered for the spur upper reservoir design as outlined in Table 3.2.

Table 3.2 Spur alignment options

Option	Description	Image
1	Connected basin with FSL at 610 mAHD. Minimum reservoir rim level at 611 mAHD. Minimum freeboard above FSL of 1m. Volume 1.94 GL. Approximate site clearing: 160,000 $m^{2.}$ Approximate excavation: 4,500,000 $m^{3.}$	
2	Separate basin with FSL at 610 mAHD. Minimum reservoir rim level at 611 mAHD. Minimum freeboard above FSL of 1m. Volume 1.95 GL. Approximate site clearing: 170,000 $m^{2.}$ Approximate excavation: 4,750,000 $m^{3.}$	
3	Connected basin with FSL at 605 mAHD. Minimum reservoir rim level at 606 mAHD. Minimum freeboard above FSL of 1m. The entire perimeter of the storage contained below the lowest section of saddle. No gravity walls required. Volume 1.97 GL. Approximate site clearing: 200,000 $m^{2.}$ Approximate excavation: 5,400,000 $m^{3.}$	
4	Narrow connected basin with FSL at 610 mAHD Minimum reservoir rim level at 611 mAHD. Minimum freeboard above FSL of 1m. Volume 1.95 GL. Approximate site clearing: 160,000 $m^{2.}$ Approximate excavation: 4,200,000 $m^{3.}$	
5	Narrow connected basin with FSL at 615 mAHD Minimum reservoir rim level at 616 mAHD. Minimum freeboard above FSL of 1m. Volume 1.93 GL. Approximate site clearing: 130,000 $m^{2.}$ Approximate Excavation: 3,500,000 $m^{3.}$	
6	Narrow connected basin with FSL at 620 mAHD. Minimum reservoir rim level at 621 mAHD. Minimum freeboard above FSL of 1m. Volume 1.90 GL. Approximate site clearing: 155,000 $m^{2.}$ Approximate excavation: 3,400,000 $m^{3.}$	

Options 4 and 5 were assessed as the most appropriate options in consideration of environmental and economic constraints. options. A cost sensitivity analysis identified option 4 as the preferred arrangement.

Further design development is discussed in Sections 3.2.5 and 3.2.6.

iii Do nothing option

The detailed NSW Electricity Strategy (DPIE 2019) identifies five major changes underway in the NSW electricity market:

- Increasing electricity prices, which are putting pressure on household and business budgets.
- Power stations are reaching the end of their technical lives, driving a need for replacement sources of energy and risk management to address increasing risk of part failure and decreasing the reliability of the electricity system.
- Improving economics of renewables, which are now the most economic form of new generation, with a mix of wind and solar firmed with gas, batteries and pumped hydro expected to be the most economic form of reliable electricity.
- Congestion in the electricity system, driven by the connection of new renewable energy sources to the grid (with renewables often best located at the remote edges of the grid).
- Changing patterns in the use of electricity, with the energy sector moving away from a centralised power system to a decentralised power system as more small-scale resources connect.

Given these identified changes, the 'do nothing' option is not considered practicable. Not proceeding with the project could lead to unserved energy in NSW, blackouts and potential load shedding.

3.2 Site details

The site comprises various Lots and Deposited Plans (DPs), with a number of adjoining roads being Coal Road and Sandy Creek Road, Muswellbrook, as well as Dolahentys Road, McCullys Gap. The site is located around four km north-east of the Muswellbrook town centre, within the Hunter Valley region of NSW, and is situated entirely within the Muswellbrook LGA.

The majority of the upper reservoir is situated within Lot 93 DP752484, which is privately owned freehold land zoned C3 Environmental Management under the Muswellbrook Local Environment Plan 2009 (MLEP 2009). A small portion of the reservoir is located in Lot 100 DP666041, which is owned by MCC and lot 183 DP752484 which is privately owned. Both of these lots are zoned C3 Environmental Management under the MLEP 2009.

The lower reservoir is situated within the MCC mine site which is owned by MCC and zoned RU1 Primary Production under the MLEP 2009.

3.2.1 Project area description

The project site is situated within the Muswellbrook Shire Council LGA. The project site includes both land within the operational MCC mine and its adjoining buffer lands.

An overview of the project area is provided in Figure 3.2 showing the township of Muswellbrook, MCC mine, Bells Mountain, the project investigation area, and road network and access points.

Potential access to the project area would be via Sandy Creek Road, which intersects with the New England Highway to the south-west of the proposed project area.

The project area is bounded by Sandy Creek in the north and Muscle Creek in the south. The upper reservoir would have an elevation of approximately 580 mAHD above sea level, and the lower reservoir 130 m above sea level.

Part of the project area has been affected by past land use, including agricultural activities and mining. Vegetation across the site comprises undisturbed areas, disturbed areas that have been rehabilitated containing exotic and native flora and fauna species.

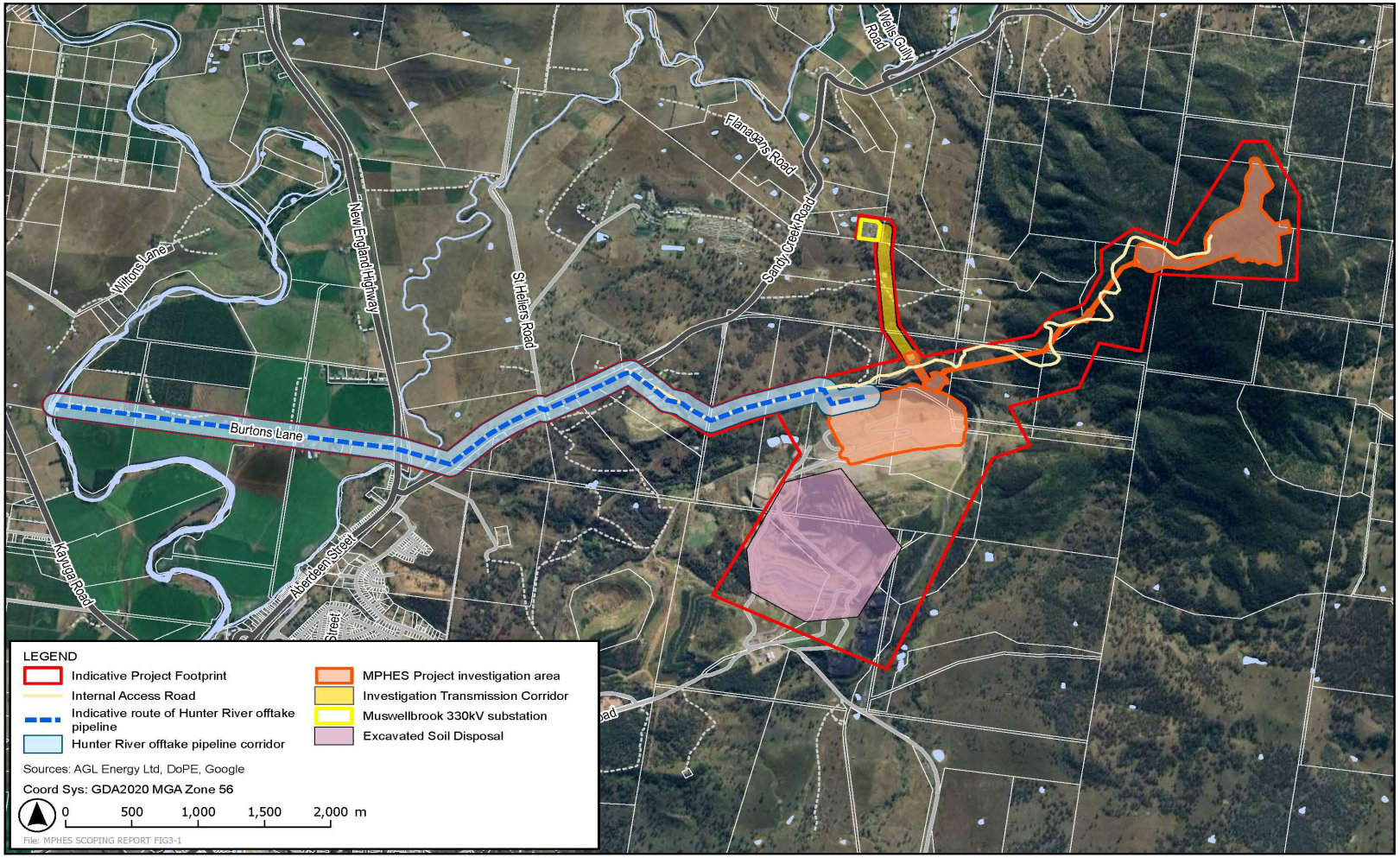

Figure 3.2 Project area and location overview

3.2.2 Project area zoning

The infrastructure for the project would occur in land zoned RU1 Primary Production, SP2 Infrastructure and C3 Environmental Management under the MLEP 2009. The main project elements occurring in these zones are listed in the following table.

Table 3.3 Land use zones affected by the project

Land use zone	Project element
RU1 Primary Production	Lower reservoir and intake Headrace –part of surface penstock Hydropower station and switchyard Transmission line (to TransGrid 330 kV substation) Internal access road(s) to lower reservoir Hunter River offtake pipeline
C3 Environmental Management	Upper reservoir Headrace – tunnel and part of surface penstock Access road to upper reservoir
SP2 Infrastructure	Hunter River offtake pipeline

3.2.3 Land ownership

The project would be developed predominantly within the MCC mine site utilising Pit 2 void as the lower reservoir. Hydro-electricity generation units, waterway infrastructure including a pipeline, and the electricity switchyard will also be developed on MCC mine land along with newly constructed roads and construction laydown area(s).

The final design of the project will determine the layout and land ownership requirements for the project including acquisition or development of easements of land not presently owned by Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust. Figure 3.4 provides an indicative project footprint along with landowners and Lots and Deposited Plan information.

i Upper reservoir

The upper reservoir will be developed on freehold land which AGL Energy Pty Ltd has entered into an agreement to purchase from the landowner if the project proceeds. The current footprint of the upper reservoir and above-ground penstock affects two separate freehold properties. If confirmed after detail design that these properties are still affected, then agreements to locate the infrastructure within these properties will be required from these landowners.

ii Lower reservoir

As noted previously, the lower reservoir would utilise the MCC Pit 2 void which is located wholly within the MCC mine site.

iii Transmission line

The transmission connection to the Muswellbrook 330kV substation would traverse two freehold properties (Lot 180, DP 627509; Lot 41, DP 1112699). Land agreements for an easement will be required for the freehold properties affected by the transmission line corridor.

iv Hunter River water pipeline

The water pipeline would run between the Hunter River and the lower reservoir. The indicative route is shown in Figure 3.2. The pipeline would be located in road reserves where practicable. Where the pipeline would traverse private freehold properties, the route would be agreed in consultation with the affected property owner/occupants.

Access agreements (such as easement agreements) would be entered into with the landowners.

3.2.4 Potential local receivers

MCC mine and Bells Mountain are located approximately four kilometres south-west from Muswellbrook and local residents. The Muswellbrook Waste and Recycling Facility is located between the township and mine site. Surrounding the mine site and Bells Mountain are privately owned rural properties with some located on the boundary of the mine site to the north and south and others several kilometres away to the north and east side of Bells Mountain in McCully's Gap. Potential local receivers identified from the geotechnical investigation noise assessment are shown on Figure 3.5. Additional potential receivers would be identified in the noise assessment for the EIS.

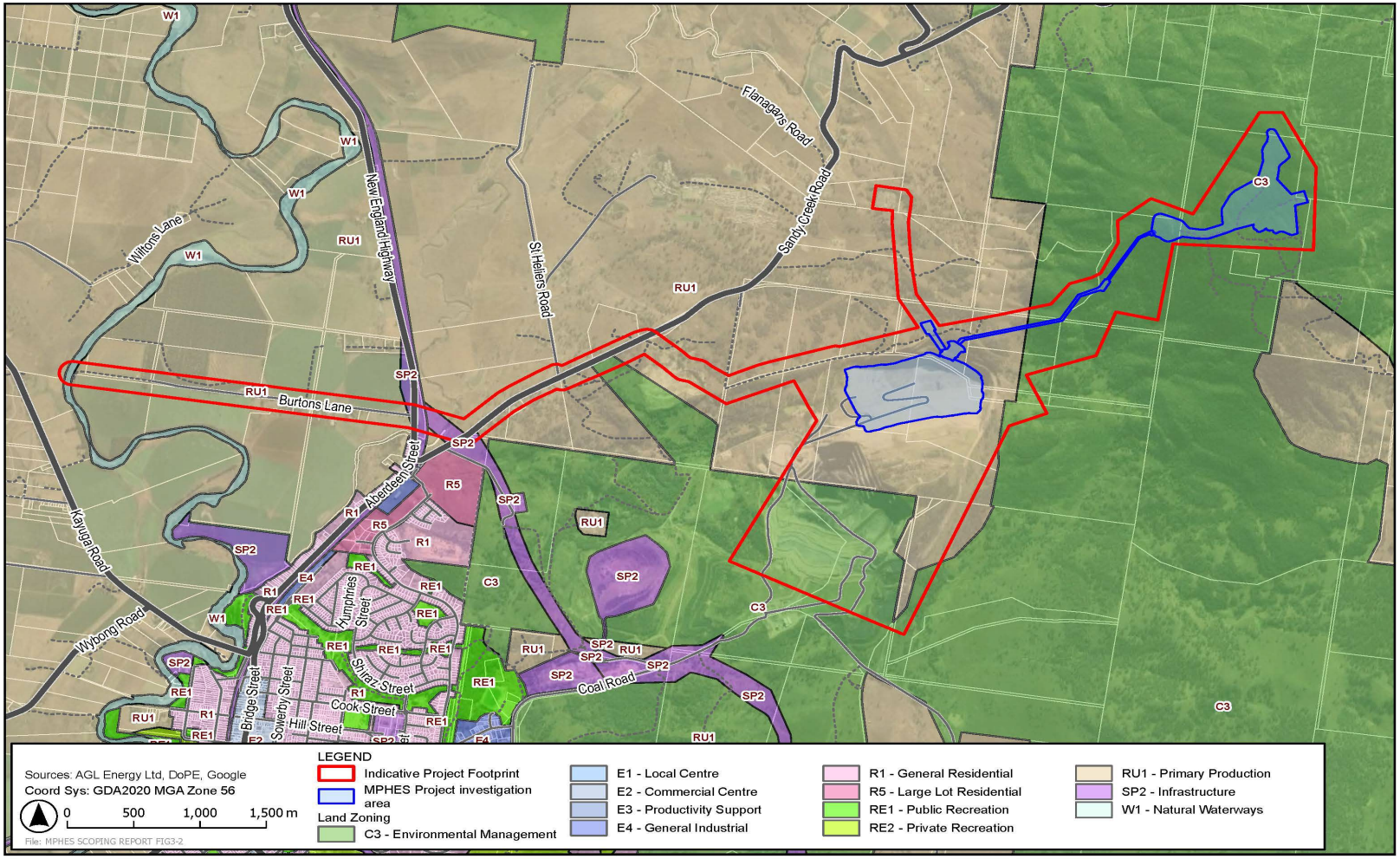

Figure 3.3 Muswellbrook PHES project land zoning

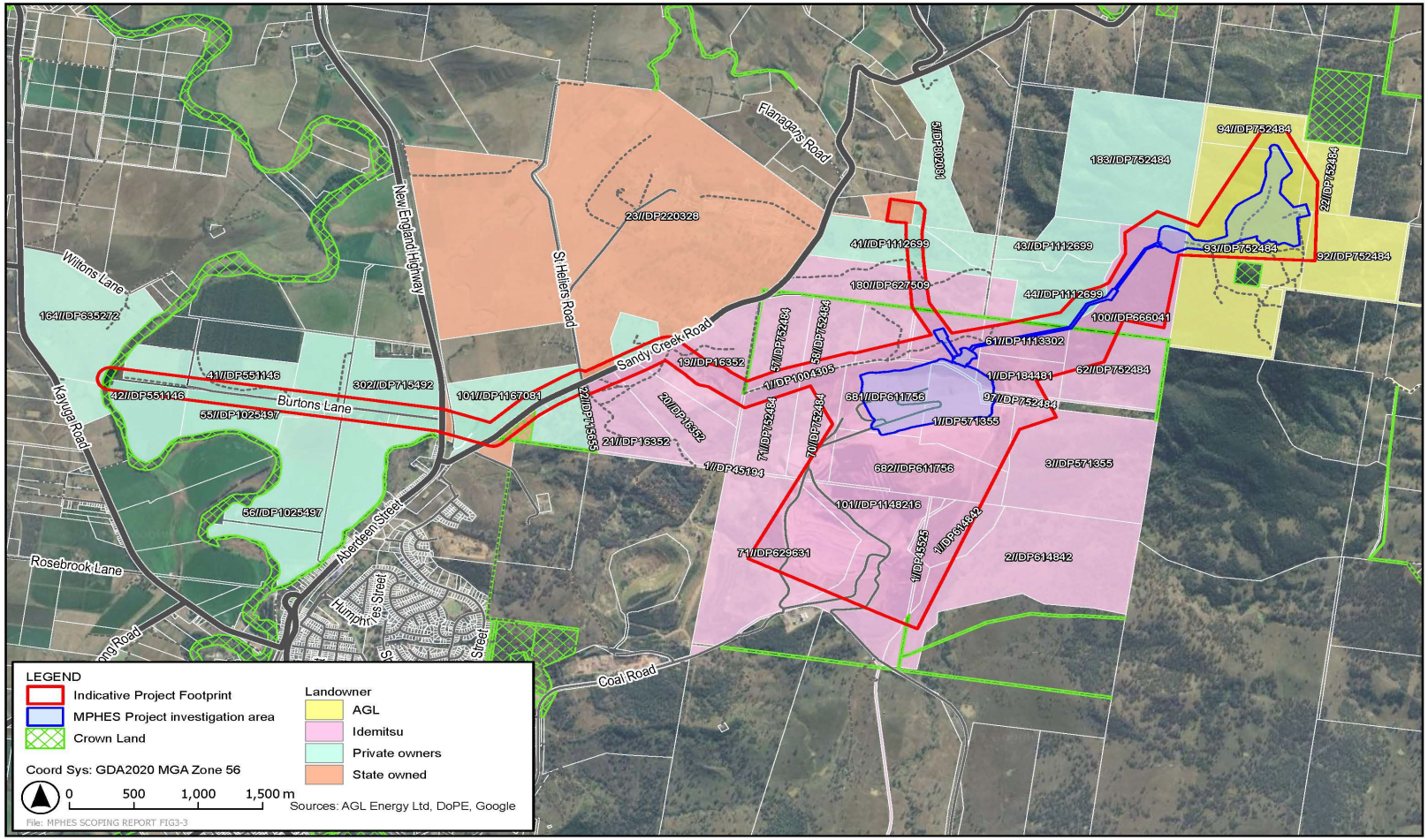

Figure 3.4 Muswellbrook PHES project property ownership

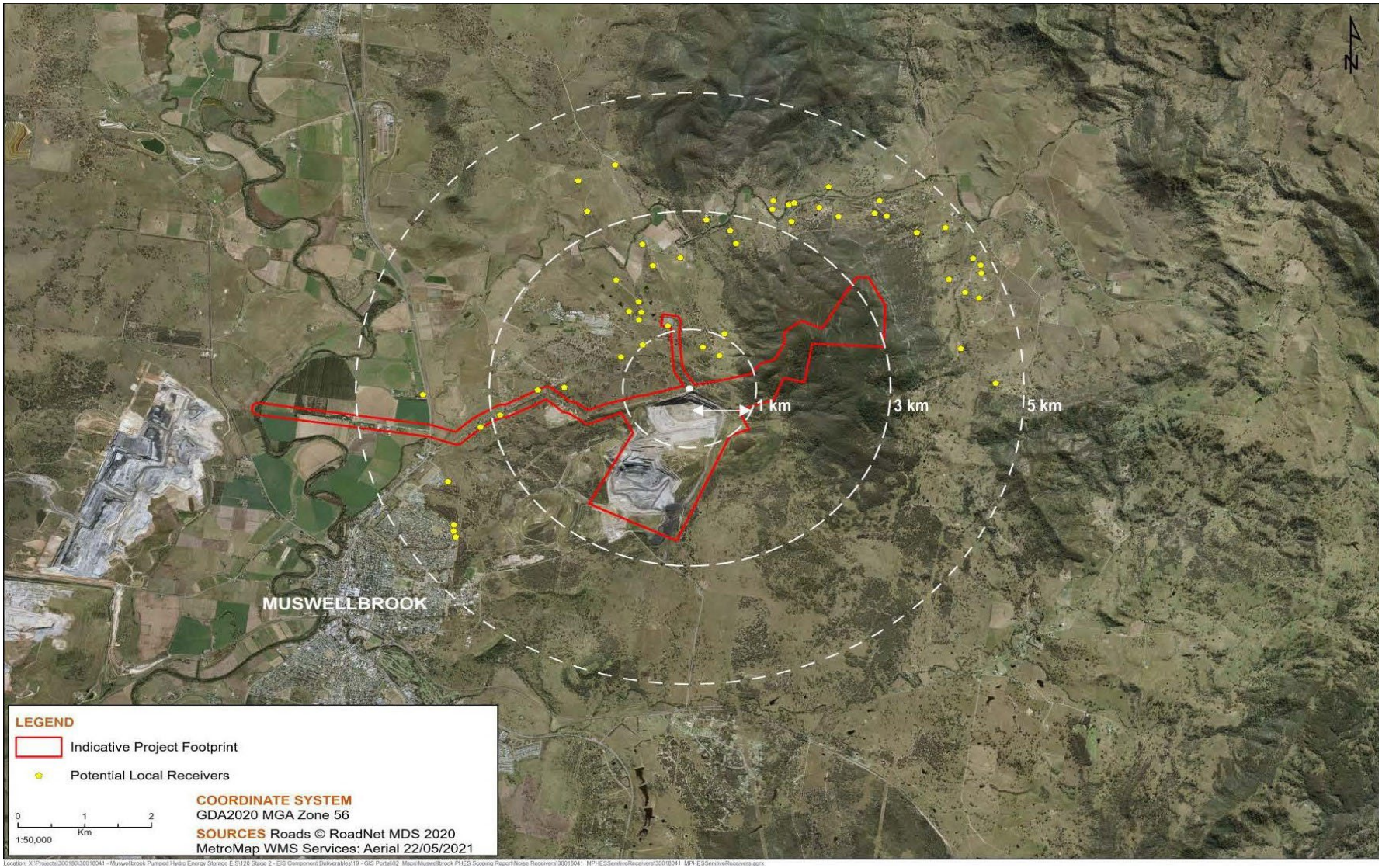

Figure 3.5 Potential local receivers

3.2.5 Design development

In 2018, AGL and Idemitsu carried out an assessment of potential options for a PHES facility, focusing on the existing mining pit at the MCC mine and the nearby potential upper storage area known as Bells Mountain.

Following the options assessment, in 2019 AGL and Idemitsu commissioned a feasibility study which included geological investigation. This comprised three separate phases as follows:

- Phase 1 – Review of options assessment
- Phase 2 – Geotechnical investigation
- Phase 3 – Feasibility design.

The assessment of options was initially based on 250 MW capacity; however, due to AGL's recent announcements for closure of its coal fired power station at Bayswater, further consideration for additional installed capacity of up to 500 MW with eight hours of generation is being considered as a feasible option. The project capacity and number of generator units would be determined upon the completion of additional geotechnical investigation of the upper and lower reservoir to inform the detailed design.

Subject to obtaining planning approval, the final design of the upper reservoir and hydro generation infrastructure would be determined following further detailed investigations confirming the geology of the project footprint together with other considerations such as renewable generation capacity requirements.

