

Lake Lyell Geotechnical Program

Statement of Environmental Effects

Prepared for EnergyAustralia
March 2022





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Lake Lyell Geotechnical Program

Statement of Environmental Effects

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22 March 2022

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22 March 2022

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Executive Summary

EnergyAustralia (EA) is investigating the feasibility of developing a 335 megawatt (MW) Pumped Hydro Energy Storage (PHES) at Lake Lyell approximately 15 km south of the existing Mount Piper Power Station, within the Lithgow Local Government Area (LGA). The PHES Project is currently in concept form. To support the ongoing development of the Project, EA needs to complete a geotechnical program.

The geotechnical program involves the installation of nine boreholes from seven drill pad locations, a 2.6 km seismic survey, and access track establishment on land north of the Farmers Creek arm of Lake Lyell (the 'proposed development'). The land is wholly owned by EA and is zoned SP2 Infrastructure (Electricity Generating Works). The site is characterised by steep, vegetated terrain with limited previous disturbance associated with existing access tracks and the impoundment of the Coxs River to create Lake Lyell. Further description of the site is provided in Section 2.

The approach in assessing the environmental impacts from the proposed development has been to establish a boundary around the borehole sites and new access track, referred to as an 'investigation envelope' to allow for potential environmental impacts to be identified, assessed and avoided where possible. The final disturbance footprint for the proposed development within the investigation envelope will not exceed 0.97 ha; the location of the disturbance footprint may vary within the investigation envelope to minimise potential environmental impacts where practical. This is further detailed in Section 3.

This Statement of Environmental Effects (SEE) has been prepared to support a development application (DA) to Lithgow City Council as the consent authority, under Part 4 of the *Environmental Planning and Assessment Act 1997* (EP&A Act). This SEE provides a full analysis of all environmental, physical and social implications of the proposed development. Supplementary information is also provided in relation to a controlled activity approval for works on waterfront land. Further information on relevant legislation and approvals required for the proposed development is provided in Section 4.

Potential impacts from the proposed development have been assessed in Section 5 (and supporting studies in Appendix B, Appendix C and Appendix D) and include:

- Direct and indirect biodiversity impacts associated with clearing of native vegetation, including a community that may align to the Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions endangered ecological community (EEC).
- Potential disturbance to Aboriginal cultural heritage, however the site is assessed as having a low likelihood of archaeological materials present within the landscape.
- Potential for sedimentation and water quality impacts, as well as consideration of flooding, primarily with regard to works occurring on waterfront land adjacent to Farmers Creek.
- Other impacts expected to be minor and reasonably mitigated such as traffic, air and noise, visual amenity, public safety, social and economic and waste management.

The proposed development is considered to provide a low residual risk to the local environment for environmental aspects and the community.

Potential impacts from the proposed development are primarily temporary in nature, with the program of works expected to take between 3 and 6 months. Up to 20 workers are expected during peak works, and this is not expected to place additional pressure on the external road network or the local community.

Management measures have been identified in Section 6 to respond to the potential impacts of the proposed development. These measures will be incorporated into a Construction Environment Management Plan (CEMP) to be prepared for the proposed development and implemented accordingly.

EA and EMM recommend that Lithgow City Council approve the proposed development for the geotechnical program to be carried out within a defined investigation envelope to inform the overall feasibility of a PHES Project at this site. EA will continue to consult with Lithgow City Council and relevant stakeholders in ensuring the proposed development can proceed subject to the conditions of consent.

Table of Contents

Executive Summary	ES.1
1 Introduction	1
1.1 Overview	1
1.2 Assessment process	1
1.3 Property and ownership details	1
1.4 Applicant details	2
1.5 Terms used in this report	2
2 Description of the Site	4
2.1 Site overview	4
2.2 Land zoning	4
2.3 Current and previous uses	4
2.4 Site characteristics	4
2.5 Site analysis – suitability of the site	7
3 Description of the proposed development	10
3.1 Disturbance footprint	10
3.2 Investigation envelope	10
3.3 The proposed development	12
3.4 Workforce and accommodation	19
3.5 Water requirements and management	19
3.6 Waste management	19
3.7 Duration and timing	20
4 Strategic and statutory context	21
4.1 Need for the proposed development	21
4.2 NSW planning framework	21
4.3 Commonwealth legislation	30
4.4 Consultation	31
5 Likely impacts on the environment	32
5.1 Biodiversity	32
5.2 Aboriginal heritage	37
5.3 Surface water, flooding and drainage	40