Design development would include consideration of environmental constraints and would investigate opportunities to avoid or minimise impacts on sensitive environmental areas, such as threatened ecological communities and threatened species habitat. An example would be identification of options for internal access roads that avoid these areas. This is explored in more detail in Chapter 6 of this report.

i Upper reservoir access

At this stage of design development, two potential access routes have been identified to the upper reservoir locality as follows:

- Eastern access from Dolahentys Road
- Western access from Sandy Creek Road.

For each route, options for deviation of individual sections have been identified to avoid the need to clear vegetation as far as practicable (regardless of conservation status) and where this may not be practicable, to minimise the area of vegetation to be cleared.

Opportunities to further refine the access to the upper reservoir locality to avoid and minimise impacts would be considered during preparation of the EIS.

3.2.6 Ongoing design refinements

Hydropower projects, like the Muswellbrook PHES project, typically require adjustments throughout the design phase as further investigation of geology and other site conditions and design parameters are determined. Refinement of the PHES design would continue during detailed design and would include:

- upper reservoir final design capacity and extent including spillway design
- waterway alignment and sizing
- upper and lower intake structures

- turbine and design location
- auxiliary infrastructure design and location.

Design refinements may also be driven through the findings of the environmental assessment process.

3.3 Development footprint

The general development footprint of the project is shown in Figure 3.2. The project development footprint, excluding the Hunter River water pipeline, covers an area of approximately 566 hectares (ha). The approximate areas for the major infrastructure elements within the footprint are as follows:

- Upper reservoir – 48 ha
- Penstock – 3.9 ha
- Lower reservoir – 50 ha.

The Hunter River water pipeline would be approximately 5 km in length. The transmission line to the Muswellbrook 330 kV substation would be approximately 1.5 km in length.

The final development footprint and associated disturbance areas to facilitate the Project will be confirmed in the EIS.

3.3.1 Physical layout and design

The scheme consists of an upper reservoir located near the top of Bells Mountain. The lower reservoir would utilise the existing mine Pit No. 2 void. A penstock would connect the two reservoirs and would comprise a combination of tunnels and surface water pipes. The penstock would be lined to minimise water losses through seepage and to prevent water ingress from groundwater.

3.3.2 Lower reservoir

The lower reservoir would be located in Pit No. 2 with an elevation above sea level of about 130 mAHD. The submerged intake would be located on the north-eastern high wall of the MCC mine Pit No. 2. The volume of the lower reservoir storage upon completion of final rehabilitation would be approximately four times the volume required for the upper reservoir. This would de-risk any capacity requirements and would be used to control any potential of overtopping the upper reservoir storage. The reservoir would be lined to minimise water losses through seepage.

3.3.3 Upper reservoir

The upper reservoir would be located on the northern spurs of Bells Mountain (Figure 3.2). The reservoir would be largely formed by excavation into the mountain. The reservoir would be lined to minimise water losses through seepage.

3.3.4 Headrace

The water conveyance system for the hydroelectric power station will comprise a headrace running between the upper reservoir and the power station at the eastern end of the lower reservoir (refer Figure 3.1). The current concept design for the headrace comprises a tunnel section from the upper reservoir and a surface section (penstock) terminating at the power station. The intake of the upper reservoir will incorporate isolation gates and screens to prevent debris or trash from entering the intake.

The final design and configuration of the headrace would be determined when the geotechnical investigations for the upper and lower reservoirs have been completed.

3.3.5 Hydro power station

The hydroelectric power station would supply up to 500 MW of deep storage from renewable energy and may comprise up to four hydroelectric generator units providing up to eight hours of renewable energy to the electricity supply grid.

The final design would be determined once detailed engineering assessments and design work have been completed.

3.3.6 Spillways

The upper reservoir would be designed to incorporate best practice water management monitoring and emergency management/discharge features including, if required, a spillway as part of the upper reservoir design. The lower reservoir would utilise the existing Pit No. 2 void where no built-in spillway is required as there is sufficient storage volume well above the project requirements.

3.3.7 Site access and access roads

Presently, access to the MCC mine site is through two entry points via Muscle Creek Road and Coal Mine Road to the south mine site, and Limestone Road off Sandy Creek Road northwest of Pit No. 2. Site entry and traffic flows to the mine site for construction would be assessed with likely site access being off Sandy Creek Road.

A permanent access road to the upper reservoir would be designed and constructed from the power station area considering environmental constraints, safety and design requirements.

The feasibility of using a construction access for permanent access to the power station and power waterway areas would be investigated during detailed design and construction planning.

3.4 Network connections

3.4.1 Power

Electricity supply for construction would be supplied through connection to an existing electricity distribution line along Sandy Creek Road. A new local service powerline (22 kV) would be constructed to the upper reservoir for construction and used later for operations and maintenance requirements.

3.4.2 Telecommunications

Communication high speed fibre lines would be installed during construction of the project. The location of this telecommunication infrastructure and details of connection to services would be determined during detailed design of the project.

3.4.3 Supporting infrastructure

The project will require various items of supporting infrastructure during construction and the final operational phase. Infrastructure likely to be required includes:

- site offices and amenities
- stores with bunded chemical and fuel storage areas
- workshops

- power, water, wastewater, and communication infrastructure.

The final detail and arrangement onsite would be determined during detailed design.

3.5 Ancillary infrastructure

3.5.1 Hunter River water pipeline

The lower reservoir would require an initial fill which would be sourced from the Hunter River. Additional supplementary filling may be required during operation should rainfall be insufficient to maintain the operational volume.

The water pipeline would run between the Hunter River and the lower reservoir. The indicative route is shown in Figure 3.2. The pipeline would be located in road reserves where practicable. Where the pipeline would traverse private freehold properties, the route would be agreed in consultation with the affected property owner/occupants. Access agreements (such as easement agreements) would be entered into with the landowners.

3.5.2 Switchyard

The existing Muswellbrook 330 kV substation owned and operated by TransGrid is approximately 1.5 km due north of the lower reservoir Pit No. 2 and the site for the hydroelectric turbine units (Figure 3.2).

The close proximity of the substation makes the site ideal for a 330 kV connection. Augmentation of the substation may be required to facilitate connection at 330 kV. This would be confirmed during the detailed design phase of the project.

3.5.3 Transmission line

The transmission line would be constructed within areas requiring minimal disturbance and would connect the proposed PHES substation/switchyard to the existing 330 kV Muswellbrook substation. The final alignment of the transmission line would be determined during detailed design. The Investigation area for the transmission line is shown in Figure 3.2.

3.6 Construction

The following description of construction activities should be regarded as preliminary and would be subject to further development during detailed design and construction planning.

Construction activities for the project would comprise:

- construction of an upper reservoir at Bells Mountain
- reconfiguration and reuse of an existing mine void for use as the lower reservoir
- treatment (such as installation of a liner) of the reservoirs to minimise the risk of seepage
- construction of a power station hall in the general vicinity of the lower reservoir
- construction of approximately two kilometres of waterway consisting of a combination of tunnel and surface penstocks
- construction of a water pipeline (approximately five kilometres) to take water from the Hunter River for initial filling of the lower reservoir and for supplementary filling as required during operation

- construction of main step-up transformers, auxiliary electrical and mechanical buildings, control room and an assembly bay area
- installation of a transmission line (approximately 1.5 km) to TransGrid's existing Muswellbrook 330 kV substation
- construction of permanent access roads and other ancillary infrastructure
- installation of temporary construction infrastructure such as site offices, workshops, carparking, concrete batching plants and laydown areas.

Construction materials would include:

- mechanical plant for the hydropower plant
- geomembrane linings for the two reservoirs
- concrete for foundations and other supporting structures
- steel for transmission towers
- pipelines – such as high-density polyethylene
- fencing.

3.6.1 Construction methods

Construction methods and techniques will be confirmed during the detailed design process. Proposed construction methods are outlined in Table 3.4.

Table 3.4 Construction methods for key project elements

Project aspect	Description
Lower reservoir and intake	Pit 2 is already excavated. The lower intake portal will likely be excavated using civil methods into the side of the reservoir while the pit is dry.
Upper reservoir and intake	Likely construction will include clearing and ripping, drill and blast, and civil excavation. The intake will likely be constructed into the base of the reservoir as a short shaft.
Headrace	Likely construction will include drilling, boring and blasting methods, and civil construction works.
Power station	Likely construction will include drilling, boring and blasting methods, and civil construction works.
Ancillary facilities (e.g. construction compounds)	Civil and building work for the construction compounds, lay down yards, concrete batching plant, and site offices.

3.6.2 Site access

Access to the site during construction would be off Sandy Creek Road. It is expected that most of the earthmoving equipment for the reservoir construction would be transported to the site at the commencement of construction and will remain onsite until the construction earthworks are completed.

There would be periodic heavy vehicle movement for delivery of construction equipment and power station components to site during the construction phase.

3.6.3 Transportation of materials

The main electrical and mechanical plant would, where possible, be transported from the Port of Newcastle via the New England Highway. The routes for transport of construction materials would be dependent on where these are sourced from but would be expected to use the New England Highway.

3.6.4 Excavated rock management

To minimise the spoil generated by the construction of the project, a number of removal and beneficial reuse methods will be considered including:

- reuse of excavated rock material in the construction of the upper reservoir dam
- reuse excavated rock as aggregate
- reuse excavated rock to form hard stand and laydown areas
- reuse excavated rock for road base and tracks
- spoil generated from the upper reservoir excavation to be used for local resurfacing.

The preferred location for disposal of spoil from construction of the upper reservoir that is unsuitable for reuse (such as landscaping) within the project or the broader mine site is Void Pit 1 on the MCC mine site (refer Figure 3.1). After mine rehabilitation the re-shaped pit 1 will retain a void volume of approximately 13.3 Mm^3 and be revegetated.

The spoil site was selected to have

- minimal impact on waterways
- minimal impact on construction activities
- minimise impact to the community
- minimise haul distances.

The spoil dump would be subject to geotechnical design to ensure long term stability and disposal operations would be closely monitored to ensure nominated slopes are adhered to. Material would be placed to ensure good drainage and avoid erosion, sympathetic to the existing rehabilitated landform. The spoil dump would be rehabilitated at the end of the works program by replanting with appropriate vegetation.

Spoil disposal on the rehabilitated mine site would be explored further during detailed design once expected spoil volumes are further quantified. Emplacement in the mine footprint would be subject to suitable assessment and approvals. If required, a rehabilitation management strategy would be developed as part of the EIS.

If required, other disposal options would be investigated during detailed design.

3.6.5 Construction workforce

Workforce estimates would be refined during the development of the EIS and detailed design. A peak workforce of up to 250 people is currently estimated for construction. Construction workers would arrive and leave the site in either light vehicles or dedicated small/large buses.

It is anticipated the majority of the workforce could be sourced from the local Muswellbrook community and nearby LGAs as large amount of work would be civil construction-based. Out of area workers could be accommodated in Muswellbrook, and the nearby towns of Singleton, Denman, Aberdeen, and Scone if required.

3.6.6 Construction hours

Subject to planning approval, construction of the project is anticipated to commence in early 2026 and be completed by the end of 2029. Further details of the construction schedule and hours of construction would be provided in the EIS.

The *Interim Construction Noise Guideline* (ICNG) (DECC 2009) identifies recommended hours as:

- Monday to Friday, 7 am to 6 pm
- Saturday 8 am to 1 pm
- No construction work on Sundays or public holidays.

The ICNG also provides for work outside of these recommended hours such as:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- Public infrastructure works that shorten the length of the project and are supported by the affected community
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

Out of hours works that are likely to be required for the project include 24-hour concrete pours. Mitigation measures to manage potential impacts of these works would be addressed on a case-by-case basis and may include use of methods such as directional lighting and temporary noise barriers.

It is also proposed that below-ground construction activities such as construction of the tunnel section of the pipeline between the upper and lower reservoirs where receivers are unlikely to be affected would be on a 24-hour basis.

As noted in the ICNG, the recommended hours are not mandatory and Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust would be seeking approval for 24/7 working hours for the construction period.

3.6.7 Supporting services infrastructure and facilities

The supporting services, infrastructure and utilities that will support the construction of the project includes:

- local power supply
- telecommunications/Fibre-optics
- security services
- traffic management
- wildlife management
- local potable water supply

- catering services
- wastewater treatment
- waste disposal
- on-site construction water management (e.g. settling basins).

3.7 Operation

The operational PHES facility would require up to 20 workers at peak times during normal operations. An on-site maintenance workforce would monitor and manage the facility.

The plant would be remote controlled, monitored and dispatched from the AGL 24-hour operations centre. Electricity generated would be dispatched to support developing renewable grid requirements.

3.8 Rehabilitation and decommissioning

Rehabilitation would be carried out during all project phases, where practicable and reasonable. Rehabilitation would be considered throughout construction, operation, and decommissioning.

- Areas disturbed for temporary access and not retained for operational access would be rehabilitated.
- Construction portal areas would be sealed from entry and rehabilitated.
- After infrastructure is removed, construction compound areas would be rehabilitated to a state suitable for final land use.
- Construction areas for tunnel entries and tunnel entry batters would be stabilised and revegetated.
- Material in temporary stockpiles would be re-used in rehabilitation, and surfaces would be repaired.
- Intake structures at the upper and lower reservoirs would receive a façade treatment to stabilise barriers and minimise visual impacts.

3.9 Project timing

Subject to approval, construction would occur over a four-year period commencing in 2026 with commissioning and performance running of the project expected to be complete by 2030. An indicative timeline for the project is shown in the following figure. The greatest impacts are expected to occur during the construction period.

Activity	2023	2024	2025	2026	2027	2028	2029	2030
Geotechnical Investigations								
Scoping Report & SEARs								
Preparation of EIS								
Response to submissions								
Decision of development consent / approval								
Management plan approvals								
Detailed design								
Construction								
Operation								

Figure 3.6 Indicative project timeline

4 Statutory context

4.1 State context

The EP&A Act is the principal environmental legislation in NSW regulating the planning approvals process for development. Section 4.15 of the EP&A Act describes the matters for consideration in assessing State significant development (SSD), which includes provisions of relevant environmental planning instruments (EPIs) including State Environmental Planning Policies (SEPPs) and Local Environmental Plans. In determining an application for SSD, a consent authority is required to take into account various factors prescribed under section 4.15 of the EP&A Act.

If a declaration of SSI or CSSI is made by the Minister for Planning pursuant to sections 5.12 or 5.13 of the EP&A Act, the carrying out of the SSI may be approved by the Minister in accordance with the assessment and approval process under Division 5.2 of the EP&A Act. This process also includes an environmental assessment and public consultation.

4.1.1 Planning approval pathway

Section 4.36(2) of the EP&A Act provides:

> A State environmental planning policy may declare any development, or any class or description of development, to be State significant development.

Clause 20 (Electricity generating works and heat or co-generation) of Schedule 1 to *State Environmental Planning Policy (Planning Systems) 2021* (PS SEPP) provides:

> Development for the purposes of electricity generating works or heat or their co-generation (using any energy source, including gas, coal biofuel, distillate, waste, hydro, wave, solar or wind power) that-
>
> a) has a capital investment value of more than $30 million, or
>
> b) has a capital investment value of more than $10 million and is located in an environmentally sensitive area of State significance

The project would meet both criteria in clause 20 and therefore be designated as SSD. The provisions under Division 4.7 of the EP&A Act would apply.

For the purposes of the EP&A Act, the project would meet the definition of 'electricity generating works' under clause 2.35 of *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) being:

> … a building or place used for the following purposes, but does not include a solar energy system-
>
> (a) making or generating electricity,
>
> (b) electricity storage.

The permissibility of the project is considered in Section 4.1.3.

4.1.2 Consent authority

Section 4.5(a) of the EP&A Act provides:

> For the purposes of this Act, the consent authority is as follows:
>
> a) in the case of State significant development - the Independent Planning Commission (if the development is of a kind for which the Commission is declared the consent authority by an environmental planning instrument) or the Minister (if the development is not of that kind)

Clause 2.7 (Designation of Independent Planning Commission as consent authority for certain State significant development) of the PS SEPP provides:

> The Independent Planning Commission is declared, under section 4.5(a) of the Act, to be the consent authority for any of the following development that is State significant development unless the application to carry out the development is made by or on behalf of a public authority or unless the development is declared to be State significant infrastructure related development under subsection (2)-
>
> a) development in respect of which the council of the area in which the development is to be carried out has duly made a submission by way of objection under the mandatory requirements for community participation in Schedule 1 to the Act,
>
> b) development in respect of which at least 50 submissions (other than from a council) have duly been made by way of objection under the mandatory requirements for community participation in Schedule 1 of the Act,
>
> c) development the subject of a development application made by a person who has disclosed a reportable political donation under section 10.4 of the Act in connection with the development application.

If the above criteria are not triggered, DPE would determine the SSD application on behalf of the Minister.

Clause 2.7 of the PS SEPP also provides:

> The Minister may, if of the opinion that any State significant development is related to State significant infrastructure, declare, by Ministerial planning order, that the development is State significant infrastructure related development for the purposes of this section.

No Ministerial Order has been made in this regard at the time of preparation of this report.

4.1.3 Other planning approval pathways

The project may be assessed and determined under Division 5.2 of the EP&A Act should the proposed development be declared SSI under section 5.12 of the EP&A Act. Under the EP&A Act, the project be declared to be SSI in the following two ways:

- a SEPP may declare any development, or any class or description of development, to be SSI (section 5.12(2))
- specified development on specified land may be declared to be SSI by a SEPP or by an order of the Minister than amends a SEPP for that purpose (section 5.12(4)).

The Minister for Planning and Public Spaces may also declare SSI to be CSSI under section 5.13 of the EP&A Act "if it is of a category that, in the opinion of the Minister, is essential for the State for economic, environmental or social reasons". Schedule 5 of the PS **SEPP** lists SSI that has been declared to be CSSI.

In this context, it is open to the Minister to declare the project as CSSI by an order to amend Schedule 5 of the PS SEPP. However, if the Minister is not amenable to declaring the project as CSSI, the Minister may nonetheless make a project-specific SSI declaration by an order to amend Schedule 4 of the PS SEPP.

If the project is declared SSI or CSSI, it would be subject to a separate assessment and approval process under Division 5.2 of the EP&A Act. Under this division, the Minister's approval must be obtained in order to carry out SSI or CSSI in (section 5.14 of the EP&A Act).

4.2 Permissibility

Section 2.36(1) of the T&I SEPP provides:

> Development for the purpose of electricity generating works may be carried out by any person with consent on the following land—
>
> (a) in the case of electricity generating works comprising a building or place used for the purpose of making or generating electricity using waves, tides or aquatic thermal as the relevant fuel source—on any land,
>
> (b) in any other case—any land in a prescribed non-residential zone.

The project area is on land zoned as RU1 Primary Production, C3 Environmental Management, and SP2 Infrastructure as identified on the MLEP 2009 (see Table 3.3). Within these three zones, 'electricity generating works' is prohibited by the MLEP 2009.

Section 2.36(1) of the T&I SEPP provides that 'electricity generating works' are permissible with consent in zone RU1 Primary Production and zone SP2 Infrastructure. However, 'electricity generating works' are prohibited in zone C3 Environmental Management under the Transport T&I SEPP.

Section 2.7(1) of the T&I SEPP provides that where there is an inconsistency between Chapter 2 of the SEPP and any other EPI, the chapter prevails to the extent of the inconsistency. On this basis the project is partly permissible with consent and partly prohibited.

Section 4.38(3) of the EP&A Act addresses consent for SSD and states that:

> (3) Development consent may be granted despite the development being partly prohibited by an environmental planning instrument.

Therefore, development consent may be granted for the project despite it being partly prohibited by an EPI.

Should the project be declared SSI or CSSI, the partial prohibition of the project under the T&I SEPP is overcome by section 5.22 of the EP&A Act, which provides that EPIs do not apply to SSI or CSSI (except for the provisions of the EPI that declare the project to be SSI or CSSI).

4.3 Other approvals

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

Under sections 4.41 and 4.42 of the EP&A Act, certain separate environmental approvals would not be required for the project or could not be refused if necessary for carrying out SSD that is authorised by a development consent.

Other approvals may be required in addition to those referred to under sections 4.41 and 4.42 of the EP&A Act and these would be considered as part of the EIS. Comment on the relevance of these to the project is provided in Table 4.1.

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

Approval	Relevance to the project
Approvals not required under section 4.41 of the EP&A Act	
Fisheries Management Act 1994: a permit under sections 201, 205 or 219	Relevant; s201 relates to dredging of water land which may be required for the Hunter River pipeline offtake works.
Heritage Act 1977: an approval under Part 4, or an excavation permit under section 139	Unlikely to be relevant; investigations to date have not identified any listed heritage items that would be affected by the project.

Approval	Relevance to the project
National Parks and Wildlife Act 1974: an Aboriginal heritage impact permit under section 90	Relevant principally to upper reservoir locality. Appropriate assessment would be carried with regard to potential impacts on Aboriginal heritage.
Rural Fires Act 1997: a bush fire safety authority under section 100B	Not relevant.
Water Management Act 2000: a water use approval or a water management work approval	Relevant; the Hunter River pipeline and offtake works would comprise a water supply work.
Approvals that must be applied consistently (section 4.42 of EP&A Act)	
Fisheries Management Act 1994: aquaculture permit under section 144	Not relevant
Coal Mine Subsidence Compensation Act 2017: section 22 approval	Relevant (refer Table 4.2)
Mining Act 1992: mining lease	Not relevant
Petroleum (Onshore) Act 1991: production lease	Not relevant
Protection of the Environment Operations Act 1997: environment protection licence under Chapter 3	Relevant (refer Table 4.2)
Roads Act 1993: consent under section 138	Relevant (refer Table 4.2)
Pipelines Act 1976: licence	Not relevant

If the project is declared SSI or CSSI, certain separate environmental approvals would not be required for the project or could not be refused if necessary for carrying out development that is authorised by an infrastructure approval (sections 5.23 and 5.24 of the EP&A Act).

4.3.2 Other approvals not expressly integrated into the SSD assessment under the EP&A Act

Table 4.2 identifies other NSW approvals that would or may be required for the PHES project.

Table 4.2 Required approvals

Statute	Requirement
Coal Mine Subsidence Compensation Act 2017	Approval under section 22 for undertaking development within a Mine Subsidence District.
Conveyancing Act 1919	An easement established under section 88B is likely to be required for the connection to the Ausgrid network.
Crown Land Management Act 2016	Licence under section 5.21 to authorise the use or occupation of Crown Land.
Dams Safety Act 2015	The upper reservoir may be considered a 'declared dam' for the purposes of this Act and therefore have compliance obligations under the Act.
Protection of the Environment Operations Act 1997	Environment protection licences with regard to: • Operation – electricity generating works (scheduled activity) • Construction – crushing, grinding, separating • Regulation of water pollution.
Roads Act 1993	Approval under section 138 for carrying out work (such as the pipeline from the Hunter River) in, on or over a public road.

Table 4.2 Required approvals

Statute	Requirement
Water Management Act 2000	A water access licence under section 56 for extraction of water from the Hunter River for initial filling of the lower reservoir and any further supplementary filling.

4.3.3 Pre-conditions to exercising the power to grant consent

i Biodiversity Conservation Act 2016

Section 7.9 of the *Biodiversity Conservation Act 2016* (NSW) (BC Act) provides for the assessment of biodiversity matters for SSD. This requires an application for approval of SSD:

- to be accompanied by a biodiversity development assessment report (BDAR) unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values
- to include the biodiversity assessment required by the environmental assessment requirements of the Planning Agency Head under the EP&A Act.

As SSD, the project would require the assessment of biodiversity in accordance with the Biodiversity Assessment Method (BAM) and will trigger the need for a BDAR in accordance with the BAM. The EIS would include a BDAR.

ii Coal Mine Subsidence Compensation Act 2017

The project sits within the Muswellbrook Mine Subsidence District. Part 3 of this Act relates to development within a Mine Subsidence District (MSD). Section 21 of the Act provides for certain development in an MSD to require approval (under section 22) and this would include the project.

iii Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) establishes the process for investigating whether land is contaminated and if required land that the NSW Environment Protection Authority (EPA) considers to be contaminated significantly enough to be regulated.

A preliminary assessment would be undertaken of land affected by the PHES project to determine the status of the site under the CLM Act and the *Contaminated Land Management Regulation 2022*.

The EIS would consider relevant mitigation and management measures that would be incorporated as part of the development to address potential contamination risks.

iv Dams Safety Act 2015

This Act provides for the management of prescribed dams within NSW through Dams Safety NSW. The upper reservoir may be a prescribed dam under this Act. This would be confirmed during detailed design. The lower reservoir, relying on the MCC mine void Pit 2, is not expected to be identified as prescribed dam in accordance with the *Defining dams for declaration* publication (Dam Safety 2023). However, MPH will consult with Dam Safety NSW to ensure both reservoirs are appropriately considered under the *Dams Safety Act 2015.*

v Fisheries Management Act 1994

A permit under sections 201, 205 or 219 of this Act to block fish passage or dredge or carry out reclamation work on water land would not be required pursuant to section 4.41 of the EP&A Act.

The project may require work in proximity to waterways to facilitate the upgrade of road crossing located near mine void Pit 2 or to establish new crossings of watercourses within the project area. These works would be undertaken in accordance with *Fish-Friendly Waterway Crossings; Policy and Guidelines for Fish Habitat Conservation and Management* (DPI 2013).

vi Heritage Act 1977

An approval under Part 4, or an excavation permit under section 139, of this Act would not be required pursuant to section 4.41 of the EP&A Act. Despite there being no listed heritage items within the project area, the EIS would conduct an assessment of potential impacts to non-Aboriginal heritage values in accordance with relevant NSW guidelines to confirm these preliminary findings.

vii National Parks and Wildlife Act 1974

An Aboriginal heritage impact permit under section 90 of this Act would not be required pursuant to section 4.41 of the EP&A Act. Nevertheless, an Aboriginal Cultural Heritage assessment would be undertaken for the project area. Any Aboriginal heritage sites identified within the project area would be avoided as far as practicable through the design process.

viii Native Title (New South Wales) Act 1994

This Act establishes how land use and ownership/leasing activities which have occurred in NSW may interact with the Commonwealth native title framework as set out within the *Native Title Act 1993.*

ix Protection of the Environment Operations Act 1997

This Act and supporting regulations provide for the regulation of pollution to the environment. The Act identifies premises based and non-premises based activities that, where specified thresholds are exceeded, are defined as 'scheduled activities' and require an Environment Protection Licence (EPL) to regulate emissions to the environment. EPLs that may be required for the project are identified in Table 4.2.

x 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 an aquifer interference approval) under section 91 of this Act would not be required pursuant to section 4.41 of the EP&A Act.

A water access licence under section 56 would be required for extraction of water from the Hunter River for initial filling of the lower reservoir and any further supplementary filling.

The *Water Management (General) Regulation 2018* identifies specific purpose access licences under clause 5(1) and includes 'unregulated river pumped hydro-electricity generation (construction and initial storage fill) access licence'. However, the Hunter River is a regulated river.

The MPH JV partners hold established licences under the following water sharing plans:

- North Coast Fractured and Porous Rock Groundwater:
  - 4,600 shares – aquifer
- Hunter Regulated River (zone 1b)
  - 1,754 shares – Regulated river - high security
  - 2,908 shares – Regulated river - general security

- 36,000 shares – Major utility - specific purpose (power generation)
- 36,000 shares – Supplementary.

It is anticipated that the existing water use approvals would be applied to the project as there is sufficient entitlement for the construction and initial fill of the reservoir. Licenses would be transferred from MPH JV parties to the project as required. Where existing licences cannot be used, the project would seek to buy entitlements on the open market.

Construction work near or within watercourses may be required. These works would be carried out in accordance with relevant DPE Water guidelines for controlled activities on waterfront land.

The EIS will include an assessment of the impacts of the project on groundwater aquifers and groundwater dependent ecosystems having regard to the *NSW Aquifer Interference Policy* and relevant Water Sharing Plans.

The EIS will also consider incidental water take from catchment runoff, and operational top up from to replace system losses (e.g. via evaporation and leakage).

xi State Environmental Planning Policy (Resilience and Hazards) 2021

Clause 4.6 of this SEPP requires contamination and remediation to be considered in determining a development application.

A consent authority must not consent to the carrying out of any development on land unless:

- it has considered whether the land is contaminated
- if the land is contaminated, it is satisfied that the land is suitable in its contaminated stage (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out
- if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

The EIS would consider the potential for the project to impact on contaminated land.

4.4 Mandatory matters for consideration

4.4.1 Objects of the EP&A Act

Section 1.3 of the EP&A Act sets out the Objects of the Act. The consistency of the PHES project with the relevant Objects is outlined as follows.

i To promote the social and economic welfare of the community and a better environment by the proper management, development, and conservation of the State's natural and other resources (s 1.3(a))

The project represents an opportunity to capitalise on a site which contains redundant coal mine infrastructure next to a naturally elevated area which is extremely suitable for pumped hydro. The project also capitalises on the close proximity of the site to an existing 330 kV substation to allow connection to the NEM, reducing the length of overhead transmission lines. The project is near the established township of Muswellbrook and has the advantage of access to road, rail, air, and port infrastructure which connects Muswellbrook to the broader region and the world.

Construction and operation of this project would provide local employment opportunities in a post-mine closure economy for roles and skillsets directly relevant to a transition workforce such as earthmoving, construction, and

various other technical and managerial roles. It would also help NSW work towards decarbonisation by adding more capacity and reliability into the renewable energy market.

The project contains an energy transformational element in that it demonstrates what can be achieved by the renewable energy industry at a brownfield coal mine site. The technical attributes of the power station strongly support the development of a modern renewables dominated energy market.

ii To facilitate ecologically sustainable development by integrating relevant economic, environmental, and social considerations in decision-making about environmental planning and assessment (s 1.3(b))

The project is considered to exemplify ecologically sustainable development (ESD), as it involves the reuse of a brownfield coal mine final void in order to generate energy that can be used to augment existing gaps in the NSW renewable energy market (by providing supplementing electricity during times of peak needs, and grid support when needed).

The project would demonstrate the sustainable land use opportunities which can be undertaken at a brownfield coal mine site in order to assist the NSW electricity market with decarbonisation.

iii To promote the orderly and economic use and development of land (s 1.3(c))

As set previously noted in Section 3.1.3iii (do nothing option), not proceeding with the project would mean forgoing the decarbonisation and LDS potential of the project for the NSW electricity market. It would also result in a loss for local employment opportunities in a post-mine closure economy, and the lost opportunity to make beneficial reuse of a site which has strategic connections by road, rail, port and air to key regional, national and international markets.

iv To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities, and their habitats (s 1.3(e))

The EIS would consider these matters in greater detail. However, it is considered that the potential environmental impacts of the project t could be mitigated to an appropriate level of impact, and that the decarbonisation benefits of the project generate a significant, positive environmental impact more generally.

v To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage) (s 1.3(f))

The EIS would consider these matters in greater detail. An archaeologist has been engaged and consultation with Registered Aboriginal Parties (RAPs) has commenced.

vi To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants (s 1.3(h))

The project would be designed and operated according to appropriate engineering and statutory standards.

vii To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State (s 1.3(i))

The assessment for this project will be governed by NSW and Commonwealth legislation. Appropriate consideration would be given to matters that may be subject to local government processes.

viii To provide increased opportunity for community participation in environmental planning and assessment (s 1.3(j))

Preparation of the EIS would address relevant matters in *Undertaking Engagement Guidelines for State Significant Projects* (DPIE 2022a).

ix Relevant matters for consideration in assessing SSD

Section 4.15(1) of the EP&A Act identifies the relevant matters a consent authority must consider in assessing SSD, which include:

- relevant EPIs including SEPPs
- relevant development control plans
- likely impacts of the development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality
- the suitability of the site for the development
- planning agreements and statutory regulations
- any submissions made in accordance with the EP&A Act or the regulations
- public interest.

All relevant matters would be addressed in the EIS.

4.4.2 Environmental Planning and Assessment Regulation 2021

Section 190 of the *Environmental Planning and Assessment Regulation 2021* (NSW) (EP&A Regulation) provides the requirements for an EIS.

An EIS must contain the following information (section 190(1)):

- the name, address and professional qualifications of the person who prepared the EIS
- the name and address of the responsible person (the applicant)
- the address of the land to which the development application relates, or on which the activity or infrastructure to which the statement relates will be carried out
- a description of the development, activity, or infrastructure
- an assessment by the person who prepared the EIS of the environmental impacts of the development, activity, or infrastructure, dealing with the matters referred to in Part 8, Division 5 of the EP&A Regulation.

For SSD, the person preparing the statement must have regard to the *State Significant Development Guideline* (DPE 2022) or the *State Significant Infrastructure Guidelines* (DPE 2022), as applicable (section 190(2)).

An EIS must also contain a declaration by the person who prepared the statement of the following:

- The EIS has been prepared in accordance with the EP&A Regulation.
- The EIS contains all available information that is relevant to the environmental assessment of the development, activity, or infrastructure.
- The information contained in the EIS is not false or misleading.
- The EIS required under the Registered Environmental Assessment Practitioner Guidelines.

Section 192 of the EP&A Regulation provides the requirements for the content of an EIS as follows:

- A summary of the EIS.

- A statement of the objectives of the development, activity or infrastructure.
- An analysis of feasible alternatives to the carrying out of the development, activity or infrastructure, considering its objectives, including the consequences of not carrying out the development, activity or infrastructure.
- An analysis of the development, activity or infrastructure, including:
    - a full description of the development, activity or infrastructure
    - a general description of the environment likely to be affected by the development, activity or infrastructure and a detailed description of the aspects of the environment that are likely to be significantly affected
    - the likely impact on the environment of the development, activity or infrastructure
    - a full description of the measures to mitigate adverse effects of the development, activity or infrastructure on the environment
    - a list of the approvals that must be obtained under another Act or law before the development, activity or infrastructure may lawfully be carried out.
- A compilation, in a single section of the EIS, of the measures referred to in section 192(1)(d)(iv) of the EP&A Regulation.
- The reasons justifying the carrying out of the development, activity or infrastructure, considering biophysical, economic and social factors, including the principles of ESD set out in section 193 of the EP&A Regulation.

4.5 Commonwealth legislation

4.5.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) establishes the legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are defined as matters of national environmental significance (MNES) under the EPBC Act[14]. The following table lists the current MNES and provides comment on their relevance to the project.

Table 4.3 MNES relevant to the project

MNES	Relevance to the project
Listed threatened species and ecological communities	Relevant; there are several ecological communities and fauna species listed under the EPBC Act which are known or predicted to occur within the vicinity of the site.
Listed migratory species	Relevant; there are migratory species listed under the EPBC Act which are known or predicted to occur within the vicinity of the site.
Wetlands of international Importance	Not relevant; the nearest wetlands are the Hunter Estuary wetlands, approximately 100 km to the south-east.
The Commonwealth marine environment	Not relevant; the project would not affect any Commonwealth marine areas.

[14] https://www.dcceew.gov.au/environment/epbc

Table 4.3 MNES relevant to the project

MNES	Relevance to the project
Listed threatened species and ecological communities	Relevant; there are several ecological communities and fauna species listed under the EPBC Act which are known or predicted to occur within the vicinity of the site.
World Heritage properties	Not relevant; the closest World Heritage properties to the project are the Greater Blue Mountains World Heritage Area (approximately 30 km to the south-west) and Gondwana Rainforest of Australia (approximately 30 km to the north-east). Neither area would be affected by the project.
National Heritage places	Not relevant; the closest National Heritage places to the project are The Greater Blue Mountains Area (approximately 30 km to the south-west) and Gondwana Rainforests of Australia (approximately 30 km to the north-east). Neither area would be affected by the project.
Nuclear actions	Not relevant; the project would not constitute a nuclear action.
Great Barrier Reef Marine Park	Not relevant; the project would not affect the Great Barrier Reef Marine Park.
Protection of water resources from coal seam gas development and large coal mining development	Not relevant; the project would not constitute these types of developments.

Potential impacts of the project on relevant MNES would need to be considered in accordance with the Australian Government guideline *Matters of National Environmental Significance Significant impact guidelines 1.1* (Dept of the Environment 2013).

The project would be referred to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) for consideration as to whether the project would be a controlled action and therefore require approval under the EPBC Act in addition to approval under the EP&A Act.

Under the EPBC Act, the Commonwealth Environment Minister can make a written agreement with a state or territory government called a bilateral agreement[15]. There are two types of agreements that can be made:

- An assessment bilateral agreement allows a State or Territory to conduct a single environmental assessment process.

  At the completion of the assessment the State or Territory provides a report to the Australian Government assessing the likely impacts of the project on MNES. Two approval decisions and two sets of conditions (if appropriate) are required before the project goes ahead.

- An approval bilateral agreement allows a state or territory to assess the likely impacts of a project on the environment and make a determination, accounting for both state matters and MNES. Only one approval decision and one set of conditions (if appropriate) is required before the project goes ahead.

There is an existing assessment bilateral agreement in place for NSW[16]. This only covers major projects where the NSW Government is the consent authority as it is an agreement between the NSW and Australian governments[17].

15 https://www.dcceew.gov.au/environment/epbc/bilateral-agreements

16 https://www.dcceew.gov.au/environment/epbc/bilateral-agreements/nsw

17 https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/assessment-bilateral-agreement

4.5.2 Native Title Act 1993

Section 3 of the *Native Title Act 1993* sets out the main objects of the Act, these being:

- to provide for the recognition and protection of native title
- to establish ways in which future dealings affecting native title may proceed and to set standards for those dealings
- to establish a mechanism for determining claims to native title
- to provide for, or permit, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.

Native title may be claimed in areas such as[18]:

- vacant (or unallocated) Crown land
- parks and public reserves
- beaches
- some leases (such as non-exclusive pastoral leases)
- land held by government agencies
- some land held for Aboriginal and Torres Strait Islander communities
- oceans, seas, reefs, lakes, rivers, creeks, and other waters that are not privately owned.

Native title rights cannot be claimed in relation to minerals, gas, or petroleum under Australian law. Native title in tidal and sea areas can only be of a non-exclusive nature, as exclusive native title is considered inconsistent with other common law rights regarding marine access and navigation.

There were no existing native title claims at the time of preparation of this report.

4.5.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* protects objects and places within Australia which are of particular significance to Aboriginal persons in accordance with their traditions. The Minister is able to make declarations regarding such objects and places.

There are no such objects or places declared under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* which relate to the site or its surrounding environs.

[18] https://nativetitle.org.au/learn/native-title-and-pbcs/native-title-rights-and-interests#:~:text=The%20Native%20Title%20Act%201993,their%20traditional%20laws%20and%20customs

5 Engagement

Stakeholder engagement is a key part of the project and has occurred prior to and during the project scoping phase. Should the project progress, proactive engagement with stakeholders and the community would continue throughout the planning approval, EIS development and approvals phases.

In early 2015 AGL released a revised Greenhouse Gas Policy and confirmed closure dates for Liddell and Bayswater Power Stations. Since that time AGL has implemented a program of engagement and communication with the Upper Hunter community regarding site repurposing plans, and regional renewable and alternative energy developments.

AGL has worked particularly closely with Muswellbrook Shire Council as a member of Council's Industrial Closure Committee. The Committee was established in 2019 to help the community and local economy plan for and minimise the impact of imminent industry closures.

AGL has conducted rounds of community surveys to better understand sentiment in the Upper Hunter. The survey findings show that the local community understands the region is facing industrial transition, and they are concerned about the impacts on jobs, training, and prosperity. There is corresponding support for new projects in the region that will bring employment, skills development and maintain the Upper Hunter's reputation as the energy capital of NSW.

5.1 Key stakeholders

Key stakeholders that have been identified or anticipated to be affected by the project include:

- local communities
- directly impacted landholders, including MCC
- indirectly impacted landholders
- Registered Aboriginal Parties and local First Nations representative organisations including the Wanaruah Local Aboriginal Land Council, Wonnarua Nation Aboriginal Corporation, Hunter Valley Aboriginal Corporation and Plains Clans of the Wonnarua People
- Muswellbrook Shire Council and other local councils
- community interest and environmental groups
- businesses and business chambers
- government departments, including DPE, NSW Resources Regulator, Department of Regional NSW (including its Mining, Exploration and Geoscience group), and DCCEEW
- government authorities, agencies and entities including EnergyCo, TransGrid and WaterNSW
- local State and Federal Members of Parliament and departmental ministers
- utilities and asset owners, including Santos – Hunter Gas Pipeline
- industry stakeholders, including Upper Hunter Mining Dialogue and ESCO Pacific
- media.

This preliminary list would be expanded as the consultation process continues throughout EIS development and future phases (set out in Section 5.3).

5.2 Scoping phase consultation

During the project scoping phase, AGL and Idemitsu representatives and their consultants engaged with agencies and the local community.

The Proponent has met with key stakeholders as part of the scoping phase to provide an overview of the project. The key stakeholders included:

- local State and Federal Members of Parliament
- Muswellbrook Shire Council
- First Nations groups including, Plains Clans of the Wonnarua People, Wanaruah Local Aboriginal Land Council, Wonnarua Nation Aboriginal Corporation and Hunter Valley Aboriginal Corporation
- TransGrid
- landowner of the proposed upper reservoir
- landowners affected by the proposed transmission corridor
- landowners near the Hunter River regarding an offtake point for the water pipeline
- near neighbours to the project.

Should the project progress, proactive engagement with stakeholders and the community will continue throughout the preparation of the EIS with the aim to ensure the community is kept informed of any project updates, and to consider any feedback collected during consultation activities.

5.2.1 Early stakeholder engagement

During the project scoping phase, AGL and Idemitsu representatives and their consultants engaged with agencies and the local community, as summarised within Table 5.1. A detailed stakeholder engagement log is provided in Appendix E, which has been redacted for the publicly available version of this report to maintain stakeholder confidentiality.

Table 5.1 Stakeholder engagement and outcomes

Stakeholder	Activity and timing	Feedback
NSW Government agencies		
DPE	Meeting with Director and Assistant Director, Energy Assessments Planning and Assessment, on 20 October 2022 regarding the proposed development and broader PHES scheme.	Discussed planning approvals including rezoning C3 Environmental Management Zone.
DPE - Water	Informal telephone discussion with DPE - Water officer on 5 November 2023 to discuss at a high level the water licensing strategy for the project.	DPE – Water, whilst not in position to formally comment on the project, noted that the proposed water licensing strategy for the project appeared consistent with the relevant water sharing plans.

Table 5.1 Stakeholder engagement and outcomes

Stakeholder	Activity and timing	Feedback
	Formal meeting with DPE – Water representatives on 29 November 2023. Providing a high level overview of the project and proposed water licensing strategy.	DPE – Water, whilst not in position to formally comment on the project, reiterated that the proposed water licensing strategy for the project appeared consistent with the relevant water sharing plans.
Members of Parliament		
Dan Repacholi MP Member for Hunter	Meeting held 20 July 2023 to provide Project overview, introduction brochure and contact details of the Community Relations Manager. Mr Repacholi was also shown an artist's impression flyover of the Project and a short "What is pumped hydro" animation.	Supportive of the re-use of an existing mine void, potential jobs for the area during construction and operation and responsible use of water resource. Questions regarding the extent of First Nations and stakeholder consultation and feedback to date, planning and regulatory challenges for the project.
Dave Layzell MP Member for Upper Huter	Meeting held 25 July 2023 to provide Project overview, introduction brochure and contact details of the Community Relations Manager. Mr Layzell was also shown an artist's impression flyover of the Project and a short "What is pumped hydro" animation.	Supportive of the re-use of a mine site and supportive of pumped-hydro technology. Questions about the timeline for community engagement
Local government and business groups		
Muswellbrook Shire Council	Informed Council officers in 2020 when the first geotechnical investigation and Development Application for the project was lodged with Statement of Environmental Effects.	No concerns raised. DA for geotechnical works were approved
	JV representatives presented the project at a pre-application meeting at the MCC mine site on 8 August 2022 to undertake further geotechnical assessments to support detail design of the overall project.	Council did not raise any concerns in relation to the proposed application.
	JV representatives meet with Muswellbrook Council officers on the 7 December 2022 to discuss the need for a water pipeline from the Hunter River for the initial fill of the lower reservoir.	Council officers indicated that they would prefer the pipeline to be situated outside of the road reserves due to the limited space available.
	Two separate development applications have been submitted to Muswellbrook Council to undertake additional geotechnical investigations to inform detailed design of the project.	The JV received 3 submissions in relation to the lower reservoir development application and 1 submission in response to the upper reservoir development application. Main concerns raised included: • not supportive of renewable projects and repurposing of the coal mine void • impacts to Bells Mountain • impacts due to geotechnical drilling • traffic impacts as a result of the geotechnical investigation.

Table 5.1 Stakeholder engagement and outcomes

Stakeholder	Activity and timing	Feedback
	The JV has presented to Muswellbrook Shire Council's State Significant Development Committee on the 19 June 2023 and 11 September 2023 to provide project updates following the lodgement of development applications for geotechnical investigations.	No issues or concerns were raised from the committee. The questions from Councillors and Council officers related to technical aspects of the project.
Muswellbrook Renewable Energy Technology Precinct (Energy Estate, Shell, Department of Regional NSW, NSW Resources Regulator, DPE (Energy))	Muswellbrook Renewable Energy Technology Precinct meeting on 20 April 2021 to discuss transition to hydrogen and renewables.	Discussed constraints and opportunities, consultation, approval pathways, funding and next steps. No issued raised
AGL Site Transition Working Group, including representatives from Regional NSW; NSW DPE (Water & Planning); NSW EPA, Training Services NSW; NSW Treasury; EnergyCo; Hunter and Central Coast Development Corporation; Regional Development Australia (Hunter); and Hunter Joint Organisation of Councils	Quarterly group meetings to discuss planning and development requirements for New Upper Hunter projects, including Muswellbrook Pumped Hydro.	No issues raised
First Nations peoples		
Plains Clans of the Wonnarua People	Meeting held on 8 February 2023 in Singleton to provide an overview of the project.	project Representative of the Plains Clans of the Wonnarua People indicated they were supportive of the energy transition and moving away from coal mining. Main concern raised was potential biodiversity impacts on top of Bells Mountain.
	Formal invitation extended 29 September 2023 to participate in Cultural Heritage Surveys to inform proposed geotechnical works on the proposed sites for upper and lower reservoir	RSVP'd not able to participate on this occasion but interested in attending a site visit at another time.
Wanaruah Local Aboriginal Land Council	Meeting held on 8 February 2023 in Muswellbrook to provide an overview of the project.	No concerns were raised relating to the project.
	Formal invitation extended 29 September 2023 to participate in Cultural Heritage Surveys to inform proposed geotechnical works on the proposed sites for upper and lower reservoir.	Invitation accepted.
	Two representatives participated in Cultural Heritage Surveys on the proposed upper and lower reservoir sites 25-26 October 2023 to inform proposed geotechnical works.	Recommended the presence of on-site Cultural Heritage monitors for duration of geotechnical works.