5.4	Groundwater	43
5.5	Soils and land use	44
5.6	Traffic and access	45
5.7	Air and noise	46
5.8	Historic heritage	47
5.9	Visual amenity	48
5.10	Public safety	49
5.11	Social and economic	50
5.12	Waste	50
6	Proposed environmental management measures	51
7	Conclusion	58
8	References	59

Appendices

Appendix A Design drawings and site plans

Appendix B Flora and Fauna Assessment

Appendix C Aboriginal heritage due diligence

Appendix D Supplementary information for controlled activity approval

Tables

Table 1.1	Property details	2
Table 3.1	Disturbance locations and associated footprint	10
Table 4.1	Consistency of relevant State policies and plans	28
Table 4.2	Assessment of the proposed development against the DCP	29
Table 4.3	Matters of National Significance results	31
Table 5.1	Vegetation types impacted within the disturbance footprint.	35
Table 5.2	AHIMS extensive search results	38
Table 6.1	Summary of proposed environmental management measures	52

Figures

Figure 1.1	Overview of proposed development	3
Figure 2.1	Land zoning	8

Figure 2.2	Topography	9
Figure 3.1	Survey approach using the investigation envelope	11
Figure 3.2	Access route to BH101-BH106	13
Figure 3.3	Access route to BH107/108 by barge	14
Figure 3.4	Schematic cross-section with proposed borehole locations and targeted geology (source: Arup 2021)	17
Figure 5.1	Plant community types within the investigation envelope	33
Figure 5.2	Archaeological potential of the investigation envelope	39
Figure 5.3	Hydrological context	41
Figure 5.4	Approximate location of the investigation envelope outlined in red on a historical parish map dating to 1892 (source: HLRV)	48

1 Introduction

1.1 Overview

EnergyAustralia (EA) is investigating the feasibility of developing a 335 megawatt (MW) Pumped Hydro Energy Storage (PHES) at Lake Lyell approximately 15 kilometres (km) south of the existing Mount Piper Power Station, within the Lithgow Local Government Area (LGA). The PHES Project is currently in concept form. To support and inform the feasibility of the PHES, a geotechnical program needs to be completed.

The geotechnical program would provide an understanding of the local geological conditions to assess the technical feasibility of a PHES. It should also identify any potential engineering hazards that would be addressed during the detailed design and construction of any future PHES.

Geotechnical investigations are proposed within a 0.97 ha disturbance footprint, approximately 3.5 km southwest of Lithgow. The geotechnical investigations are referred to as the 'proposed development'.

The proposed development would consist of the following:

- nine boreholes drilled from seven drill pads;
- 2.6 km of low-impact seismic refraction survey;
- clearing and establishment of approximately 1.3 km of a new vehicle track to enable access to geotechnical investigation locations; and
- repairing existing vehicle tracks and fire trails where necessary to ensure safe access.

An overview of the proposed development is shown in Figure 1.1.

1.2 Assessment process

EA is the applicant for the proposed development. The proposed development requires assessment and approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

EMM Consulting Pty Ltd (EMM) has prepared this Statement of Environmental Effects (SEE) on behalf of EA to accompany a development application (DA) to Lithgow City Council.

1.3 Property and ownership details

The proposed development is located on the land parcel identified in Table 1.1. The land is wholly owned by EnergyAustralia NSW Pty Ltd.

Table 1.1 **Property details**

Lot	DP	Tenure/ownership	Sites on property
103	DP751651	EnergyAustralia NSW Pty Ltd	BH101, BH102, BH103, BH104, BH105, BH106, BH106A, BH107, BH108, access road

1.4 Applicant details

EA is the applicant for the proposed development.