Table 5.1 Stakeholder engagement and outcomes

Stakeholder	Activity and timing	Feedback
Hunter Valley Aboriginal Corporation	Meeting held 6 September 2023 in Muswellbrook to provide an overview of the project.	Main concerns raised were potential land disturbance and biodiversity impacts on top of Bells Mountain, as well as the impacts on cultural heritage sites if applicable.
	Formal invitation extended 29 September 2023 to participate in Cultural Heritage Surveys to inform proposed geotechnical works on the proposed sites for upper and lower reservoir.	Invitation accepted.
	Two representatives participated in Cultural Heritage Surveys on the proposed upper and lower reservoir sites 25-26 October 2023 to inform proposed geotechnical works.	Recommended the presence of on-site Cultural Heritage monitors for duration of geotechnical works.
Wonnarua Nation Aboriginal Corporation	Meeting held 12 September 2023 via Microsoft Teams to provide an overview of the project.	Initial concerns were in relation to employment opportunities arising out of the project.
	Formal invitation extended 29 September 2023 to participate in Cultural Heritage Surveys to inform proposed geotechnical works on the proposed sites for upper and lower reservoir	RSVP'd unavailable to participate on this occasion.
Property owners		
Neighbouring landowners	Meetings held with several neighbouring landowners commencing in September 2022 to inform them about the project. A number of follow-up meetings have been held with each of the neighbours to keep them informed of the project status.	Purpose of the meetings was to provide a project overview, outline any potential impacts to their property and to keep them informed of the project updates. Main concerns in relation to the project included: • noise during construction • noise during operations • potential for dam wall failure of the upper reservoir • biodiversity impacts to Bells Mountain • moved to the area with the understanding the coal mine was closing and now they are being surrounded by new projects.
Landowners affected by transmission corridor	Met with three landowners potentially affected by the transmission line since November 2022.	Landowners were not opposed to a new transmission line through their property, but indicated their preference for the powerline to be underground.
Landowners on the Hunter River regarding an offtake point for the water pipeline	Initially met with landowners in February 2023 at their property and have had a number of follow up meetings.	The landowners are not opposed to the water pipeline infrastructure. Currently working with the landowners to enter into Licence Agreements to carry out investigation works on their property.

Table 5.1 Stakeholder engagement and outcomes

Stakeholder	Activity and timing	Feedback
Correctional Services	Initially met with correctional services in April 2023 and had a number of follow up meeting in person and virtually to discuss locating the water pipeline within their property.	Correctional services on site team have been supportive to locate the water pipeline in their property. Negotiations are currently underway with entering a Licence Agreement to carry out investigation works on their property.

5.2.2 Community engagement

Community engagement for the project has been occurring since 2019. Meetings with the MCC Community Consultative Committee (CCC) and annual community newsletters have been Idemitsu's primary methods of engagement.

The CCC consists of representatives from the community, MCC, Muswellbrook Shire Council and the Wanaruah Local Aboriginal Land Council.

The CCC was consulted and provided with updates on the project at meetings held at the MCC Administrative Office as outlined in Table 5.2.

Table 5.2 MCC Community Consultative Committee meetings

Timing	Feedback and outcomes
3 December 2019	Informed that tender documents had been released to carry out the feasibility study.
9 June 2020 (online)	Informed that work has started on the feasibility study and groundwork had been completed.
2 December 2020	Discussed proposed mine closure and land use, positioning of corridors required for infrastructure Provided update on feasibility study, including geotechnical evaluation and assessment of project viability.
8 June 2021	Confirmed completion of feasibility study and next steps (detailed feasibility study and environmental approvals).
7 December 2021	Confirmed completion of feasibility study and next steps (detailed feasibility study and environmental approvals).
7 June 2022	Discussed proposed projects (Muswellbrook Solar Farm), including project size and timing and integration with the Muswellbrook PHES project. Discussed post-mining land opportunities associated with pumped hydro.
6 December 2022	Discussed the project in the context of the broader mine closure and provided confirmation that post mining land use studies are continuing.
6 June 2023	Confirmation that detailed design and the environmental approvals process has commenced for the project.

MCC community newsletters containing updates on the project were released on:

- May 2020
- May 2021
- May 2022

- May 2023.

Media releases including information about the project have also been regularly issued from Idemitsu Australia and AGL as follows:

- 9 December 2017 – AGL announces plans for Liddell Power Station
- 2 August 2019 – Schedule for the closure of AGL plants in NSW and SA
- 26 July 2019 – MoU signals next step in proposed Muswellbrook Pumped Hydro project
- 19 April 2021 – AGL and Idemitsu prepare for next stage of feasibility on Muswellbrook Pumped Hydro project
- 2 September 2022 - AGL and Idemitsu Joint Venture Secures Funding to Advance Development Studies for Muswellbrook Pumped Hydro
- The October 2023 edition of the AGL Hunter News newsletter included a Project status update. The newsletter has a distribution span of up to 2,000 including 120 direct community subscribers as well as current and former AGL employees, Singleton and Muswellbrook business chambers and their networks.

5.2.3 Near Neighbour Engagement

i Phone calls and in-person meetings

In November 2023 phone calls were made to neighbouring landowners and nearby residents of the Project site, located along Sandy Creek Rd, corner of St Heliers Rd, Wells Gully Rd, Dolahentys Rd and Pretoria Row, where contact details (including names and phone numbers) could be obtained via publicly available online directories. The intention of the phone calls was to offer in-person Project introductory meetings to allow for questions or concerns to be raised and gather initial feedback.

Where contact was made with near-by residents, in-person meetings were offered and scheduled to provide a Project introduction brochure and contact details of the Community Relations Manager. Residents were also shown an artist's impression flyover of the Project and a short "What is pumped hydro" animation.

Feedback received will be considered in the detailed design of the Project where possible (see a summary of issues and further discussion in Section 5.3).

In-person meetings with near-by residences will continue to be offered throughout the development and assessment of the Project along with additional activities to engage the wider community.

ii Letterbox Drop

Phone calls and in-person meetings were followed-up by a letterbox drop to 74 near-by residences with visible and accessible letterboxes in proximity of the Project on Sandy Creek Rd, (McCully's Gap Rd), Wells Gully Rd, (corner of) St Heliers Rd, Dolahentys Rd, Dolahentys Branch Rd and Pretoria Row. An introductory Project brochure and the contact details of the Community Relation Manager was left at each residence.

5.3 Community views

Preliminary investigations suggest that community interest is likely to predominantly occur within the local region. Concerns and areas of interest identified by stakeholders during the consultation process have been varied, with key items including:

- impact on value of rural residential land

- impacts on visual amenity
- impacts to groundwater and natural processes from seepage
- impacts from noise associated with construction and operations (water running through pipelines)
- impacts to biodiversity on Bells Mountain
- cumulative impacts associated with other developments in the area
- risk associated with a dam wall failure
- feasibility of an underground transmission line
- access for upper reservoir, transmission lines, water pipeline infrastructure and geotechnical works.

At the time of writing, these viewpoints had been taken into consideration and used to inform the project team's understanding of local concerns and values, and to refine communication channels and consultation methods.

5.4 Engagement to be carried out

5.4.1 Social and economic assessment

A preliminary assessment of potential social and economic impacts of the project has been carried out using the DPE Social Impact Assessment (SIA) Scoping Worksheet and is provided as Appendix D to this report (refer also Section 6.7).

The SIA scoping assessment worksheet has identified that a detailed level of assessment would be required for the project, including broad consultation and targeted research. Targeted consultation would be programmed as an early activity to better characterise the key economic and social issues associated with the project, and to provide for refinement of the SIA methodology as required.

5.4.2 Aboriginal cultural heritage assessment

Previous investigations for other existing and proposed infrastructures such as the Muswellbrook bypass (TfNSW 2021) and the Muswellbrook Solar Farm (EMM 2022) have identified the strong cultural values and connection to country held by the local Aboriginal community. As such, consultation will form a key part of the assessment. Consultation with Aboriginal stakeholders will be carried out in accordance with the DECCW (2010) guideline *Aboriginal cultural heritage consultation requirements for proponents 2010*.

5.4.3 Stakeholder engagement

MPH remains committed to continuing the stakeholder engagement process, and to using the insights gained in the assessment of the environmental, social, and economic impacts.

Consultation activities are planned during the EIS phase to inform the development of the EIS and the project. Consultation activities and approach will be outlined in a comprehensive Community and Stakeholder Engagement Plan.

The Community and Stakeholder Engagement Plan will address:

- engagement purpose and objectives according to International Association of Public Participation (IAP2) guidelines
- key messages

- detailed stakeholder analysis
- risk analysis including mitigation measures
- engagement tools and channels
- action plan including engagement activities, timing, and responsibility.

Proposed activities during EIA phase consultation will include, at a minimum:

- project website for community members to seek information about the project
- phone and email address for community members to provide feedback and facilitate a two-way conversation with the project team
- direct consultation with directly and indirectly impacted landholders to identify key issues via phone, email, and meetings
- project updates distributed to residents at key milestones, and available online
- advertisements in local and regional newspapers and online
- community information sessions targeting landholders and community groups
- targeted consultation with noise sensitive receivers affected by investigation or construction work, at least two weeks prior to the commencement of work
- targeted meetings and workshops with government agencies, utilities, industry groups, Traditional Owners groups, and other key stakeholders
- consultation and related activities will occur during EIS exhibition and during the submissions phase to demonstrate how feedback has influenced the project and closing the feedback loop.

Consultation will continue with Crown Lands NSW as there are various areas of mapped Crown Lands in the vicinity of the proposed works. Depending on the final project footprint, it is possible Crown Lands may be directly impacted.

This approach to community engagement may be refined as the EIS progresses, for example, in response to community feedback or identification of new issues.

6 Proposed assessment of impacts

A preliminary environmental assessment has been undertaken in accordance with Scoping Report Guidelines (DPIE 2021) and *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2022c) to identify matters requiring further assessment in the EIS and the level of assessment required for each matter. As detailed in the Scoping Report Guidelines the following key factors have been considered:

- The scale and nature of the likely impacts of the project and the sensitivity of the receiving environment.
- Whether the project is likely to generate cumulative impacts with other relevant future projects in the area.
- The ability to avoid, minimise and/or offset the impacts of the project, to the extent known at the scoping stage, having regard to:
  - factors that can be considered or incorporated into the detailed design of the project
  - consideration and investigation into potential mitigation measures for the project
  - determination of the feasibility and use of negotiated agreements or offsets is feasible to address any residual impacts of the project following mitigation.

A scoping summary table in accordance with the Scoping Report Guidelines (DPE 2022) is provided in Appendix A.

The following table present the identified matters requiring further assessment, as either detailed or standard assessments, according to the Scoping Report Guidelines. Further specific details are provided in the Sections 6.1 to 6.15 inclusive.

Table 6.1 Matters requiring further detailed or standard assessment

Level of Assessment	Matters
Detailed	• Biodiversity • Terrestrial flora and fauna • Aquatic flora and fauna • Heritage • Aboriginal heritage • Amenity • Noise and vibration • Visual amenity • Access • Traffic and transport • Hazards and risk – dam safety – land movement • Social – way of life – community – accessibility – surroundings • Water – Surface water – Groundwater

Table 6.1 Matters requiring further detailed or standard assessment

Level of Assessment	Matters
	– Water quality
Standard	• Access – access to property • Air – Greenhouse gas emissions • Amenity – Air quality (construction emissions) • Built environment – private property • Heritage – non-Aboriginal heritage • Land – Soils and spoil management – Topography.
Unlikely to require any assessment	• Amenity – Odour • Hazards and risks – Coastal hazards Refer Table 6.3 for details justifying non-assessment.

Table 6.2 summarises the key environmental matters identified for further assessment.

Table 6.2 Overview of key environmental matters Identified for the project

Matter	Summary of impact	Assessment and mitigation
Biodiversity	The project would result in loss of native vegetation and fauna habitat.	The EIS will include a Biodiversity Assessment to assess the potential impacts associated with the project. It will include the preparation of Biodiversity Development Assessment Report (BDAR) with targeted surveys of threatened species likely to be present onsite. The BDAR will include an assessment of serious and irreversible impacts to address relevant Commonwealth matters. Where opportunities exist to avoid and minimise disturbance, the project design will take these opportunities into consideration to improve the ecological outcome.
Aboriginal heritage	AHIMS register searches found Aboriginal sites within vicinity of the project including artefacts, modified trees (carved or scarred) and open camp sites. Construction activities may uncover undisturbed Aboriginal heritage.	An Aboriginal Cultural Heritage Assessment (ACHA) will be prepared including Aboriginal community consultation and site field survey investigations in accordance with EP&A Act and NPW Act requirements. Consultation will be undertaken with RAPs and will be undertaken in accordance with *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH, 2010).
Non-Aboriginal heritage	No recorded historic sites are listed within the project area or immediate surrounds. There is potential for areas that have not been surveyed having non-Aboriginal heritage which, if occurred, could be impacted by construction activities.	The EIS will include a Non-Aboriginal Heritage Assessment including historic database searches and literature review and consultation with stakeholders including local historical society.

Table 6.2 Overview of key environmental matters Identified for the project

Matter	Summary of impact	Assessment and mitigation
Noise and vibration	Construction activities including traffic, excavating and blasting, building infrastructure may affect the amenity of neighbouring properties and township Muswellbrook.	A noise and vibration impact assessment will be included in the EIS to determine anticipated noise impacts to neighbouring properties and local community during construction and operation including the initial pumping of water from Hunter River into mine void Pit 2. Mitigation measures will be developed to achieve required project noise management levels.
Air quality	During construction generation of dust is likely to occur from traffic movements on unpaved roads and during excavation works which has potential to impact neighbouring properties. Air quality impacts arising from operations are expected to be minimal. Overall, the project will benefit the State in the production of renewable energy to reduce greenhouse gas emissions and the carbon footprint by allowing displacement of more carbon intensive electricity generators.	The EIS will include an assessment of air quality impacts during construction and operation phases. An Air Quality Management Plan specific to the site and construction works will be developed to manage onsite dust emissions and avoid impacts to nearby sensitive receivers and the local area.
Visual	Construction activities including vegetation clearing and installation of project facilities will be visible to neighbouring properties. Permanent facility including penstock (pipeline) and possible dam wall could be noticeable to neighbouring properties and from public roads. The transmission line will be visible from Sandy Creek Road and neighbouring properties. The water pipeline supply line could be visible if aboveground, however may be buried which would require above-ground markers to be installed.	The EIS will include a Visual Impact Assessment for construction and operation visual impacts including a description of the existing landscape and visual receivers. The assessment will identify measures to minimise visual impacts. The choice of materials and colouring for infrastructure including pipelines would be considered during detailed design to minimise the visual aspect of the project.
Traffic	Construction traffic on New England Highway and local rural roads is expected to be a noticeable increase. Light and heavy vehicle movements will increase between Singleton and Muswellbrook adding to the deterioration of road surfaces. Safety conditions at intersections entering the MCC mine site would affect normal road users and visitors to region.	A Traffic Impact Assessment will be included in the EIS focusing on the construction phase of the project and will consider the impacts on turn-off from New England Highway onto Muscle Creek Road and into Coad Road. Muswellbrook Shire Council and Transport for NSW will be consulted during the assessment where road or tun-off upgrades are identified as required.
Waste	Construction of the project will generate waste from construction material, cementitious waste and domestic waste. Waste during operations would likely comprise minor waste streams that would be routinely collected for disposal at licenced facility.	The EIS will include an assessment of waste streams and standard management practices during construction and operations along with consideration of local licenced waste facilities. The EIS will include standard management practices compliant with the *Waste Avoidance and Resource Recovery Act 2001* and other relevant guidelines and good management practices.

Table 6.2 Overview of key environmental matters Identified for the project

Matter	Summary of impact	Assessment and mitigation
Water quality	The project has the potential to impact Sandy Creek north and Muscle Creek south of Bells Mountain along with surrounding landowner properties with surface water sediment runoff during construction of the upper reservoir and aboveground penstocks connection upper reservoir to the lower reservoir. Impact to groundwater during construction is also a consideration during excavation work.	Water quality assessment of impacts during construction will be considered in the EIS along with management and mitigation measures of surface waters from rainfall events including impact assessment of receiving Sandy and Muscle Creeks.
Land	The project area surrounding the proposed upper reservoir (atop Bells Mountain) will encounter volcanic materials from the New England Fold Belt, whilst the lower project area sections of the scheme will lie within the sedimentary units of the Braxton formation and Greta Coal Measures. Whilst the lower reservoir will be developed within existing mine void Pit 2 and surrounding disturbed areas, the upper reservoir on top Bells Mountain will undergo transformation from excavation works and also areas along aboveground pipeline route.	An assessment of soils and geology will be included in the EIS to inform of soil profiles and geophysical structures within areas to be excavated. This would draw on the geotechnical investigations carried out for the concept design of the project. Soil profile data will provide details of soil types within areas to be excavated.
Soils and spoil management	Excavation of the upper reservoir at Bells Mountain would generate rock and spoil material requiring placement in new location(s). The management of excavated materials can have positive and negative impacts as this material can be reused on the MCC mine site to rehabilitate other areas or it can introduce contaminates and cause surface water runoff. Exposure of soils from vegetation clearing and movement of material can have potential during construction to impact waterways particularly on steep slopes, if not correctly managed.	Soil assessment will be undertaken within relevant guidelines including *Soil and Landscape Issues in Environmental Impact Assessment* (DLWC,2020). Excavated material will be reused during construction where practical to minimise spoil stockpiling. The type, volume and management of excavated materials along with site rehabilitation will be addressed in the EIS.
Hydrology	The lower reservoir (mine void) receives water inflows from groundwater and surface water after rainfall. The groundwater is saline. The initial water supply to fill lower reservoir void will be sourced from the Hunter River as one-off supply. Inflows from surface water is expected to exceed evaporation losses. Balancing water inflows and salinity in upper and lower reservoirs including flood mitigation will require hydrologic study.	Hydrologic, hydrogeological and hydraulic studies to build on initial design feasibility studies including water balance details will inform the EIS of water quality, flood mitigation and dam safety.

There are a number of existing and proposed major projects in the vicinity which would contribute to cumulative impacts from the project. Existing environment includes mining operations, planned renewable energy projects and road network upgrades. A cumulative impact assessment will be carried out as part of the EIS as per the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2022). This will include assessment of potential cumulative impact issues such as the New England Highway Muswellbrook Bypass and renewable energy projects, and associated visual, social, biodiversity, heritage, noise, vibration, traffic, land, and water impacts.

The assessment will also identify potential opportunities associated with the project to improve visual amenity and social outcomes.

6.1 Scoping Biodiversity

Preliminary biodiversity assessments have been carried out for the project. The project will likely trigger a formal BDAR to be prepared under the *Biodiversity Conservation Act 2016*.

As noted in Section 5.2.1, the project will be referred to DCCEEW on the basis that it may impact on threatened species and communities and migratory species listed under the EPBC Act. There is a bilateral process agreed to with the NSW State Government to streamline this process as part of the overall NSW project assessment.

6.1.1 Existing environment

The project site sits predominantly within the MCC mine site. The project will utilise the northern mine void Pit 2 as the lower reservoir. The mine void, the site of the hydro energy generation unit(s) and internal access Coal Road are cleared of vegetation. The upper reservoir and access waterway (penstock route) infrastructure will be developed on the lower slopes and at the top of Bells Mountain northeast of the lower reservoir. Relatively undisturbed native vegetation occurs in these locations.

The project site spans two Interim Biogeographic Regionalisation for Australia (IBRA) Regions (Sydney Basin region and North Coast region) and two IBRA subregions (Hunter subregion and Ellerston subregion). It also occurs across two Mitchell Landscapes (Central Hunter Foothills and Scone – Gloucester Foothills). The site contains a combination of cleared or disturbed agricultural land, remnant native vegetation.

A preliminary assessment of the biodiversity values of the project footprint (up to 500 MW capacity) has been carried out involving a desktop-based analysis of previous records of threatened species in the area and a review of regional vegetation mapping and relevant literature. Field surveys were undertaken in spring 2022 which included random meanders and Rapid Data Point (RDP) surveys within the 500 MW upper reservoir footprint area, as well any areas proposed to contain transmission easement, access waterways (pipeline), lower reservoir mine void and internal access roads.

i Mapped species and communities

Plant community types mapped in the vicinity of Bells Mountain are listed in Table 6.3.

Table 6.3 Plant community types at Bells Mountain

PCT	Vegetation form	Vegetation class	Plant community type name
73	Grasslands	Western Slopes Grasslands	Derived grassland of the NSW South Western Slopes.
121	Rainforests	Dry Rainforests	Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley.

Table 6.3 Plant community types at Bells Mountain

PCT	Vegetation form	Vegetation class	Plant community type name
156	Wet Sclerophyll Forests (Grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests	White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley.
171	Grassy Woodlands	Coastal Valley Grassy Woodlands	Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter.
172	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter.
173	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	White Box - Narrow-leaved Ironbark – Blakely's Red Gum shrubby open forest of the central and upper Hunter.
220	Grassy Woodlands	Coastal Valley Grassy Woodlands	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter.
290	Rainforests	Dry Rainforests	Sydney Hinterland Grey Myrtle Dry Rainforest.

Desktop searches comprised:

- review of threatened fauna and flora records within a 10 km radius of the site, contained in the NSW Energy and Sciences (EES) Atlas of NSW Wildlife (BioNet)
- review of MNES records within a 10 km radius of the site, using the EPBC Act Protected Matters Search Tool
- NSW EES Threatened Species website https://www.environment.nsw.gov.au/topics/animals-and-plants/threatenedspecies
- commonwealth Species Profile and Threats Database <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- a review of existing regional vegetation mapping (Greater Hunter Native Vegetation Mapping v4.0. VIS ID 3855) to determine the types of vegetation communities previously mapped in the site and surrounding areas.

Vegetation mapping within and near project surveyed area including Bells Mountain are listed in Table 6.3.

Table 6.4 Review of existing vegetation PCT mapping within and near survey area

Dataset	Vegetation communities mapped within or near the site
NSW State Vegetation Type Map (Trees Near Me NSW)	PCT 3431 Central Hunter Ironbark Grassy Woodland PCT 3120 Hunter-Peel Ranges Dry Rainforest PCT 3439 Hunter Escarpment Grey Gum Sheltered Forest PCT 3401 Upper Hunter Sheltered Viney Shrub Forest PCT 3076 Hunter Valley Whalebone Dry Rainforest PCT 3086 Lower North Hinterland Riparian Dry Rainforest PCT 3851 Upper Hunter Hills Rocky Scrub PCT 3314 Central Hunter Slopes Grey Box Forest PCT 4089 Namoi-Upper Hunter River Red Gum Forest

Table 6.4 Review of existing vegetation PCT mapping within and near survey area

Dataset	Vegetation communities mapped within or near the site
	PCT 339PCT 3397 Northwest Flats Yellow Box Woodland.
Greater Hunter Vegetation Mapping (Vegetation_GreaterHunter_v4_3855)	• Narrow-leaved Ironbark/Grey Box grassy woodland of the central and upper Hunter • White Box/ Sticky Daisy Bush/Bead Bush shrubby woodland with semi-evergreen vine thicket elements of the Central Hunter Valley • Narrow-leaved Ironbark/Native Olive shrubby open forest of the central and upper Hunter • White Box/Narrow-leaved Ironbark/Blakely's Red Gum shrubby open forest of the central and upper Hunter • Rusty Fig/Native Quince/Native Olive/dry rainforest of the Central Hunter Valley • River Red Gum/River Oak grassy riparian woodland of the Hunter Valley.
Upper Hunter Vegetation Mapping (Vegetation_SVTM_UpperHunter_v1)	• PCT 1691 Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter. • PCT 796 Derived grassland of the NSW South Western Slopes. • PCT 1605 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter. • PCT 1607 Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter. • PCT 1606 White Box - Narrow-leaved Ironbark - Blakely's Red Gum shrubby open forest of the central and upper Hunter. • PCT 1895 Sydney Hinterland Grey Myrtle Dry Rainforest. • PCT 1584 White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley. • PCT 1543 Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley.

Threatened and migratory species recorded or predicted to occur within 10 km of the site by a search of the NSW BioNet Atlas and EPBC Protected Matters Search Tool are listed in Table 6.4.

Table 6.5 Species recorded or predicted within 10 km – NSW and EPBC databases

Species name	BC Act	EPBC Act	BioNet records
Flora			
Acacia pendula Acacia pendula population in the Hunter catchment	E	-	27
Androcalva procumbens	V	V	-
Cynanchum elegans White-flowered Wax Plant	E	E	-
Dichanthium setosum Bluegrass	V	V	-
Diuris tricolor Pine Donkey Orchid	V	-	5
Diuris tricolor Pine Donkey Orchid population in the Muswellbrook local government area	E	-	5
Eucalyptus camaldulensis Eucalyptus camaldulensis population in the Hunter catchment	E	-	1

Table 6.5 Species recorded or predicted within 10 km – NSW and EPBC databases

Species name	BC Act	EPBC Act	BioNet records
Eucalyptus glaucina Slaty Red Gum	V	V	3
Eucalyptus nicholii Narrow-leaved Peppermint	V	V	-
Euphrasia arguta	CE	CE	-
Haloragis exalata subsp. *velutina* Tall Velvet Sea-berry	V	V	-
Lepidium aschersoni Spiny Pepper-cress	V	V	-
Pomaderris brunnea Rufous Pomaderris	E	V	-
Prasophyllum sp. Wybong Leek-orchid	-	CE	-
Pterostylis gibbose Illawarra Greenhood	E	E	-
Rhodamnia rubescens Scrub Turpentine	CE	CE	-
Thesium austral Austral Toadflax	V	V	-
Vincetoxicum forsteri listed as *Tylophora linearis*	V	E	-
Birds			
Actitis hypoleucos Common Sandpiper	-	M	-
Anseranas semipalmata Magpie Goose	V	-	1
Anthochaera phrygia Regent Honeyeater	CE	CE	-
Apus pacificus Fork-tailed Swift	-	M	-
Artamus cyanopterus cyanopterus Dusky Woodswallow	V	-	1
Botaurus poiciloptilus Australasian Bittern	E	E	-
Calidris ferruginea Curlew Sandpiper	E	CE, M	-
Calidris melanotos Pectoral Sandpiper	-	sM	-
Callocephalon fimbriatum Gang-gang Cockatoo	V	E	-
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo	V	V	-
Chthonicola sagittata Speckled Warbler	V	-	10
Circus assimilis Spotted Harrier	V	-	1
Daphoenositta chrysoptera Varied Sittella	V	-	4
Ephippiorhynchus asiaticus Black-necked Stork	E	-	1
Erythrotriorchis radiatus Red Goshawk	CE	V	-

Table 6.5 Species recorded or predicted within 10 km – NSW and EPBC databases

Species name	BC Act	EPBC Act	BioNet records
Falco hypoleucos Grey Falcon	E	V	-
Gallinago hardwickii Latham's Snipe	-	M	-
Glossopsitta pusilla Little Lorikeet	V	-	B
Grantiella picta Painted Honeyeater	V	V	-
Haliaeetus leucogaster White-bellied Sea-Eagle	V	-	1
Hieraaetus morphnoides Little Eagle	V	-	3
Hirundapus caudacutus White-throated Needletail	-	V, M	4
Lathamus discolor Swift Parrot	E	CE	-
Lophoictinia isura Square-tailed Kite	V	-	-
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	V	-	-
Monarcha melanopsis Black-faced Monarch	-	M	-
Motacilla flava Yellow Wagtail	-	M	-
Myiagra cyanoleuca Satin Flycatcher	-	M	-
Ninox connivens Barking Owl	V	-	-
Ninox strenua Powerful Owl	V	-	-
Numenius madagascariensis Eastern Curlew	-	CE, M	-
Oxyura australis Blue-billed Duck	V	-	-
Pandion cristatus Eastern Osprey	V	M	-
Pandion haliaetus Osprey	-	M	-
Petroca boodang Scarlet Robin	V	-	
Polytelis swainsonii Superb Parrot	V	Vs	-
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	V	-	3
Rhipidura rufifrons Rufous Fantail	-	M	-
Rostratula australis Australian Painted Snipe	E	E	-
Symposiachrus trivirgatus Spectacled Monarch	-	M	-
Tringa nebularia Common Greenshank	-	M	-
Tyto novaehollandiae Masked Owl	V	-	-
Mammals			
Chalinolobus dwyeri Large-eared Pied Bat	V	V	3

Table 6.5 Species recorded or predicted within 10 km – NSW and EPBC databases

Species name	BC Act	EPBC Act	BioNet records
Dasyurus maculatus Spotted-tailed Quoll	V	E	8
Falsistrellus tasmaniensis Eastern False Pipistrelle	V	-	2
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	V	-	4
Miniopterus australis Little Bent-winged Bat	V	-	1
Miniopterus orianae oceanensis Large Bent-winged Bat	V	-	12
Myotis macropus Southern Myotis	V	-	7
Macropus parma Parma Wallaby	V	V	-
Nyctophilus corbeni Corben's Long-eared Bat	V	V	2
Petauroides volans Greater Glider	-	V	-
Petaurus australis australis Yellow-bellied Glider (south-eastern)	V	V	-
Petaurus norfolcensis Squirrel Glider	V	-	7
Petrogale penicillate Brush-tailed Rock-wallaby	E	V	-
Phascolarctos cinereus Koala	E	E	6
Potorous tridactylus tridactylus Long-nosed Potoroo (northern)	E	V	-
Pseudomys novaehollandiae New Holland Mouse	-	V	-
Pteropus poliocephalus Grey-headed Flying-fox	V	V	10
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	V	-	3
Scoteanax rueppellii Greater Broad-nosed Bat	V	-	3
Vespadelus troughtoni Eastern Cave Bat	V	-	10
Herpetofauna			
Aprasia parapulchella Pink-tailed Worm-lizard	V	V	-
Delmar impar Striped Legless Lizard	V	V	11
Litoria aurea Green and Golden Bell Frog	E	V	-
Litoria booroolongensis Booroolong Frog	E	E	-

Note: CE = (Critically Endangered), E = (Endangered), V = (Vulnerable), M = (Migratory).

ii Field survey plant community types

The following PCTs were identified within the survey area:

- PCT 796 Derived grassland of the NSW South-Western Slopes
- PCT 3120 Hunter-Peel Ranges Dry Rainforest

- PCT 3431 Central Hunter Ironbark Grassy Woodland
- PCT 3439 Hunter Escarpment Grey Gum Sheltered Forest
- PCT 3525 Upper Hunter Box-Blakley's Red Gum Grassy Forest.

Appendix C lists the plant community types and vegetation zones identified on the project site.

iii Revised PCT classifications

PCT classification has recently been revised for the eastern NSW coast and tablelands IBRA bioregions. The revised PCTs were released to BioNet on 24 June 2022, however under the transitional arrangements they will not apply to the BOS (and are currently unavailable in the BAM-C) for at least six months following the BioNet release. The PCTs listed in Appendix C are the revised PCTs and any future assessments on the site are likely to require use of the revised PCTs in place of the parent PCTs listed in Table 6.5 which will soon be decommissioned.

Table 6.6 Revised PCT classifications

Revised PCT	Parent PCT to be decommissioned
PCT 796 Derived grassland of the NSW South Western Slopes	NA – PCT 796 remains unchanged.
PCT 3120 Hunter-Peel Ranges Dry Rainforest	PCT 1543 Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley.
PCT 3431 Central Hunter Ironbark Grassy Woodland	PCT 1691 Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter. PCT 1606 White Box - Narrow-leaved Ironbark - Blakely's Red Gum shrubby open forest of the central and upper Hunter.
PCT 3439 Hunter Escarpment Grey Gum Sheltered Forest	PCT 1608 Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter.
PCT 3525 Upper Hunter Box-Blakley's Red Gum Grassy Forest	PCT 1606 White Box - Narrow-leaved Ironbark - Blakely's Red Gum shrubby open forest of the central and upper Hunter.

Five PCTs were identified, including two that are associated with listed threatened ecological communities (TECs) (one being BC Act-listed NSW Central Hunter Grey Box—Ironbark Woodland and EPBC Act-listed Central Hunter Valley Eucalypt Forest and Woodland and the other being BC Act-listed Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions).

In addition, the site was found to contain suitable habitat for several threatened species listed under the BC Act and EPBC Act. No threatened species were incidentally observed during site visits.

iv Connectivity

The site's vegetation would continue to contribute to connectivity between large areas of habitat to the west (Goulburn River National Park and Wollemi National Park) and the east (Barrington Tops National Park) for more mobile fauna able to cross open areas. Locally, the site's ephemeral creek line may provide connectivity as a riparian corridor. The site also occurs within an important area of the Great Eastern Ranges (GER) Corridor (Muswellbrook Shire Council 2017).

6.1.2 Matters for consideration

Potential impacts to biodiversity arising from the project would be:

- permanent vegetation clearing for construction of the upper reservoir
- vegetation clearing and habitat removal and disturbance within the project area, including the upper reservoir and areas associated with permanent infrastructure including access waterways (pipeline), roadways and temporary construction facilities
- modification of Bells Mountain drainage lines potentially impact flows into Sandy Creek and Muscle Creek
- construction impacts to Sandy Creek potentially affecting aquatic species
- erosion and sedimentation could lead to impacts on surrounding native vegetation of areas being cleared
- changes to hydrogeological conditions arising from reservoir/dam creation and other construction activities could impact groundwater-dependent ecosystems
- increase in construction and general vehicle traffic may lead to higher mortality rate of local fauna
- noise and light emissions associated with night time construction activities may disturb nocturnal fauna species in the vicinity of works.

Opportunities exist during construction to avoid and/or minimise biodiversity impacts from the project and to and improve biodiversity values including:

- avoid and minimise removal of vegetation through design development
- maximise the reuse of excavated material to reduce spoil material and minimise spoil stockpile areas
- establish biodiversity nature reserves and corridors by establishment of biodiversity stewardship sites
- creating key habitat features in rehabilitated areas and provide nesting sites for mammals, birds and bats including hollows and fauna resting places
- while the reservoir levels will fluctuate, it is expected that they would provide habitat that could be utilised by fauna.

Relevant survey guidelines and species-specific guidelines will be used to guide methods to target survey efforts for threatened species likely to occur within the project area. These guidelines include but are not limited to following:

- EPBC Act Referral Guideline for the Vulnerable Koala (Commonwealth of Australia 2014)
- Surveying Threatened Plants and Their Habitats (DPIE 2020)
- Survey Guidelines for Australia's Threatened Birds: Guidelines for detecting birds that are listed as threatened under EPBC Act 1999 (Commonwealth of Australia 2017)
- Survey Guidelines for Australia's Threatened Mammals: Guidelines for detecting mammals that are listed as threatened under EPBC Act 1999 (Commonwealth of Australia 2011)
- Survey Guidelines for Australia's Threatened Bats: Guidelines for detecting bats that are listed as threatened under EPBC Act 1999, Commonwealth of Australia (2010)
- Survey Guidelines for Australia's Threatened Reptiles: Guidelines for detecting reptiles that are listed as threatened under EPBC Act 1999 (Commonwealth of Australia 2011).

6.1.3 Method of assessment

A biodiversity assessment will be prepared as part of the EIS to assess potential impacts associated with the project. Specifically, the following assessments will be required for the project's EIS:

- Assessment (including detailed field surveys and significant impact assessments under the EPBC Act) to determine the need for the project to be referred to the Commonwealth DCCEEW.
- Preparation of a BDAR in accordance with the BAM. The BDAR will assess the project's impacts on threatened species, threatened ecological communities, their habitats, and impacts on biodiversity values. It will also provide guidance on how the proponent can avoid and minimise potential biodiversity impacts and identifies the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity. Several candidate species have been identified as requiring targeted survey. These surveys will comply with the relevant survey guidelines and with the seasonal timeframes specified in the NSW BioNet Threatened Biodiversity Profile Data Collection. The BDAR will be compiled in accordance with Section 6 of the BAM, including assessments of Serious and Irreversible Impacts (SAII), to meet the requirements of Commonwealth DCCEEW and NSW DPE.

To account for seasonal variation in detectability, three survey periods are proposed for summer, winter and spring.

The biodiversity assessment findings as part of EIS will inform the project design, including taking into consideration the principles of avoiding, minimising and remediating impacts. Biodiversity offsets would be used to achieve net gains where impacts are unavoidable.

6.2 Aboriginal heritage

6.2.1 Existing environment

The project area is located within the traditional country of the Wonnarua people (Wanaruah) which is recorded as covering the region from Maitland through the Upper Hunter to the Great Dividing Range in the west (Tindale 1974).

The environmental assessment for the New England Highway bypass of Muswellbrook (TfNSW 2021), which is about a kilometre to the south-west of the project site, included field survey and test excavations, and recorded 12 sites of various surface and shallowly buried stone artefact materials. The assessment also identified the cultural importance of Sandy Creek and Skellatar Hill and view lines to and from this feature, as well as a traditional pathway.

The EIS for the Muswellbrook Solar Farm (EMM 2022) noted that the proposed solar farm project was within a region well-documented to contain substantive cultural materials.

Given the immediate proximity of that project to the Muswellbrook PHES project, the same observation would hold for the latter project. The solar farm scoping report also noted (p39):

> In the undulating hills and slopes of the Central Lowlands that characterise the project area and much of the Hunter Valley, cultural materials are overwhelmingly dominated by surface and/or shallowly buried stone artefacts of varying densities. They are often focussed on water courses of all sizes, although can be found in most landforms. Culturally modified trees are also commonly documented. While cultural materials of deep antiquity are known in the region, these appear to be constrained to deep sand bodies and/or alluvial deposits that to date are found only in the southwest of the Hunter Valley in the vicinity of Warkworth. No such sand bodies have been documented within the project area to date, and cultural material if found would be expected to reflect the last few thousand years of past occupation which dominates the regional archaeological record.

And:

In addition to tangible cultural remains, there is some indication of places of intangible value in the general vicinity of the project area. These include Sandy Creek to the northwest and Skellatar Hill to the west, and an undefined traditional track east of Muswellbrook. While not previously identified as having cultural importance, Bells Mountain is also a well-known landmark in the locale.

A preliminary assessment has been carried out for geotechnical investigations in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010). The assessment comprised:

- review of the NSW Aboriginal Heritage Information Management System (AHIMS)
- review of the National Heritage List and Commonwealth Heritage List
- preliminary site inspections carried out on 17-19 October and 21 December 2022.

i AHIMS search results

An initial AHIMS search was carried out on 3 December 2019 and a second search was carried out on 7 November 2022. The search area encompassed the study area and captured all of Bells Mountain as well as the wider surroundings, including the MCC area, part of McGullys Gap in the north-east, and sections of Muswellbrook township. The AHIMS search identified 35 sites, being predominantly artefact scatters, open campsites and scarred trees. The results identified four previously registered sites within close proximity (<100 m) of the proposed geotechnical investigation works. Details are provided in Table 6.7.

Table 6.7 HIMS registered sites in the general vicinity of the study area

Site ID	Site name	Datum, zone	Easting	Northing	Context	Features	Distance to project area buffer (m)
37-2-0105	Bells Mountain*	AGD,56	306063	6432029	Open site	Modified tree	3
37-2-2030	CB2	AGD,56	306760	6432039	Open site	3 artefacts	95
37-2-2031	CB1	AGD,56	306767	6431360	Open site	1 artefact	68
37-2-1841	MWOS3	AGD,56	306850	643132s0	Open site	Open camp site	146

* The site at Bells Mountain would not be affected by the project.

ii Aboriginal Heritage Impact Permits

A search of the Aboriginal Heritage Impact Permit register[19] did not identify any active permits within the project footprint.

iii National Heritage and Commonwealth Heritage lists

The study area is not listed on either the National Heritage List or Commonwealth Heritage List.

iv Native Title

There are no existing Native Title claims potentially affecting the project area.

[19] https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Aboriginal-cultural-heritage/aboriginal-heritage-impact-permit-public-register-2021-23.pdf?la=en&hash=E71FA2CC2A750B08A5CC036F2C5F1A3C6C964C3E

Figure 6.1 Location of AHIMS registered sites

6.2.2 Matters for consideration

Bells Mountain is located close to stone resources suitable for artefact manufacture. Prior to the area's settlement it contained abundant flora and fauna suitable for exploitation by Aboriginal people, and water sources were located in the vicinity. The area also includes rocky overhangs that have the potential for past human habitation. The wider area has high potential for archaeological evidence of Aboriginal habitation.

The following site types are most common in the Muswellbrook region:

- surface scatters and isolated artefacts
- open camp sites
- quarry sites
- scarred trees
- grinding grooves
- rock shelters
- ceremony places.

Notwithstanding levels of ground disturbance caused by tree clearing, and pastoral, agricultural and mining activities, there remains potential for Aboriginal archaeology (surface and sub-surface) to exist within the study area generally. If such archaeology was to exist, it would be likely to comprise isolated artefacts and surface scatters in disturbed contexts, of low scientific significance. If sub-surface artefacts were identified, in undisturbed contexts, these would be likely to be of higher scientific significance. However, the potential for such sites to exist is relatively lower. The assessment of Aboriginal heritage will consider past uses by Aboriginal people and potential Aboriginal archaeology within the project area.

There is potential for scarred trees to exist within vegetated and open areas of the study area that have not previously been surveyed.

6.2.3 Method of assessment

Further investigation is required and will characterise and assess potential cultural materials and identify suitable management and mitigation. This includes more detailed field survey, test excavation (where required), and consultation with the local Aboriginal community.

The assessment will involve preparation of an Aboriginal Cultural Heritage Assessment (ACHA) in accordance with:

- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010b)
- Guide to Investigating, Assessing, and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents, Part 6 National Parks and Wildlife Act 1974 (DECCW 2010a).

i Database searches

A review will be conducted of relevant heritage registers to collate information for heritage sites that occur within and in the immediate vicinity of the study area. These would include:

- The former Register of the National Estate

- The NSW Aboriginal Heritage Information Management System (AHIMS)
- The NSW State Heritage Register
- The MLEP 2009
- The National Heritage List
- Commonwealth Heritage List
- The register maintained by the National Trust
- Ethnography.

ii Consultation

Consultation for the project will be undertaken in accordance with the guideline *Aboriginal Cultural Heritage Consultation Requirements for Proponents, Part 6 National Parks and Wildlife Act 1974* (DECCW 2010a).

6.3 Noise and vibration

6.3.1 Existing environment

The land immediately surrounding Bells Mountain and proposed project site is predominantly rural properties with exception of the MCC mine site. Further afield surrounding Bells Mountain to north, east and south are moderate to highly vegetated mountain ranges with varying elevations. The Muswellbrook town centre is located approximately four km south-east of the project site.

A noise assessment for geotechnical investigations in 2022 identified the surrounding land uses in the project area as follows:

- North – Distant noise sensitive receivers scattered to the north of the site. Nearest sensitive receiver is at a distance of approximately 1.2 km.
- West – Distant noise sensitive receivers scattered to the west of the site. Nearest sensitive receiver is at a distance of approximately 1.2 km.
- East – Distant noise sensitive receivers scattered to the west of the site. Nearest sensitive receiver is at a distance of approximately 1.2 km.
- South – Vegetation and hills are located to the east of the site with no noise sensitive receivers.

Locations of noise-sensitive receivers are shown in Figure 3.5.

6.3.2 Matters for consideration

The ambient noise environment in areas surrounding Bell Mountain and the project area is characterised mostly by rural environment except for rehabilitation activities at the MCC mine site. As a consequence of this setting the sensitive receivers, rural property owners, surrounding Bells Mountain and the project area have the potential to be exposed to noise and vibration associated with the construction and operation of the project.

Apart from general construction noise, the following specific activities have the potential to generate adverse noise and/or vibration impacts to nearby residents of rural properties identified as sensitive receivers:

- excavation for the powerhouse located within Pit 2 mine void and upper reservoir which would involve use of heavy machinery

- rock and material excavation work for construction of upper reservoir and water access ways on the western side of Bells Mountain
- construction noise associated with building works including powerhouse water access ways and associated infrastructures including buildings
- vehicle movements required for construction phase could lead to traffic noise impacts along Sandy Creek Road and residents residing on this road
- pump and generator located at the Hunter River as well as booster pumps (if required) to pump water may create noise impact for residents located near this infrastructure.

6.3.3 Method of assessment

Potential impacts of noise and vibration emissions associated with construction and operation of the project would be assessed. The general methodologies for these assessments are described as follows.

i Construction

A construction noise and vibration assessment will be carried out to characterise the existing ambient acoustic environment of the project site as part of the EIS as a technical report.

Background noise monitoring will be carried out to confirm background noise levels and potential noise-affected sensitive receivers will be undertaken in accordance with the methodology outlined in the NSW *Noise Policy for Industry* (EPA 2017). The noise assessment will include:

- identifying construction noise and vibration criteria for sensitive receivers based on the ICNG, the NSW *Assessing Vibration: A Technical Guideline* and NSW *Road Noise Policy*
- developing a list of proposed construction equipment and activities, and sound power and noise emission levels
- developing construction noise and blast vibration predictions using 3D noise modelling techniques and using empirical techniques
- assessing risk of potential vibration impacts on items of heritage significance including Aboriginal places and items of environmental heritage
- assessing vibration levels in accordance with relevant standards for building damage and human comfort
- determining construction noise and vibration mitigation measures in accordance with the ICNG.

ii Operation

An operational noise and vibration assessment will be carried out as part of the EIS as a technical report. This will include:

- establishing project specific noise criteria in accordance with the NSW *Noise Policy for Industry* (EPA 2017) based on the measured rating background noise levels
- developing a 3D computer model of the project site, including site noise sources and sensitive receiver locations
- carrying out predictions of operational noise levels for the finalised design option, including agreed equipment and site layout

- assessing operational noise impacts, including characteristics such as tonality, low frequency components and impulsiveness, and potential sleep disturbance noise impacts from night-time operations
- developing reasonable and practicable in-principal noise mitigation measures and noise management practices to minimise or eliminate adverse environmental noise effects
- assessing cumulative operational noise impacts of the project and other developments or existing noise intensive industries in the area.

This assessment would be used to establish operational noise criteria and determining Noise Management Levels (NMLs) for the construction and operational noise assessments, and for associated management plans.

6.4 Historic heritage

6.4.1 Existing environment

A preliminary desktop analysis for the lower reservoir site geotechnical investigation in 2020, including a historic register search for items within two kilometres of the project area, found no heritage items listed.

The non-Aboriginal heritage of the Hunter Valley area is reasonably well-established. This includes historical accounts of early European settlement of the Hunter Valley, and the pastoral, urban and industrial development of the region, particularly coal mining.

Muswellbrook was founded in 1833 by surveyor Robert Dixon who defined the town plan based on a reserve already set aside for a government village. The first lots were sold in 1834. The towns grew steadily throughout the 1800s to a population of about 1895 in 1911. Agricultural cultivation was among the first activities of European settlers. This included crops, orchards, vineyards, and vegetable production and led to the establishment of associated development. Pastoral activities, primarily cattle grazing and dairying, were also a major part of early European settlement in the region and again led to the development of associated industries (HLA 2002).

Coal was discovered in the Hunter region in 1797. However, it was not until the late 1800s that coal mining began in the Muswellbrook area, although this was limited until the discovery of the Greta Coal Measures and subsequent founding of the MCC in 1907.

6.4.2 Matters for consideration

The continued development of coal mining and subsequently power generation defined the area. Construction of the Liddell Power Station commenced in 1964 and power generation commenced in 1972. This had a dramatic impact on employment, housing, and commerce in the area (HLA 2002).

Prior to mining operations commencing, the land that is now within the MCC mine lease was used for agricultural and pastoral purposes.

There is low potential for non-Aboriginal heritage in previously disturbed areas. Should any such heritage occur within the project area, it could be impacted by construction activities through direct clearing and excavation activities.

6.4.3 Method of assessment

A desktop and literature review will be undertaken, including database searches and consultation with local historical society and landowners with results provided in the EIS. Searches will be inclusive of following:

- National Heritage List
- Commonwealth Heritage List

- NSW State Heritage Register (SHR)
- National Trust of Australia NSW
- Muswellbrook LEP 2009.

6.5 Air quality

6.5.1 Existing environment

The project is located partly at an existing coal mine which has ceased operations and partly at Bells Mountain adjacent to the mine site. A search of the National Pollutant Inventory (NPI) identified seven existing air pollutant emission sources within 10 km of the project area:

- MCC mine (within two kilometres)
- Muswellbrook Quarry (within four kilometres) – while listed as active in the NPI, MCC has advised that this quarry is no longer operational
- Ravensworth East Mine (within seven kilometres)
- Elgas Limited (Oak Factory Hunter Street) (within eight kilometres)
- Lowes Petroleum Muswellbrook Depot (within eight kilometres)
- Caltex Petroleum (within nine kilometres)
- Walfertan Processors Pty Ltd (within nine kilometres).

Other major existing air pollutant sources surrounding the project area include Mount Pleasant coal mine, Mangoola coal mine, Bengalla Operations mine and Bayswater power station.

The Muswellbrook EPA monitoring station is located in Bowman Park, Lorne Street on the outskirts of Muswellbrook.

Other fugitive air emissions sources include vehicles light and heavy using the New England Highway, smoke from local heating, and outdoor fires and bushfires and dust from agricultural activities.

6.5.2 Matters for consideration

The project has the potential to generate fugitive air emissions including dust emissions to local sensitive receivers during construction from certain activities such as:

- clearing of vegetation to create roads and prepare sites for installation of infrastructure
- mulching vegetation cleared from site
- excavation of upper reservoir and removal of materials
- vehicle movements over unsealed roads carrying spoil and excavated materials
- spoil and material stockpiling
- concrete preparation and fugitive dust from batching and screening
- use of diesel generators and emissions from diesel driven equipment and vehicles.

Operation of the project is not expected to generate significant emissions.

6.5.3 Method of assessment

The existing air environment in the project region will be further described through analysis of air quality and meteorological monitoring data that is representative and publicly available, including monitoring data collected by the MCC mine under its EPL. The locations of sensitive receivers in relation to the project will also be confirmed.

A detailed air quality assessment will be carried out as part of the EIS in accordance with the guideline *Approved methods for the modelling and assessment of air pollutants* (EPA 2022). This will include:

- a description of existing air environment
- semi-quantitative air quality assessment of construction-related impacts
- qualitative air quality mitigation and management measures
- recommendation of air quality mitigation and management measures.

Potential impacts to neighbouring sensitive receptors (human and ecological) from construction dust emissions will be assessed using a qualitative impact assessment approach. While no specific methodology for such an assessment is available in Australia, the United Kingdom-based Institute of Air Quality Management (IAQM) has prepared the *Guidance on the assessment of dust from demolition and construction* (GADDC) (IAQM 2014). The GADDC has been applied to construction projects in NSW and accepted by the EPA as a progressive approach to assess the particulate matter impact risk associated with short-term construction and demolition projects.

A quantitative greenhouse gas assessment for the construction and operation of the project will be carried out in accordance with the *National Greenhouse and Energy Reporting Act 2009* (NGER Act) framework.

Overall, the project would be expected to have a positive impact by displacing more carbon or greenhouse energy intensive generation within NSW and more broadly the NEM.

6.6 Visual

6.6.1 Existing environment

The project area is located at Bells Mountain within the Muswellbrook Shire and within the MCC mine site. The Bells Mountain peak has an elevation of 690 m. The area has a diverse range of native and exotic flora and fauna. Apart from the site, the mountain is surrounded by rural properties. On the lower slopes of Bells Mountain, on the western side, an overhead transmission line and tower are visible including the 330 kV Muswellbrook substation to the north of the MCC mine site (refer to Figure 3.2). The township of Muswellbrook is located to the south-west of the proposed upper reservoir location.

6.6.2 Matters for consideration

During construction, some construction areas may be visible to nearby receivers. The project would introduce new permanent features into the landscape, including an upper reservoir and lower reservoir, pumped hydro infrastructure and access roads. These would result in changes to existing visual environment and landscape appearance within the project area.

i Reservoirs

The lower reservoir, being on the MCC mine site, would be visible from air but not at ground level except for those accessing the former MCC mine site.

Development of the upper reservoir will require excavation on the upper slopes and summit of Bells Mountain. Parts of the reservoir may be visible for residents immediately east and west and from vehicles travelling along Sandy Creek and McCully's Gap roads. The upper reservoir may be partially visible to the broader community of Muswellbrook and motorists on New England Highway.

ii Transmission infrastructure

A high voltage transmission line is proposed between the power house, substation and the TransGrid Muswellbrook substation. There may also be a small high voltage service line from the power house to the upper reservoir.

iii Access roads

Construction of internal access roads within the MCC mine site to allow service to the upper reservoir, pipeline, pumped hydro and other proposed infrastructure would create or contribute further to existing visual impacts.

iv Water supply pipeline

A water supply pipeline from Hunter River to MCC mine site would be established for the initial filling of the lower reservoir and for supplementary filling as required.

6.6.3 Method of assessment

The assessment will consider existing environment, potential changes to the landscape character and visual appearance of the project area, and visual impacts to potential visual receivers. The assessment will include identification of measures to minimise visual impacts.

The landscape and visual impact assessment will be carried out in accordance with relevant guidelines and standards including:

- Guideline for Landscape and Visual Impact Assessment (Centre for Urban Design 2020)
- Guidelines for Landscape and Visual Impact Assessment (GLVIA3) (Landscape Institute and IEMA 2013).

Targeted community engagement is proposed with surrounding landholders in relation to visual amenity impacts and development of mitigation options. The preparation of photomontages from key vantage points may be prepared to support the landscape and visual impact assessment and for use in community engagement.

The visual impact assessment will include:

- desktop assessment identifying potentially affected viewpoints and scale of impact
- identification of affected sensitive receptors and analysis of visual impacts to those receptors, such as through a viewshed analysis
- outline of standard mitigation measures to avoid or reduce impacts to sensitive receivers.

6.7 Traffic

6.7.1 Existing environment

The main entry to the MCC mine site is off the New England Highway (NEH) via Muscle Creek Road and Coal Mine Road to the south of the mine. The mine site has a northern access to the proposed lower reservoir site from the NEH and Sandy Creek Road on the northern edge of Muswellbrook. The northern entry to site is currently accessed from Sandy Creek Road via unpaved Limestone Road approximately 3.25 m wide and approximately 2.85 km from the NEH.

The NEH is a State Road that forms part of the inland Sydney to Brisbane road link. In the vicinity of the project, the road is a two-lane, two-way road with a posted speed limit of 60 km/h. An overtaking lane (approximately 125 m) is provided on the northbound carriageway at the intersection of Sandy Creek Road. Within Muswellbrook, the highway continues as Bridge Street south of Hunter Street with a posted speed limit of 50 km/h and two lanes in each direction for most of its length. NEH/Bridge Street forms the spine of the traffic network, providing direct access to the town centre and strategic trips through Muswellbrook heading to Aberdeen to the north and Singleton to the southeast.

Sandy Creek Road is a two-way, two-lane road with a speed limit of 100 km/h reduced to 60 km/h on approach to the NEH. The road has an at-grade rail crossing facility located approximately 40 m to the east of the NEH.

Site entry during construction will be off Sandy Creek Road. A new private access road will be constructed during to provide access to the power station and power waterway and reservoir areas. The internal MCC Coal Road off Limestone Road is likely to be utilised during construction and operations.

A permanent access road to the upper reservoir will be designed and constructed from the power station area considering environmental constraints, safety, and design requirements.

6.7.2 Matters for consideration

Approximately eight kilometres of new private road is proposed to be constructed within the MCC mine site to provide construction and permanent access to the lower reservoir and upper reservoir sites. The final alignment of the new road would be subject to design requirements, environment, and heritage constraints.

Road upgrades and a new turn-off for entry onto the mine site off Sandy Creek RoadR would be designed in consultation with MCC and affected residents along the road. Consultation will also be required with TfNSW regarding the New England Bypass which has an intersection upgrade at Sandy Creek Road.

The project will use existing mine roads to reduce native vegetation clearing (refer to Figure 3.2).

Construction of the project will introduce additional traffic through Muswellbrook and along approximately three kilometres of Sandy Creek Road, including some oversized and over mass vehicles for delivery of PHES infrastructure and equipment.

No material change would arise from operational traffic, except during periodic maintenance cycles based on final PHES design.

Assessment for potential increased road noise will be assessed as part of the broader noise and vibration assessment detailed in Section 6.3 Noise and Vibration.

6.7.3 Method of assessment

A review of existing information and analysis of the existing environment will be carried out to establish a baseline for traffic and transport impacts. This will include:

- a high-level review of roads and traffic on the existing road network
- identification of existing potential constraints
- a review of sensitive receivers along relevant construction routes.

The traffic impact assessment will include consideration of:

- assessment of existing traffic and road conditions including traffic volumes, intersection configuration and existing level of service
- traffic access to and within the project site, including transport of plant and equipment and removal of waste materials

- estimates of traffic generated by construction and during normal operations
- temporary lane closures and impacts on school bus routes
- transport of large or oversize infrastructure on the external road network
- identification of measures to mitigate the impacts of proposed construction stages.

The assessment will identify and detail mitigation measures to avoid, minimise and control traffic and transport impacts resulting from the construction and operation of the proposed project. The assessment will be prepared in accordance with appropriate guidelines including:

- RTA Guide to Traffic Generating Developments
- Guide to Road Design, Part 4: Intersections and Crossings – General Edition 2.1 (Austroads 2021)
- Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections Edition 3.1 (Austroads 2021)
- Unsealed Roads Best Practice Guide 2nd Edition (ARRB Group 2020)
- Unsealed Roads Manual, Guidelines to Good Practice 3rd Edition (ARRB Group 2009).

6.8 Social and economic

6.8.1 Existing environment

The project study area includes Muswellbrook LGA, which has a local population of 16,357 people (Australian Bureau of Statistics 2021).

The median age of the Muswellbrook LGA is 37 years old. The study area also hosts a larger proportion of Aboriginal and/or Torres Strait Islander people (11.7%) compared to the state average (3.4%).

Workforce participation in the Muswellbrook area is slightly higher than the national average, showing 60.1% of the population participate in the workforce compared to 58.7% across the state. For the population participating in the workforce, the top industry of employment was coal mining, followed by: horse farming; takeaway food services; supermarket and grocery stores; and labour supply services.

NSW Health data show higher rates of some health-related indicators in the Hunter New England Local Health District area including alcohol drinking long term risk in adults (38.4% compared to NSW average of 33.5%), obesity and heart attack hospitalisations (HealthStats 2020). In the Muswellbrook area, 10.8% of the population have asthma, 10.7% have a mental health condition (including depression or anxiety), 9.7% have arthritis and 5.6% have diabetes, which are all higher than the NSW and national averages (Australian Bureau of Statistics 2021).

6.8.2 Matters for consideration

A preliminary assessment of potential social and economic impacts of the project has been carried out using the DPE SIA Scoping Worksheet (refer Appendix D).

The potential for social and economic impacts of the project is predominantly related to the construction period during which the following potential impacts are anticipated:

- An increase in the influx of people residing within the local and broader area towns from construction workforce. Although Muswellbrook and surrounding areas have a significant range of accommodation options in assorted motels, hotels, caravan parks, self-contained apartments, guesthouse accommodation and other short to medium term accommodation, the cumulative effect of construction of the PHES project with construction of other projects within the Upper Hunter could lead to shortages of accommodation.

- Stimulation of the local economy of Muswellbrook and nearby towns through the provision of accommodation, food, services and materials during construction, together with potential increased employment opportunities directly and indirectly within the region.
- Increased levels of traffic within the township of Muswellbrook and other surrounding townships associated with transport of workers and materials to the construction site.
- Potential impacts on Aboriginal cultural heritage values (both over the short and longer terms).

Potential impacts over the longer term include:

- reduced visual amenity for receivers in direct line of sight of the upper reservoir at the top of Bells Mountain
- general positive benefit for the NSW community through increased energy reliability
- improved sustainability outcomes related to reducing demand on fossil fuel-based sources of energy and associated reductions in other greenhouse gas emissions which would provide societal benefits.

6.8.3 Method of assessment

The SIA for the project will be prepared in accordance with the *Social Impact Assessment Guideline* (DPE 2023a) and the *Technical Supplement Social Impact Assessment Guideline for State Significant Projects* (DPE 2023b). The preliminary assessment in the SIA scoping assessment worksheet will be reviewed and revised as required to inform the SIA for the EIS.

The SIA scoping assessment worksheet has identified that a detailed level of assessment will be required for the project, including broad consultation and targeted research. This will include a review of available technical reports, planning inputs, applicable legislation, demographic profiles, baseline assessment of impacts, impact assessment and identification of mitigation measures.

Targeted consultation will be programmed as an early activity to better characterise the key economic and social issues associated with the project, and to provide for refinement of the SIA methodology as required.

It is anticipated that the key economic and social issues associated with the project will relate to the construction phase such as workforce participation. This will be confirmed once consultation feedback has been received from DPE, Muswellbrook Shire Council and the local Muswellbrook community, after project SEARs have been issued.

6.9 Surface water

6.9.1 Existing environment

Bells Mountain, the MCC mine site and the proposed PHES project are located within the Upper Hunter Valley within the Hunter River catchment. Two catchments are located within this vicinity including Sandy Creek and Muscle Creek which are ephemeral tributaries of the Hunter River. These watercourses flow in a westerly direction joining the Hunter River north and south respectively of the township of Muswellbrook. The Hunter River catchment covers an area approximately 21,367 km^2 (SLR 2015) and includes inflows from Glenbawn Dam northeast Muswellbrook near Scone.

Surface water drainage lines exist on Bells Mountain and flow into Sandy Creek to the north and Muscle Creek to south. On the MCC mine site, clean water is diverted around mine void Pit 2 and only water from the mine site flows into the pit. Ephemeral drainage channels within the site tend to drain towards Sandy Creek.

Permanent surface waterbodies near the project area include Sandy Creek (about 4.5 km to the west), the Hunter River (about 5.5 km to the west) and Muscle Creek (about 5 km to the south).

6.9.2 Matters for consideration

The project has the potential to generate the following impacts on surface water resources:

- temporary impacts to surrounding surface water quality during construction works
- permanent impacts to the location and structure of watercourses on the site in the direct impact footprint
- minor downstream impacts to human and fauna water users relying on the Sandy Creek system
- impacts to fauna using the habitat values of existing watercourses on the site
- abstraction of water from the Hunter River for initial filling of the lower reservoir and from supplementary filling.

Consideration would also need to be given to water security and access licence usage within the catchment (noting that the proponent's related entities currently hold Water Access Licences in this region).

6.9.3 Method of assessment

Hydrologic studies that would be carried out for the EIS will include developing a water balance. These studies will build upon hydrologic assessments carried out for the feasibility study in early 2021.

A water quality assessment will be carried out as part of the EIS to assess potential surface and groundwater contamination during the proposed construction and operation of the project.

Hydrologic, hydrogeological, and hydraulic studies to build on initial design feasibility studies including water balance details will inform the EIS of water quality, flood mitigation and dam safety.

Assessment of potential impact of the PHES project on surface water resources will include:

- construction and operational impacts on water quality
- operational water requirements throughout the life of the project, including the initial filling of the lower reservoir
- impacts to downstream flow regimes, especially baseflow and low flow conditions
- identification of construction phase and operational mitigation and management measures.

The assessment will be prepared in accordance with appropriate guidelines including:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018 & ANZECC 2000)
- Australian Rainfall and Runoff (Ball et al 2019)
- NSW Water Quality and River Flow Objectives (DEC 2006)
- Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2, (Department of Environment and Climate Change 2008)
- Controlled activities – Guidelines for riparian corridors on waterfront land (DPE 2022a), Fact sheet (DPE 2022a)
- Controlled activities – Guidelines for instream works on waterfront land (DPE 2022b), Fact sheet (DPE 2022b)

- Neutral or Beneficial Effect on Water Quality Assessment Guideline (WaterNSW 2022).

6.10 Groundwater

6.10.1 Existing environment

Previous assessments (SLR, 2016) identified two main groundwater systems in the vicinity of the project area:

- Shallow bedrock (regolith):
  - comprising surficial sandy and silty-clayey soils and weathered bedrock, with variable permeability and porosity, at variable depth and thickness
  - during sustained wet periods, the aquifer becomes a temporarily perched
  - provides a source of recharge to the underlying coal measures, although limited due to the very hydraulic conductivities of deeper strata
- Permian bedrock (Greta Coal Measures):
  - comprising negligible intergranular porosity and permeability, with low to moderately permeable coal seams as the primary water bearing strata with typical permeability of c. 2m/day at shallow depths to less than 0.01 m/day at a depth of 130m
  - groundwater is associated with fracture (secondary) permeability and porosity from discontinuities (fractures, faults, joints, and bedding planes)
  - intervening unproductive coal measures are 'tight' with permeability c.2 orders of magnitude lower than that of the coal seams (i.e. 0.01 m/day at shallow depths to 0.0001 m/day at 100 m depth)
  - Specific storage coefficient (storativity) is estimated to be in the order of c.3 x 10-6.

A mapped area of groundwater vulnerability is located around eight kilometres to the northwest of the site (refer to Figure 6.2).

The lower reservoir Pit 2 receives saline groundwater inflows from within the catchment.

6.10.2 Matters for consideration

The project has the potential to intersect groundwater bodies during construction such as in relation to construction of the headrace tunnel and the power station.

As noted previously, the two reservoirs will be lined to avoid seepage; conversely these will also serve to prevent groundwater inflows. The headrace tunnel will also be lined. Accordingly, operation of the PHES project is not expected to materially affect groundwater resources.

Hydrogeological modelling may be required to demonstrate how the project would interact with local and regional aquifers, including those already intercepted by the existing mining void. The assessment may also need to be undertaken in accordance with the NSW Aquifer Interference Policy. The level of groundwater assessment necessary will be subject to further discussion with DPE Water.

6.10.3 Method of assessment

Assessment of potential impact of the PHES project on groundwater resources will include:

- characterisation of the local and regional groundwater resource drawing on existing information from sources such as monitoring bores and piezometers, and geotechnical investigations
- a numerical model may be developed to demonstrate project interaction with local and regional aquifers and the mine void.
- identification and assessment of construction and operational activities that could impact on groundwater resources
- identification of construction phase and operational mitigation and management measures.

The following guidelines will be considered as relevant during the preparation of the groundwater assessment:

- Australian Groundwater Modelling Guidelines (Waterlines Report, National Water Commission 2012)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000)
- DPE (2022) Guidelines for Groundwater Documentation for SSD/SSI Projects – Technical Guideline
- DPE (2022) Minimum groundwater modelling requirements for SSD/SSI Projects
- NSW Aquifer Interference Policy (DPI 2012).

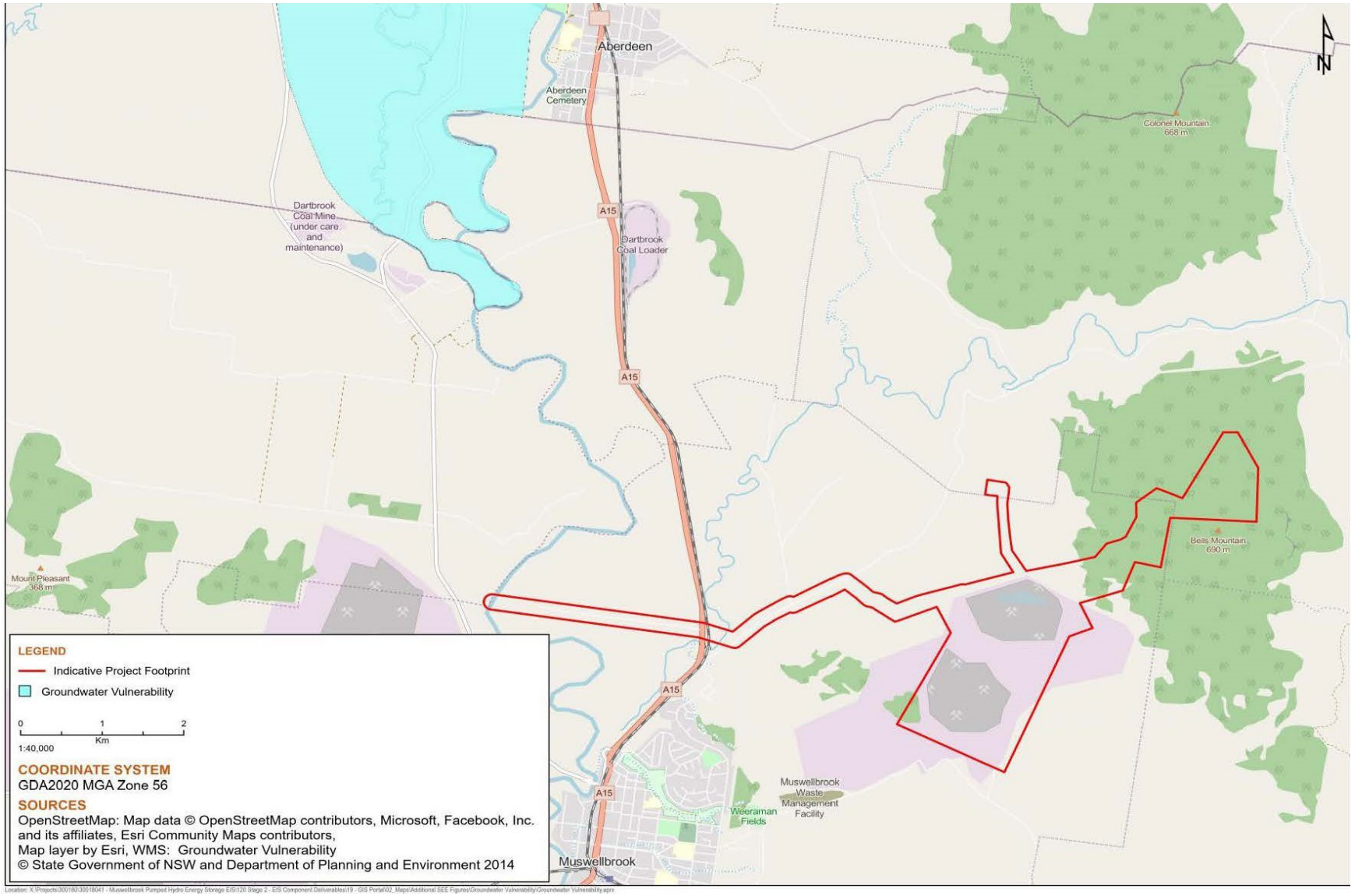

Figure 6.2 Mapped groundwater vulnerability

6.11 Soils and geology

6.11.1 Existing environment

i Geology

The project area extends across two major geological provinces:

- Sydney-Gunnedah Basin
- New England Fold Belt.

The boundary between these regions is defined by the Hunter-Mookie Thrust Fault, of which the early dipping section has resulted in Carboniferous aged volcanic rocks of the New England Orogen over Permian aged sedimentary rocks of the Sydney-Gunnedah Basin. The project area surrounding the proposed upper reservoir (atop Bells Mountain) will encounter volcanic materials from the New England Fold Belt, whilst the lower project area sections of the scheme will lie within the sedimentary units of the Braxton formation and Greta Coal Measures.

Bells Mountain is capped by a thick layer of pale white volcaniclastic tuffaceous siltstone/crystallithic tuff. This layer is underlain by coarse, polymictic cobble-boulder conglomerate with Qolcanic and volcanisclastic clasts.

ii Soils

Within the MCC mine site 14 soil types were found across the site during 2014 soil investigation by SLR. These soil types were 'dominated by Brown, Black and Red Vertosois, with smaller areas of Chromosols, Sodosols, Dermosols and Rudosols.' SLR (2014). Summary profile provided for each soil type includes:

- Vertosols (black, brown and red) – soils were found to be located on various landform positions ranging from ridge lines to lower slopes and flats across the mine site assessment areas. Alkalinity was generally moderate to strong, with sodicity and salinity increasing with depth from moderate to high.
- Chromosol – found mid to upper slopes on cleared grazing and timbered land. Soils varied in topsoil depth from 0.1 to 0.2 m, with an abrupt clear boundary to the clay subsoil.
- Sodosols (brown) – soils located on the creeklines, flat and lower slopes and varied in topsoil depth from 0.1 m to 0.2 m, with abrupt to clear boundary to the clay subsoil. Slightly acidic at surface 0.1 m and strongly alkaline at depth 0.2 m. Non-saline and non-sodic up to depth 0.2 m.
- Dermosols (brown) – cleared grazing land lower slopes and flats with soil varying in topsoil depth from 0.1 m to 0.3 m, with gradual boundary to the clay subsoil. Slightly acidic at surface 0.12 m then very strongly alkaline 0.7 m depth where soil is strongly sodic.
- Rudosols (brown) – grazing land soils varied in topsoil depth due to depositional layers, however often included grave layers within the upper profile. Non saline up to depth 0.6 m and increasing in alkalinity to strongly alkaline at depth 0.6 m.

There are no acid sulfate soils known or expected to occur within or surrounding the project area (NSW SEED 8 February 2023).

6.11.2 Matters for consideration

While the lower reservoir would be developed within existing mine void Pit 2 and surrounding disturbed mine areas, the upper reservoir area at the top of Bells Mountain would undergo transformation from excavation works permanently removing existing rock formations including volcaniclastic tuffaceous siltstone/crystallithic tuff. Land transformation will result from excavation of volcanic and sedimentary rocks for the upper reservoir including spillway and dam walls and access roads.

The construction of the surface penstock from the upper reservoir at the top of Bells Mountain towards the lower reservoir would also result in the excavation and transformation of affected areas of the mountain.

Exposure of soils from vegetation clearing and movement of material can have potential during construction to impact waterways particularly on steep slopes, if not correctly managed. Appropriate assessment and management of soil and surplus excavated materials will minimise impacts to surrounding landowners and waterways through potential erosion and sediment transport. Sediment transport into waterways including Sandy Creek and Muscle Creek downstream has potential to cause deterioration of water quality and impacts to aquatic environments.

6.11.3 Method of assessment

i Soil characterisation

Soil encountered during geotechnical investigations and field surveys will be characterised for physical and chemical properties including potential for soil erosion and sediment transport capability along with contamination risks.

Soil assessment would be undertaken within relevant guidelines including:

- Soil and Landscape Issues in Environmental Impact Assessment (DLWC 2020)
- Managing Urban Stormwater: Soils and Construction. Volume 1 (Landcom 2004) (The Blue Book)
- Managing Urban Stormwater. Soils and Construction. Volume 2 (2C. Unsealed Roads; 2E. Mines and Quarries) (DECC 2008)
- Acid Sulfate Soils Assessment Guidelines (DoP 2008)
- Acid Sulfate Soils Manual (Acid Sulfate Soils Management Advisory Committee, 1998)
- Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land (DUAP & EPA 1998)
- Guidelines for Consultants Reporting on Contaminated Sites (OEH, reprinted 2011)
- Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (EPA 2015)
- Urban and regional salinity – guidance given in the Local Government Salinity Initiative booklets (http://www.environment.nsw.gov.au/salinity/solutions/urban.htm) which includes Site Investigations for Urban Salinity (DLWC, 2002).

Excavated material, where suitable, may be reused during construction to minimise spoil stockpiling.

The type, volume, and management of excavated materials along with site rehabilitation would be addressed in the EIS including requirements for a site-specific Sediment and Erosion Control Management Plan. If required, a rehabilitation management strategy may also be developed for emplacement of excess spoil material.

ii Geology

A detailed geological assessment would be included in the EIS to inform of soil profiles and geophysical structures within areas to be excavated. Additional investigations undertaken for the project that may inform the EIS would include:

- geological and geotechnical assessment
- location and condition of the Hunter-Mookie and Aberdeen thrust faults
- soil profiles and geo-mechanical properties across the project
- additional geological mapping and geophysical testing for project structures including shafts, waterway tunnels, tunnel portals
- detailed analysis for the lower reservoir including pit wall stability and dam basin design.
- mine spoil and recent rehabilitation stability analysis
- groundwater and geochemical assessment
- stability assessments for excavations, including kinematic stability of proposed excavations and cuts
- assessment of in-situ stress conditions within Bells Mountain.

6.12 Waste and resource recovery

6.12.1 Existing environment

The lower reservoir would be established within the existing MCC mine site void Pit 2 which has undergone excavation and onsite management of this material in accordance with site operating requirements and licences.

As noted in Section 3.6.4, the existing MCC mine site void Pit 1 is proposed to be used for placement of excavated material from construction of the upper reservoir.

6.12.2 Matters for consideration

Construction activities would produce waste streams including vegetation, cementitious, construction and domestic wastes. If these are not managed properly, there is potential the project could result in adverse impacts to the local environment including release of waste to soils and waterways, odour and air quality impacts, impacts to amenity, and risk to health and safety of construction workers, mine site employees and broader community.

During normal operations it is not expected that significant volumes of waste would be generated beyond occasional minor waste streams associated with periodic maintenance activities. There would be very minor domestic waste arising from projects operations.

Waste streams generated during construction and operation of the PHES project that cannot be repurposed, reused or recycled, would be disposed of at appropriately licensed waste facility for material being disposed.

Sewage generated from construction project site facilities would be appropriately collected and disposed of in accordance with statutory and local government requirements.

Excavation for the upper reservoir and water accessway infrastructure will generate rock and spoil material. This would be treated as a resource to be reused on-site such as for landscaping activities and rehabilitation. Disposal of unsuitable material into mine site void Pit 1 would be a secondary priority.

6.12.3 Method of assessment

i Spoil management

Spoil management would consider results of geotechnical investigation program including rock and soil material encountered and characterisation and test results to ascertain contamination impacts. Geotechnical drilling for detailed design will be used to estimate volumes of rock materials and quality for suitability for reuse and long term storage and management.

Spoil material unsuitable for reuse will be contained within designated spoil disposal areas. These areas will be developed in accordance with industry good practice spoil management standards including:

- Mine Rehabilitation. Leading Practice Sustainable Development Program for the Mining Industry (Australian Government 2016)
- Mine Rehabilitation Handbook (Minerals Council of Australia 1998).

It is anticipated that moderate levels of waste soil would be generated as result of construction.

Designated spoil storage areas, design details, management and rehabilitation objectives would be included in the Soils and Spoil Management Assessment of EIS.

ii Waste management

A detailed waste assessment would be carried out for the EIS and would identify potential waste streams associated with construction and operation of the project. The EIS would include standard management practices compliant with the *Waste Avoidance and Resource Recovery Act 2001* and other relevant guidelines and good management practices.

The EIS would contain a comprehensive analysis of potential waste sources, impact assessment and mitigation measures to help reduce the project's waste impact.

6.13 Hazards and risk

There is a range of potential hazards and risk associated with the project These include but are not limited to:

- bushfire
- handling and storage of dangerous goods and hazardous substances
- contaminated land
- exposure to electromagnetic fields
- climate change
- dam break.

Assessment of potential hazards and risks would be undertaken in accordance with relevant guidelines including:

- Planning for Bushfire Protection (RFS 2019)
- Environmental Health Risk Assessment, Guidelines for assessing human health risks from environmental hazards (Commonwealth of Australia, enHealth 2012)
- Methodology for Valuing the Health Impacts of Changes in Particle Emissions (EPA 2013)

- Health Impact Assessment: A practical guide (NSW Health 2007)
- Health Impact Assessment Guidelines (Commonwealth Department of Health and Aged Care, enHealth 2001)
- SEPP No. 33 - Hazardous and Offensive Development
- Climate Change Impacts and Risk Management – A Guide for Business and Government (Australian Government 2006)
- AS/NZS 3100:2009 Risk Management – Principles and Guidelines.

A dam break analysis for the upper storage would be prepared as part of design development. Relevant details would be reported in the EIS.

6.14 Other issues

The following table lists matters not considered to require assessment in the EIS together with justification for their exclusion or clarification with regard to where and how they would be considered as part of assessment other aspects.

Table 6.8 Matters not requiring assessment in the EIS

Group	Specific matter	Comment
Amenity	Odour	Negligible emissions anticipated from operation of the project.
Hazards and risks	Coastal hazards	Project is located outside of coastal zone defined under State Environmental Planning Policy (Resilience and Hazards) 2021.
Aboriginal heritage	Native Title	Aboriginal cultural heritage assessment would acknowledge the Native Title process but given there are no current applications affecting the proposal area, limited discussion would be provided in this regard.

6.15 Cumulative impacts

The project would contribute to the development of renewable energy in the Hunter Region. There are a number of existing and future major projects in the vicinity relevant to assessment of potential cumulative impacts of the PHES project. Relevant nearby major projects are shown in Figure 2.5.

Relevant projects include existing mining operations, existing and planned renewable energy projects and road upgrade works. The existing Liddell and Bayswater Power Stations are also in the region and expected to undergo future changes of closure and decommissioning.

A scoping phase cumulative impact assessment was completed in accordance with the NSW *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE 2021). The scoping phase cumulative impact assessment is provided in Table 6.9.

The preliminary assessment identified the following potential cumulative impact issues that would require further consideration in the EIS:

- biodiversity, heritage, and noise and vibration (principally construction) impacts of the Muswellbrook Solar Farm and New England Highway Muswellbrook Bypass projects
- noise and vibration (principally construction) of the Muswellbrook Solar Farm and New England Highway Muswellbrook Bypass projects

- visual impacts of the Muswellbrook Solar Farm, New England Highway Muswellbrook Bypass and Bowmans Creek Wind Farm and projects
- traffic and transport impacts of the MCC mine closure and rehabilitation, Muswellbrook Solar Farm, New England Highway Muswellbrook Bypass, Muswellbrook Hospital Redevelopment Stage 3 and Muswellbrook Battery Energy Storage System projects
- surface water resources impacts of the Muswellbrook Solar Farm, New England Highway Muswellbrook Bypass, and Muswellbrook Battery Energy Storage System projects
- air quality impacts during construction of the Muswellbrook Solar Farm, New England Highway Muswellbrook Bypass and operation of Mount Pleasant Mine
- social impacts such as increased demand for services from the Muswellbrook Solar Farm, New England Highway Muswellbrook Bypass, Muswellbrook Hospital Redevelopment Stage 3, Muswellbrook Battery Energy Storage, Bowmans Creek Wind Farm projects and the Mount Pleasant Mine expansion.

Table 6.9 Cumulative impact assessment scoping summary

Project	Approximate distance	Project status & timing	Potential cumulative impacts – assessment type							
			Biodiversity	Heritage	Noise & vibration	Traffic & transport	Surface water resources	Visual amenity	Air quality	Social & economic
MCC mine closure & rehabilitation	Within and adjacent to mine site	Mining operations have ceased and rehabilitation and monitoring would continue during construction and operation of the PHES project.	Nil	Nil	Nil	Standard assessment in EIS	Nil	Nil	Nil	Nil
Muswellbrook Solar Farm	Within and adjacent to mine site; overlaps with PHES project area	Environmental assessment currently in preparation. Construction expected to take about 18 months. Scoping report anticipates construction to occur ahead of construction of PHES project.	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS

Table 6.9 Cumulative impact assessment scoping summary

Project	Approximate distance	Project status & timing	Potential cumulative impacts – assessment type							
			Biodiversity	Heritage	Noise & vibration	Traffic & transport	Surface water resources	Visual amenity	Air quality	Social & economic
New England Highway Muswellbrook Bypass	Immediately south-west of the MCC mine site property	Construction early works and clearing commenced in February 2023. TfNSW expecting to have short-list of tenderers for main construction works by mid-2023 with construction taking about three and a half years which could overlap with construction of the PHES project.	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS	Standard assessment in EIS
Muswellbrook Hospital Redevelopment Stage 3	Approximately 5.8 km to south-west	Stage 2 completed in 2019. Stage 3 currently in detailed planning and design.	Nil	Nil	Nil	Standard assessment in EIS	Nil	Nil	Nil	Standard assessment in EIS
Muswellbrook Battery Energy Storage System	Approximately 3.4 km to west	Project is currently undergoing assessment by DPE. The EIS identifies that subject to approval, construction is expected to commence in late 2023 and take about 12 months.	Nil	Nil	Nil	Standard assessment in EIS	Standard assessment in EIS	Nil	Nil	Standard assessment in EIS
Bowmans Creek Windfarm	Approximately 8 km to east	Project is currently undergoing assessment by DPE. The Submissions Report identifies that	Nil	Nil	Nil	Nil	Nil	Standard assessment in EIS	Nil	Nil

Table 6.9 Cumulative impact assessment scoping summary

Project	Approximate distance	Project status & timing	Potential cumulative impacts – assessment type							
			Biodiversity	Heritage	Noise & vibration	Traffic & transport	Surface water resources	Visual amenity	Air quality	Social & economic
		construction is expected to take about 18-24 months. No details were provided on expected timing in the EOS or Submissions Report but it is unlikely that there would be substantial overlap in construction periods.								
Maxwell Solar Farm	Approximately 14 km to south	Approved project. The EIS identifies that construction is expected to take about 12-18 months. Significant cumulative impacts considered unlikely.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Hunter River Solar Farm	Approximately 21 km to south-west	EIS currently in preparation. The Scoping Report identifies that construction is expected to take about 18 months. Construction periods may overlap but due to separation distance, significant cumulative impacts are unlikely.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Liddell Power Station – Future	Approximately 16 km to south	Full closure schedule for April 2023. EIS currently	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Table 6.9 Cumulative impact assessment scoping summary

Project	Approximate distance	Project status & timing	Potential cumulative impacts – assessment type							
			Biodiversity	Heritage	Noise & vibration	Traffic & transport	Surface water resources	Visual amenity	Air quality	Social & economic
Land Use and Enabling Works		in preparation. Due to separation distance, significant cumulative impacts are unlikely.								
Bayswater Power Station	Approximately 24 km to south	Planned closure scheduled for 2030-33. Due to separation distance, significant cumulative impacts are unlikely.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Bengalla Mine	Approximately 9 km to west	Construction and operation of the PHES project would overlap with mine operation. There are no current modifications lodged with DPE. Due to the distance from the PHES project, no cumulative impacts expected.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Mount Arthur Mine	Approximately 12 km to south-west	Construction and operation of the PHES project would overlap with mine operation. There is an existing application in preparation for extension of mining operations to 2030. Due	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Table 6.9 Cumulative impact assessment scoping summary

Project	Approximate distance	Project status & timing	Potential cumulative impacts – assessment type							
			Biodiversity	Heritage	Noise & vibration	Traffic & transport	Surface water resources	Visual amenity	Air quality	Social & economic
		to the distance from the PHES project, no cumulative impacts expected.								
Mount Pleasant Mine	Approximately 7 km to west	Construction and operation of the PHES project would overlap with mine operation. The application for the Mount Pleasant Optimisation Project to extend the life of the open cut operation was approved on 6 September 2022. This will involve increased extraction from 10.5 million tonnes per annum (Mtpa) up to 21 Mtpa as well as an increase in the average operational workforce from 330 to 600 workers.	Nil	Nil	Nil	Nil	Nil	Nil	Standard assessment in EIS	Standard assessment in EIS

7 Conclusion

Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust (AGL Energy Pty Limited in joint venture partnership with Idemitsu Renewable Developments Australia Pty Ltd), is proposing to design, construct and operate a PHES facility at Bells Mountain, Muswellbrook, New South Wales. This renewable energy storage project would provide up to 500 MW of electricity-generating capacity and up to eight hours of energy storage, supplying customers and supporting the Renewable Energy Network in Newcastle and Sydney.

The project would provide significant deep storage and flexible, dispatchable generation to serve NSW's energy reliability needs and the objectives of the NSW Government's Roadmap and the EII Act.

This Scoping Report provides a description of the project and has been prepared to support a request for the SEARs for the project. The report contains statutory context, details for key stakeholder engagement including SIA requirements and information of existing environment. It also identifies topics that would require further and detailed assessment in the EIS and outlines the proposed assessment approach for each topic.

References

AEMO Services (2021) *2021 Infrastructure Investment Objectives Report*, AEMO Services Ltd.

AEMO Services (2023) *Draft 2023 Infrastructure Investment Objectives Report*, AEMO Services Ltd.

AGL (2015) *AGL Greenhouse Gas Policy.*

AGL (2017) *NSW Generation Plan.*

ANZECC & ARMCANZ 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand.

Australian Energy Regulator (2022a) *NSW Electricity Infrastructure Fund – Contribution Determination Guideline*, Commonwealth of Australia, Melbourne.

Australian Energy Regulator (2022b) *Revenue determination guideline for NSW contestable network projects*, Commonwealth of Australia, Melbourne.

Australian Bureau of Statistics: https://abs.gov.au/census/find-census-data/quickstats/2021/LGA15650.

Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, AWA, Canberra.

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), 2019, *Australian Rainfall and Runoff: A Guide to Flood Estimation,* Commonwealth of Australia.

Department of the Environment (2013) *Matters of National Environmental Significance Significant impact guidelines 1.1*, Canberra.

Department of Environment, Climate Change and water (2008) *Managing Urban Stormwater: Soils and Construction* Volume 2, Sydney.

Department of Environment and Climate Change (2010) *Aboriginal cultural heritage consultation requirements for proponents 2010*, DECCW, Sydney.

Department of Environment and Conservation (2006) *NSW Water Quality and River Flow Objectives*, DEC, Sydney.

Department of Planning (2011a) Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis, DoP, Sydney.

Department of Planning (2011b) Multi-Level Risk Assessment, DoP, Sydney.

Department of Planning and Environment (2022a) *Controlled activities – Guidelines for riparian corridors on waterfront land*, Fact sheet, DPE, Sydney.

Department of Planning and Environment (2022b) *Controlled activities – Guidelines for instream works on waterfront land*, Fact sheet, DPE, Sydney.

Department of Planning and Environment (2023a) *Social Impact Assessment Guideline*, DPE, Sydney.

Department of Planning and Environment (2023b) *Technical Supplement Social Impact Assessment Guideline for State Significant Projects*, DPE, Sydney.

Department of Planning, Industry and Environment (2019) *NSW Electricity Strategy*, Nov 2019, DPIE, Sydney.

Department of Planning, Industry and Environment (2021) *State significant development guidelines –preparing a scoping report, Appendix A to the state significant development guideline*s, DPIE, Sydney.

Department of Planning, Industry and Environment (2022a) *Undertaking Engagement Guidelines for State Significant Projects,* DPIE, Sydney.

Department of Planning, Industry and Environment (2022b) *Social Impact Assessment Guideline for State Significant projects,* DPIE, Sydney.

Department of Planning, Industry and Environment (2022c) *Cumulative Impact Assessment Guidelines for State Significant Projects,* DPIE Sydney.

EMM (2022) *Muswellbrook Solar Farm*, Scoping report prepared for ESCO Pacific, Sydney.

Energy Corporation of NSW and AEMO Services (2022) *Network Authorisation Guidelines* (draft), NSW Government, Sydney.

Energy Corporation of NSW (2023) *NSW Network Infrastructure Strategy*, NSW Government, Sydney.

Environment Protection Authority (2022) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales,* EPA, Sydney.

HealthStats (2020) *Hunter New England Local Health District*. Retrieved from Health Stats NSW: https://www.healthstats.nsw.gov.au/#/location-overview/hunternewenglandlhd/LHD.

HLA (2002) *Indigenous and Non-Indigenous Heritage Study, Muswellbrook Coal Company No.1 Open Cut Extension.* Pymble NSW: HLA-Envirosciences Project No U888-4.

Hunter Ecology (2023) *Ecological Scoping Report for the Muswellbrook Pumped Hydro Energy Storage Project at Bells Mountain, Muswellbrook,* Hunter Ecology, Adamstown.

Institute of Air Quality Management (2016) *Guidance on the assessment of dust from demolition and construction, Version 1.1*, IAQM London.

Landcom (2004) *Managing Urban Stormwater: Soils and Construction* Volume 1, Sydney.

Office of Energy and Climate Change (2022a) *Electricity Infrastructure Roadmap: Electricity Infrastructure Fund (Part 7 of the Electricity Infrastructure Investment Act 2020) Exemptions Administration Process*, NSW Government, Sydney.

Office of Energy and Climate Change (2022b) *Regulatory framework for the Transmission Efficiency Test and Regulator's determinations for network infrastructure projects*, NSW Government, Sydney.

Rural Fire Service (2019) *Planning for Bushfire Protection*, RFS, Sydney.

SMEC Australia Pty Ltd (2018) Options Assessment, Bells Mountain Pumped Storage Project.

SMEC Australia Pty Ltd (2021) Feasibility Study Report, Bells Mountain Pumped Storage Project.

Tindale, N (1974) *Aboriginal Tribes of Australia: Their terrain, Environmental Controls, Distribution, Limits and Proper Names*, Australian National University Press, Canberra.

Transport for NSW (2021) *New England Highway bypass of Muswellbrook Review of Environmental Factors*. Prepared by AECOM for TfNSW, Sydney.

WaterNSW (2022) *Neutral or Beneficial Effect on Water Quality Assessment Guideline*, WaterNSW, Sydney.

Glossary

Abbreviation	Definition
ABN	Australian Business Number
ACHA	Aboriginal Cultural Heritage Assessment
AER	Australian Energy Regulator
AGL	AGL Energy Ltd
AHIMS	Aboriginal Heritage Information Management System
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity development assessment report
CCC	Community Consultative Committee (MCC)
Consent	Development consent for development application number DA 205/2002
CSSI	Critical State significant infrastructure
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DoEE	Former Department of the Environment and Energy (Commonwealth)
DP	Deposited plan
DPE	Department of Planning and Environment (NSW)
EIS	Environmental impact statement
EnergyCo	Energy Corporation of NSW
EEI Act	*Electricity Infrastructure Investment Act 2020* (NSW)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPI	Environmental planning instrument
ESD	Ecologically sustainable development
Firming capacity	Flexible energy supply that can be activated to maintain the output from a variable, intermittent power source, such as wind or solar, for a committed period of time
Firming infrastructure	Infrastructure that provides the capacity to deliver electricity to the market on demand
GADDC	Guidance on the assessment of dust from demolition and construction
ha	Hectare(s)
IAP2	International Association of Public Participation
IAQM	Institute of Air Quality Management (UK)
ICNG	*Interim Construction Noise Guideline*
Idemitsu	Idemitsu Renewable Developments Australia Pty Ltd
JV	Joint venture

Abbreviation	Definition
km	Kilometre(s)
kV	Kilovolt
LDS	Long-duration storage
LGA	Local government area
Liddell	Liddell Thermal Power Station
m	Metres
MCC	Muswellbrook Coal Company Ltd
MLEP 2009	Muswellbrook Local Environment Plan 2009
MNES	Matter(s) of national environmental significance
MSD	Mine Subsidence District
MW	Megawatt
NEM	National Electricity Market
NPI	National Pollutant Inventory
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPWS	National Parks and Wildlife Service (NSW)
NSW	New South Wales
OECC	Office of Energy and Climate Change (NSW)
OEH	Former NSW Office of Environment and Heritage (now part of DPE)
PHES	Pumped hydroelectric energy storage
PS SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
project	PHES facility at Bells Mountain, Muswellbrook
Proponent	Muswellbrook Pumped Hydro Pty Ltd as trustee for the Muswellbrook Pumped Hydro Trust, a JV partnership between AGL and Idemitsu
RAP	Registered Aboriginal Party
REZ	Renewable Energy Zone
Roadmap	NSW Electricity Infrastructure Roadmap
SEARs	Secretary's environmental assessment requirements
SEPP	State Environmental Planning Policy
SIA	Social impact assessment
SSD	State significant development
SSI	State significant infrastructure
T&I SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
TEC	Threatened ecological community

APPENDIX

A

Summary Table

A.1 Summary table

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
Detailed	Terrestrial and aquatic flora and fauna	Yes For potential impacts to threatened species and threatened ecological communities	General	Biodiversity Assessment Method (DPIE, 2020) Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance (Commonwealth of Australia, 2013) Commonwealth Department of the Environment – Survey Guidelines for Nationally Threatened Species (various)	Section 6.1
	Aboriginal Heritage	Yes Regional assessment of potential impacts	Specific	Guide to investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010) Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	Section 6.2
	Noise and Vibration	Yes For potential local cumulative sources of noise and vibration	Specific	NSW Interim Construction Noise Guideline (ICNG) (DECC, 2009) NSW Noise Policy for Industry (EPA, 2017) NSW Road Noise Policy (DECCW, 2011) Assessing Vibration: A Technical Guideline (DECC, 2006)	Section 6.3
	Traffic and Transport	Yes Regional assessment of potential impacts	Specific	Guide to Traffic Management – Part 4 Traffic Studies and Analysis (Austroads, 2013)s	Section 6.7
	Visual Amenity	Yes Regional assessment of potential impacts	Specific	Landscape Institute and IEMA (2013). Guidelines for Landscape and Visual Impact Assessment (GLVIA3) Centre for Urban Design (2020). Guideline for landscape and visual impact assessment	Section 6.6
	Socio-Economic (community)	Yes Regional assessment of potential impacts	Specific	Social Impact Assessment Guideline for State Significant Projects 2021 (DPIE, 2021)	Section 6.8

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
	Water Quality, Hydrology, and Hydrogeology	No	General	*Water Sharing Plan for the Hunter Regulated River Water 2016* *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022* Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000) Using the ANZECC Guidelines and Water Quality Objectives in NSW (Department of Environment and Conservation, 2006) Guidelines for instream works on waterfront land (DPI, 2012) Guidelines for riparian corridors on waterfront land (DPI, 2012) Guidelines for watercourse crossings on waterfront land (DPI, 2012) NSW Aquifer Interference Policy Groundwater Monitoring Guidelines (Barnett et al,. 2012)	Sections 6.9 and 6.10
	Hazards and risk	No	General	Planning for Bushfire Protection (RFS 2019) Environmental Health Risk Assessment, Guidelines for assessing human health risks from environmental hazards (Commonwealth of Australia, enHealth 2012) Methodology for Valuing the Health Impacts of Changes in Particle Emissions (EPA 2013) Health Impact Assessment: A practical guide (NSW Health 2007) Health Impact Assessment Guidelines (Commonwealth Department of Health and Aged Care, enHealth 2001) SEPP No. 33 - Hazardous and Offensive Development Climate Change Impacts and Risk Management – A Guide for Business and Government (Australian Government 2006) AS/NZS 3100:2009 Risk Management – Principles and Guidelines.	Section 6.13
Standard	Non-Aboriginal Heritage	No	General	Historical Archaeology Code of Practice (Heritage Councill, 2006)	Section 6.4

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping report reference
	Air Quality and Greenhouse Gas	Yes For potential local cumulative sources of air quality impacts	General	Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2016) (Approved Methods) National Environment Protection (Ambient Air Quality) Measure 1998 (Air NEPM) National Environment Protection (National Pollutant Inventory) Measure 1998 (NPI) Australian Government's Department of Energy's National Pollutant Inventory Guide Australia's National Greenhouse and Energy Reporting Guidance (NGER, 2020) International GHG quantification guidance (ISO14064:2006)	–
	Waste and resource recovery	No	General	Mine Rehabilitation Handbook. Minerals Council of Australia (1998) Mine Rehabilitation. Leading Practice Sustainable Development Program for the Mining Industry, Australian Government (2016).	Section 6.12
	Soils and geology	No	General	Soil and Landscape issues in Environmental Impact Assessment (DLWC, 2020) Consultant reporting on contaminated land. Contaminated Land Guidelines (NSW EPA, 2020)	Section 6.11

APPENDIX

B

EPBC Act Protected Matters Report

EPBC Act Protected Matters Report

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

Report created: 15-Feb-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	8
Listed Threatened Species:	40
Listed Migratory Species:	13

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	11
Commonwealth Heritage Places:	1
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	22
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity
Hunter estuary wetlands	50 - 100km upstream from Ramsar site

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community likely to occur within area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area
Hunter Valley Weeping Myall (Acacia pendula) Woodland	Critically Endangered	Community may occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community may occur within area
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat likely to occur within area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
FROG		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area
MAMMAL		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Notamacropus parma Parma Wallaby [89289]	Vulnerable	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
PLANT		
Androcalva procumbens		
[87153]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans		
White-flowered Wax Plant [12533]	Endangered	Species or species habitat may occur within area
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus glaucina		
Slaty Red Gum [5670]	Vulnerable	Species or species habitat known to occur within area
Euphrasia arguta		
[4325]	Critically Endangered	Species or species habitat may occur within area
Lepidium aschersonii		
Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat may occur within area
Picris evae		
Hawkweed [10839]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Pomaderris brunnea		
Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269)		
a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Pterostylis gibbosa		
Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Vincetoxicum forsteri listed as Tylophora linearis		
[92384]	Endangered	Species or species habitat may occur within area
REPTILE		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
Delma impar		
Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Commonwealth Bank of Australia	
Commonwealth Land - Commonwealth Bank of Australia [12536]	NSW
Commonwealth Trading Bank of Australia	
Commonwealth Land - Commonwealth Trading Bank of Australia [12533]	NSW
Commonwealth Land - Commonwealth Trading Bank of Australia [12530]	NSW
Communications, Information Technology and the Arts - Australian Postal Corporation	
Commonwealth Land - Australian Postal Commission [12532]	NSW
Communications, Information Technology and the Arts - Telstra Corporation Limited	
Commonwealth Land - Australian Telecommunications Commission [12531]	NSW
Commonwealth Land - Australian Telecommunications Commission [12537]	NSW
Commonwealth Land - Australian Telecommunications Commission [12535]	NSW
Commonwealth Land - Australian Telecommunications Commission [12534]	NSW
Defence	
Defence - MUSWELLBROOK GRES DEPOT [11194]	NSW
Defence - Defence Housing Authority	
Commonwealth Land - Defence Housing Authority [15955]	NSW
Unknown	
Commonwealth Land - [14106]	NSW

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Muswellbrook Post Office	NSW	Listed place

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area overfly marine area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State
North East NSW RFA	New South Wales

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Mount Pleasant Optimisation Project	2020/8735		Assessment
Muswellbrook Solar Farm	2022/09303		Assessment
Controlled action			
Bowmans Creek Wind Farm	2020/8631	Controlled Action	Assessment Approach
Continuation of Bengalla Mine	2012/6378	Controlled Action	Post-Approval
Mount Pleasant Project	2011/5795	Controlled Action	Post-Approval
Mt Arthur Coal Extension Project Hunter Valley NSW	2011/5866	Controlled Action	Post-Approval
Queensland Hunter Gas Pipeline, approximately 825 km in length	2008/4483	Controlled Action	Completed
Thomas Mitchell Drive Upgrade, Muswellbrook, NSW	2012/6533	Controlled Action	Completed
Not controlled action			
Clearance of 35 ha in Ravensworth State Forest for extension of Mt Owen coal mining operations	2004/1369	Not Controlled Action	Completed
clearing of GWB Woodland for residential development	2004/1771	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Construction of a new power line	2011/5930	Not Controlled Action	Completed
Dartbrook Mine Bord and Pillar Mining, Hunter Valley, NSW	2018/8295	Not Controlled Action	Completed
Extension of operations to existing Muswellbrook No 1 Open Cut mine	2002/614	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Industrial Subdivision, Thomas Mitchell Drive	2006/3097	Not Controlled Action	Completed
Ironbark Ridge Rural Residential Development	2009/5116	Not Controlled Action	Completed
Kyoto Alternative Energy Farm	2008/3979	Not Controlled Action	Completed
Queensland Hunter Gas Pipeline, approximately 833 km in length	2008/4620	Not Controlled Action	Completed
Not controlled action (particular manner)			
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval
N40-Ulan line underbridge replacement, Muswellbrook, NSW	2019/8507	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Clearing for development of rural subdivision	2009/4931	Referral Decision	Completed
Mount Pleasant Project	2010/5529	Referral Decision	Completed

Bioregional Assessments		
SubRegion	BioRegion	Website
Hunter	Northern Sydney Basin	BA website

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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APPENDIX

C

Plant community types and vegetation zones identified on the site

C.1 Plant community types and vegetation zones

PCT	VZ	Vegetation formation class	TEC status	PCT present cleared*	Description	Justification for PCT selection
PCT 3431 **Central Hunter Ironbark Grassy Woodland**	1	Dry Sclerophyll Forests (shrub/grass sub-formation)/ Hunter-Macleay Dry Sclerophyll Forests	Central Hunter Grey Box—Ironbark Woodland (BC Act) EPBC Act listed: Central Hunter Valley Eucalypt Forest and Woodland	86.47	Grassy woodland to open forest found on the lower, undulating areas of the Site. Highly disturbed and exposed to grazing. Abundant regrowth of ironbarks, however large hollow-bearing trees are scattered throughout. Upper Stratum – 8 m to 20 m high with a PFC of 20% to 40%. Dominated by Eucalyptus crebra, with scattered E. tereticornis/E. blakelyi, E. moluccana, Brachychiton populneus and Angophora floribunda. Mid Stratum – 1 m to 5 m high with a PFC of <1% to 40%. Dominated by Notelaea macrocarpa, Bursaria spinosand Acacias (A. paradoxa, A. implexa and A. falcata), with some scattered Breynia oblongifolia, Allocasuarina luehmannii and Myoporum montanum. Ground Stratu- <1 m high with a PFC of 20% to 70%. Dominated by Microlaena stipoides, Dichelachne micrantha, Sporobolus creber, Austrostipa scabra and Chrysocephalum apiculatum. Other species include Chloris ventricosa, Austrostipa verticillate, Rytidosperma sp., Dichondra repens, Glycine sp., Lomandra longifolia, Cheilanthes sieberi and Lepidosperma laterale. Exotic species are abundant in some areas, such as Lolium perenne, Paspalum dilatatum, Hordeum sp., Bromus sp., Plantago lanceolata, Verbena bonariensis and Senecio madagascariensis.	PCT 3120 has been mapped widely in the survey area by the NSW State Vegetation Type Map (Trees Near Me NSW). The community fits well with PCT 3431 as it contains a high number of diagnostic species particularly in the canopy and shrub layer (including Eucalyptus crebra, E. tereticornis/E. blakelyi, E. moluccana, Brachychiton populneus, Angophora floribunda, Notelaea macrocarpa, Bursaria spinosa, Acacia paradoxa, A. implexa, A. falcata, Breynia oblongifolia, Allocasuarina luehmannii, Myoporum montanum). PCT 3314 Central Hunter Slopes Grey Box Forest and PCT 3525 Upper Hunter Box-Blakley's Red Gum Grassy Forest were also considered, however the heavy dominance of E. crebra and the location of the community on the undulating floor of the landscape (rather than steeper slopes on which PCT 3314 and PCT 3525 generally occur) made PCT 3431 a better fit. Note that in the lower lying riparian areas of the western portion of the survey area, the abundance of red gums increases. It is possible that these areas are becoming ecotonal with a riparian red gum community (such as PCT 4089 Namoi-Upper Hunter River Red Gum Forest which has been mapped in the area by the NSW State Vegetation Type Map (Trees Near Me NSW). Further investigation may be required to confirm this.

PCT	VZ	Vegetation formation class	TEC status	PCT present cleared*	Description	Justification for PCT selection
						
PCT 3525 **Upper Hunter Box-Blakley's Red Gum Grassy Forest**	1	Dry Sclerophyll Forests (shrub/grass sub-formation)/ North-west Slopes Dry Sclerophyll Woodlands	No associated TEC	58.34	Tall open forest on the steep slopes and hills of Bells Mountain. Large hollow-bearing trees are abundant. Upper Stratum – 20 m to 30 m high with a PFC of 25% to 40%. Dominated by a mix of *Eucalyptus moluccana / E. albens, E. tereticornis/blakelyi, E. crebra, E. punctata* and *E. laevopinea*., with scattered *Brachychiton populneus* and Angophora floribunda. The abundance/presence of *E. crebra, E. punctata, E. laevopinea, B. populneus and A.floribunda* varies but *E. moluccana/E. albens and E. tereticornis/E. blakelyi* are consistently present throughout. were also occasionally observed. Mid Stratum – 1 m to 8 m high with a PFC of 5% to 60%. Often dominated very heavily with Olearia elliptica. Other species observed include *Notelaea macrocarpa, Pittosporum undulatum, Bursaria spinosa, Ficus rubiginosa, Allocasuarina torulosa, Acacias (A. paradoxa, A. implexa and A. falcata), Persoonia linearis, Myoporum montanum, Breynia oblongifolia, Teucrium junceum, Denhamia silvest*ris and *Myrsine variabilis*. Several areas contain dense viney cover of Passiflora herbertiana. Ground Stratum - <1 m high with a PFC of 5% to 80%. Dominated by a mix of grasses (*Microlaena stipoides, Dichelachne micrantha, Chloris ventricosa, Austrostipa scabra, Rytidosperma sp., Echinopogon ovatus*) and forbs (*Geranium solanderi, Swainsona*	PCT 3525 has been mapped widely in the survey area by the NSW State Vegetation Type Map (Trees Near Me NSW). The community fits well with PCT 3525 as it contains a high number of diagnostic species (including *Eucalyptus moluccana/E. albens, E. tereticornis/blakelyi, E. crebra, E. punctata, E. laevopinea., Brachychiton populneus and Angophora floribunda, Notelaea macrocarpa, Pittosporum undulatum, Bursaria spinosa, Ficus rubiginosa, Allocasuarina torulosa, Acacias (A. paradoxa, A. implexa and A. falcata), Persoonia linearis, Myoporum montanum, Breynia- oblongifolia, Teucrium junceum, Denhamia silvestris and Myrsine variabilis and Passiflora herbertiana. E. laevopinea* becomes dominant in an area of the community on the Bells Mountain hilltop. The possibility of this area being PCT 3354 Liverpool Range Box-Silvertop Stringybark

PCT	VZ	Vegetation formation class	TEC status	PCT present cleared*	Description	Justification for PCT selection
					galegifolia, Dichondra repens, Galium leptogonium, Hibbertia obtusifolia, Asperula conferta, Wahlenbergia stricta, Solanum brownii, Euchiton sphaericus Vittadinia cuneata Einadia sp., Pomax umbellata). Desmodium gunnii, Lomandra longifolia, Cheilanthes sieberi., Lepidosperma laterale were also observed. 	Forest was explored. However, it was concluded that these areas would still be a better fit for PCT 3525, due to the presence of E. punctata (which does not typically occur in PCT 3354). It is also noted that *E. laevopinea* also commonly occurs in PCT 3525. In some areas (particularly the steep areas and areas closer to dry rainforest gullies) the community displays some mesic elements (such as vine thickets of *Passiflora herbertian*a and species such as *Alectryon subcinereus* and Ficus *rubignosa* in the mid stratum). These ecotonal areas were still concluded to be PCT 3525 due to the sclerophyll canopy.
PCT 3525 **Upper Hunter Box-Blakley's Red Gum Grassy Forest**	2	Dry Sclerophyll Forests (shrub/gras sub-formation) / North-west Slopes Dry Sclerophyll Woodlands	No associated TEC	58.34	Regrowth woodland/open forest on the Bells Mountain hilltop. There are occasional small hollows in small dead trees. Upper Stratum – 5 m to 15 m high, with a PFC of 30%. Dominated almost entirely with *Eucalyptus tereticornis/E. blakelyi,* with only occasional *E. moluccana/E. albens, E. laevopinea, E. crebra* and *Brachychiton populneus.* Mid stratum – 1 m to 3 m high, with a PFC of 5% to 50%. Dominated almost entirely by Olearia elliptica, with some emergent canopy species. Ground Stratum - <1 m high with a PFC of 60%. Dominated by a mix of *Dichelachne micrantha, Dichondra repens, Swainsona galegifolia, Austrostipa scabra, Wahlenbergia stricta, Rytidosperma sp., Austrostipa sp., Anisopogon avenaceus*.	This community is highly disturbed, having been previously cleared. The regrowth canopy is dominated heavily by *Eucalyptus tereticornis/E. blakelyi*. It was concluded that the community was likely to be regrowth PCT 3525 due to the additional presence of *E. moluccana/E. albens, E. laevopinea, E. crebra and Brachychiton populneus.*

PCT	VZ	Vegetation formation class	TEC status	PCT present cleared*	Description	Justification for PCT selection
						
PCT 796 **Derived grassland of the NSW South Western Slopes Slopes**	1	Grasslands / Western Slopes Grasslands	PCT 796 is associated with BC Act and EPBC Act listed TEC, White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland, however the Site's derived grassland would not be commensurate with the TEC as it is derived from PCT 3525 or PCT 3431	58.34	This community includes any areas of derived grassland within the survey area. These grasslands are generally dominated by native species, including *Bothriochloa macra, Chloris truncata, Sporobolus creber, Elymus scaber, Microlaena stipoides, Panicum effusum and Chrysocephalum apiculatum.* There were several exotic species present, including *Lolium perenne, Paspalumdilatatum, Hordeum sp., Bromus sp., Plantago lanceolata, Verbena bonariensis and Senecio madagascariensis.*	PCT 796 has been mapped across the survey area and wider area in regional vegetation mapping for the Upper Hunter (Vegetation_SVTM_UpperHunter_v1). The community contains several diagnostic species for PCT 796, including *Chloris truncata, Elymus scaber, Microlaena stipoides, Panicum effusum and Chrysocephalum apiculatum*.

PCT	VZ	Vegetation formation class	TEC status	PCT present cleared*	Description	Justification for PCT selection
					 	

PCT	VZ	Vegetation formation class	TEC status	PCT present cleared*	Description	Justification for PCT selection
PCT 3120 **Hunter-Peel Ranges Dry Rain forest Rainforest**	1	Rainforests / Dry Rainforests	BC Act listed: Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions	48.28	A small area of this community occurs downslope of the projectproject footprint, on a steep slope on Bells Mountain. This area wasn't surveyed closely due to the steep terrain; however, it was observed to be dominated by *Ficus rubignosa, Notelaea macrocarpa, Melia azedarach, Pittosporum undulatum, Alectryon subcinereus, Olearia elliptica* and dense vine thickets of *Passiflora herbertiana.*  	PCT 3120 has been mapped on Bells Mountain by the NSW State Vegetation Type Map (Trees Near Me NSW). The community fits with the Dry Rainforest vegetation class and matches well with the description in the PCT 3120 profile (e.g., occurring on steep terrain, comprised of a mosaic of surface rocks and boulders, rarely with emergent Eucalypts). The community also contains several diagnostic species for PCT 3120, *including Ficus rubignosa, Notelaea macrocarpa, Melia azedarach, Pittosporum undulatum Alectryon subcinereus and Olearia elliptica.* It is likely that Bells Mountain contains a mosaic of different dry rainforest PCTs, such as PCT 3401 Upper Hunter Sheltered Viney Shrub Forest, PCT 3076 Hunter Valley Whalebone Dry Rainforest and PCT 3086 Lower North Hinterland Riparian Dry Rainforest, which have also been mapped on Bells Mountain by the NSW State Vegetation Type Map (Trees Near Me NSW). More detailed surveys of the dry rainforest in the survey area would be beneficial to confirm the PCT more confidently.

* PCT percent cleared refers to the % of the PCT that has been cleared in NSW, according to the PCT profile contained in BioNet VIS.

APPENDIX

D

SIA Scoping Worksheet

PROJECT ACTIVITIES	CATEGORIES OF SOCIAL IMPACTS	POTENTIAL IMPACTS ON PEOPLE		PREVIOUS INVESTIGATION OF IMPACT		CUMULATIVE IMPACTS		ELEMENTS OF IMPACTS - Based on preliminary investigation					ASSESSMENT LEVEL FOR EACH IMPACT				PROJECT REFINEMENT	MITIGATION / ENHANCEMENT MEASURES
Which **project activity / activities** could produce social impacts ?	what **social impact categories** could be affected by the project activities	What impacts are likely, and what concerns/aspirations have people expressed about the impact? Summarise how each relevant stakeholder group might experience the impact. **NB. Where there are multiple stakeholder groups affected differently by an impact, or more than one impact from the activity, please add an additional row.**	Is the impact expected to be **positive or negative**	Has this impact previously been investigated (on this or other project/s)?	If "yes - this project," briefly describe the previous investigation. If "yes - other project," identify the other project and investigation	Will this impact combine with others from this project (think about when and where), and/or with impacts from other projects (cumulative)?	If yes, identify which other impacts and/or projects	Will the project activity (without mitigation or enhancement) cause a material social impact in terms of its: You can also consider the various magnitudes of these characteristics					Level of assessment for each social impact	What methods and data sources will be used to investigate this impact?			Has the project been refined in response to preliminary impact evaluation or stakeholder feedback?	What **mitigation / enhancement measures** are being considered?
								extent i.e. number of people potentially affected?	**duration** of expected impacts? **(i.e. construction vs operational phase)**	**intensity** of expected impacts i.e. scale or degree of change?	**sensitivity** or vulnerability of people potentially affected?	**level of concern/interest** of people potentially affected?		Secondary data	Primary Data - Consultation	Primary Data - Research		
Upper reservoir construction	community	**Reduced amenity associated with noise and air emissions;**	Negative	**Yes - this project**	SEE for geotechnical investigations included assessment of impacts of noise emissions	Yes	Muswellbrook Solar Farm and New England Highway Muswellbrook Bypass projects (construction)	Yes	Yes	Yes	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	No	Standard construction management measures to mitigate and manage emissions.
Upper reservoir operation	way of life	Reduced visual amenity for receivers in line of sight of upper reservoir wall	Negative	**No**		No	Not required	Yes	Yes	Yes	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	No	Feasibility of surface treatments to reduce visual appearance of dam wall to be investigated during detailed design.
Construction: traffic impacts to residents and businesses	way of life	Disruptions to way of life for individuals and the community from temporary disruptions to road users	Negative	**No**		Yes	Muswellbrook Coal Mine closure and rehabilitation, Muswellbrook Solar Farm, New England Highway Muswellbrook Bypass, Muswellbrook Hospital Redevelopment Stage 3 and Muswellbrook Battery Energy Storage System projects (construction)	Yes	Yes	Yes	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	No	Preparation and implementation of construction traffic management; to include notification processes to keep community informed and minimise impacts on amenity.
Construction: workforce requirements	livelihoods	Benefits for local construction-related businesses, such as construction recruitment agencies, construction companies and resource suppliers. Benefits for local businesses such as accommodation providers	Positive	**No**		Yes	Muswellbrook Solar Farm, New England Highway Muswellbrook Bypass, Muswellbrook Hospital Redevelopment Stage 3, Muswellbrook Battery Energy Storage, Bowmans Creek Wind Farm projects and the Mount Pleasant Mine expansion	Yes	Yes	Yes	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	No	Further community consultation to be carried out during EIS preparation.
Operation: increased reliability for energy demands from the NSW electricity grid	way of life	General positive benefit for the NSW community through increased energy reliability. Project would also have environmental benefits related to reducing demand on fossil fuel-based sources of energy and associated reductions in other greenhouse gas emissions which would provide societal benefits.	Positive	**No**		No	Not required	Yes	Yes	Unknown	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	No	Nil at this stage

APPENDIX

E

Stakeholder engagement log

(Redacted from public version)


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