EnergyAustralia NSW Pty Ltd

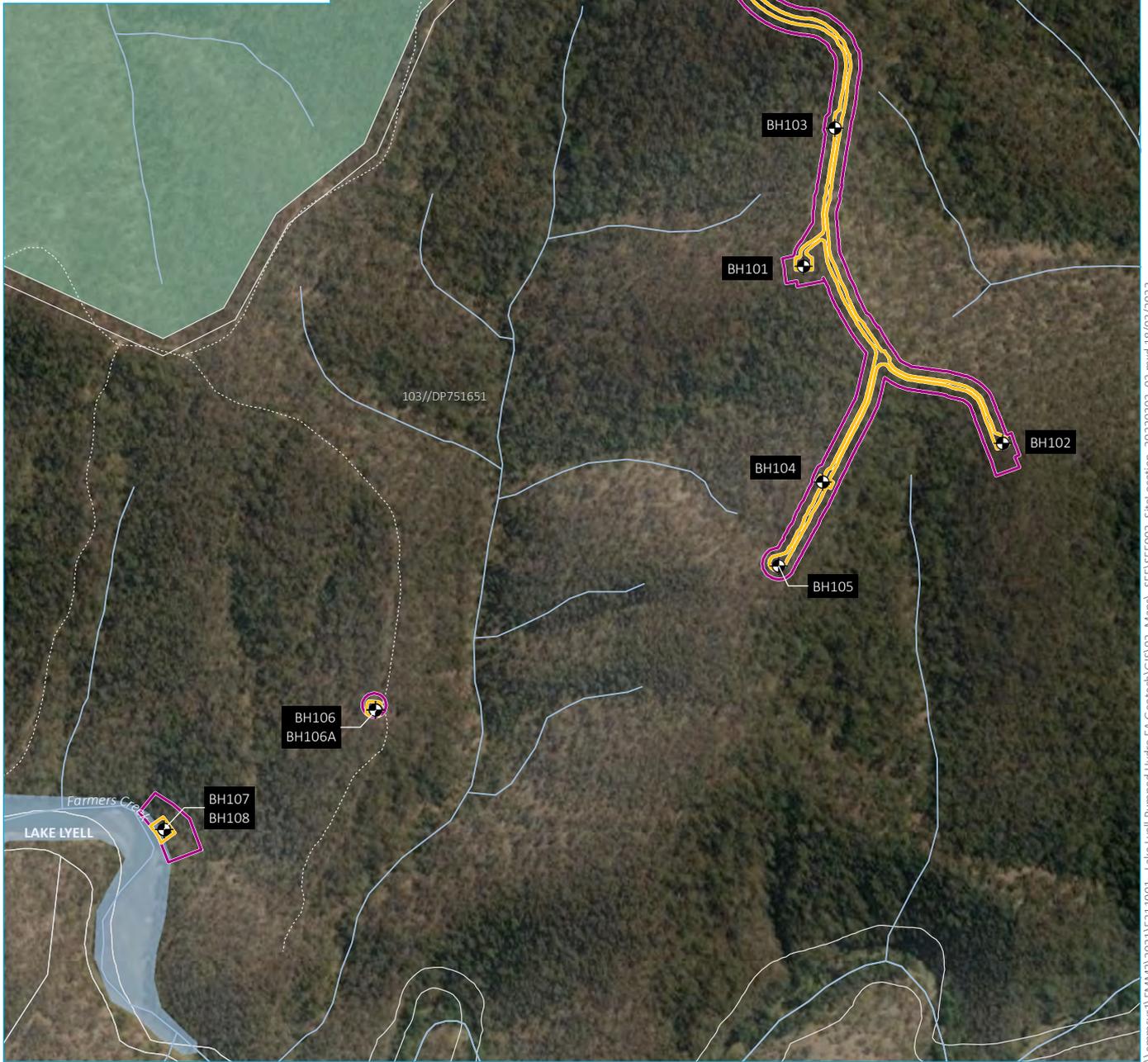
Level 19, Two Melbourne Quarter, 697 Collins Street, Docklands

Victoria, 3008

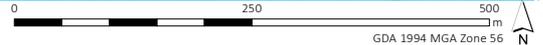
1.5 Terms used in this report

Table below defines the common terms used in this report.

Term	Description
Disturbance footprint	The area directly impacted by the proposed development.
Investigation envelope	The area assessed to allow refinement of geotechnical locations and/or access to further avoid or minimise environmental or engineering constraints that may be identified on site.
Proposed development	As described under Section 3 for the geotechnical investigations including boreholes, seismic survey and associated access.
PHES	Pumped Hydro Energy Storage.
The site	A term used to generally refer to the location on which both the investigation envelope and disturbance footprint exist.



Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DFSI (2017); GA (2011)



KEY

- Investigation envelope
- Indicative disturbance footprint
- + Borehole
- Vehicular track
- Named watercourse
- Named waterbody
- Cadastral boundary
- NPWS reserve

INSET KEY

- Major road
- NPWS reserve
- State forest

Overview of the proposed development

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 1.1



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2 Description of the Site

2.1 Site overview

The site refers to the subject land and an approximate 1km buffer around the investigation envelope used to characterise the existing environment. The site is located in the Hill End subregion of the South Eastern Highlands Bioregion in NSW (NSW Parks and Wildlife Service 2003). The Hill End subregion is primarily characterised by plateaux surrounded by steep hilly and mountainous edges, with the channels of the Macquarie and Turon Rivers deeply entrenched. The site is located in the south-eastern corner of the subregion, close to the interface of the Hill End and Bathurst subregion boundaries. The broad locale is characterised by steep hills and plateaux surrounding Lake Lyell. It's located adjacent to Marrangaroo National Park. The proposed development is situated within undeveloped lots currently owned and managed by EA, north of the Farmers Creek arm of Lake Lyell.

2.2 Land zoning

The land subject to the proposed development is located wholly on land zoned SP2 Infrastructure (Electricity Generating Works), as shown in Figure 2.1. Surrounding land uses include SP2 Infrastructure (Lake Lyell), RU2 Rural Landscape (Mount Walker Road and trig station) and C1 National Parks and Nature Reserves (Marrangaroo National Park).

2.3 Current and previous uses

Due to steep terrain, the site is unlikely to have been extensively cleared or used for farming, grazing or residential purposes. Lake Lyell was originally built in 1982 by Delta Electricity to provide water security for the Mount Piper and Wallerawang Power Stations. A review of historical aerial images centred on the site show that other than the flooding of Coxs River and Farmers Creek to create Lake Lyell, as well as the clearance of swathes of vegetation to create access tracks, the site has not been subject to any major disturbances from land clearing activities.

The investigation envelope is on private land adjacent Lake Lyell which is owned and managed by EA. The other predominant land uses in the surrounding area include national parks and reserves, agriculture, tourism, recreational activities and rural residential development.

Other than the proposed development there are no DAs for any land use or developments within the investigation envelope.

2.4 Site characteristics

2.4.1 Topography, soils and land capability

The dominant geology of the site is the Lambie Group sandstone, siltstone and mudstone deposited in the Late Devonian period (~360-380Ma).

The topography of the site and surrounding region is characterised by narrow rounded crests on steep to very steep slopes, with slopes greater than 25% and local relief between 40–200 m. Elevation ranges from 780–1,190 m (at the Mount Walker Trig station) as shown on Figure 2.2. Rock outcrops, as well as narrow, deeply incised valleys, are common. The steep terrain and incised valleys can be seen in Photograph 2.1.

The Soil Landscapes of Central and Eastern NSW database, mapped by the former Department of Planning, Industry and Environment (DPIE), places the site within the Mount Walker Soil Landscape (DPIE 2020). The Mount Walker Soil Landscape topsoils are moderately to highly susceptible to sheet erosion.

Based on eSPADE modelling (DPIE v2.1) most of the soils within the investigation envelope are kandosols, likely to have moderately low inherent fertility and of Class 7 modelled land and soil capability (LSC), being extremely severe limitations for most land uses. Class 7 land includes slopes of 33%–50% and includes areas with extreme soil erodibility.



Photograph 2.1 Steep terrain within and adjacent to investigation envelope

2.4.2 Water catchment

The investigation envelope is located within the upper Coxs River catchment, which forms part of the greater Hawkesbury-Nepean catchment. Farmers Creek is located adjacent to the investigation envelope and is a south-west flowing tributary of the Coxs River. Farmers Creek at the site is part of Lake Lyell, an artificially created waterbody, and as such the creek is also considered to have been modified from its natural form. In the area surrounding the investigation envelope, the riparian vegetation of Farmers Creek and its tributaries is generally in good condition, with relatively minor weed infestation and minimal vegetation clearing (see Photograph 2.2).



Photograph 2.2 Farmers Creek arm of Lake Lyell

2.4.3 Existing infrastructure

There is minimal existing infrastructure located within or in the vicinity of the investigation envelope. The majority of the investigation area comprises natural elements except for the following infrastructure:

- Mount Walker Road to the north of the investigation envelope and the main access to the site. Mount Walker Road access to the site is shown in Photograph 2.3;
- Mount Walker trig station, located along Mount Walker Road to the north-east of the site;
- transmission towers and easements, located to the east and west of the site; and
- Lake Lyell, an impounded lake and providing water access to the investigation envelope.

There are no utilities or other services located within the investigation envelope.

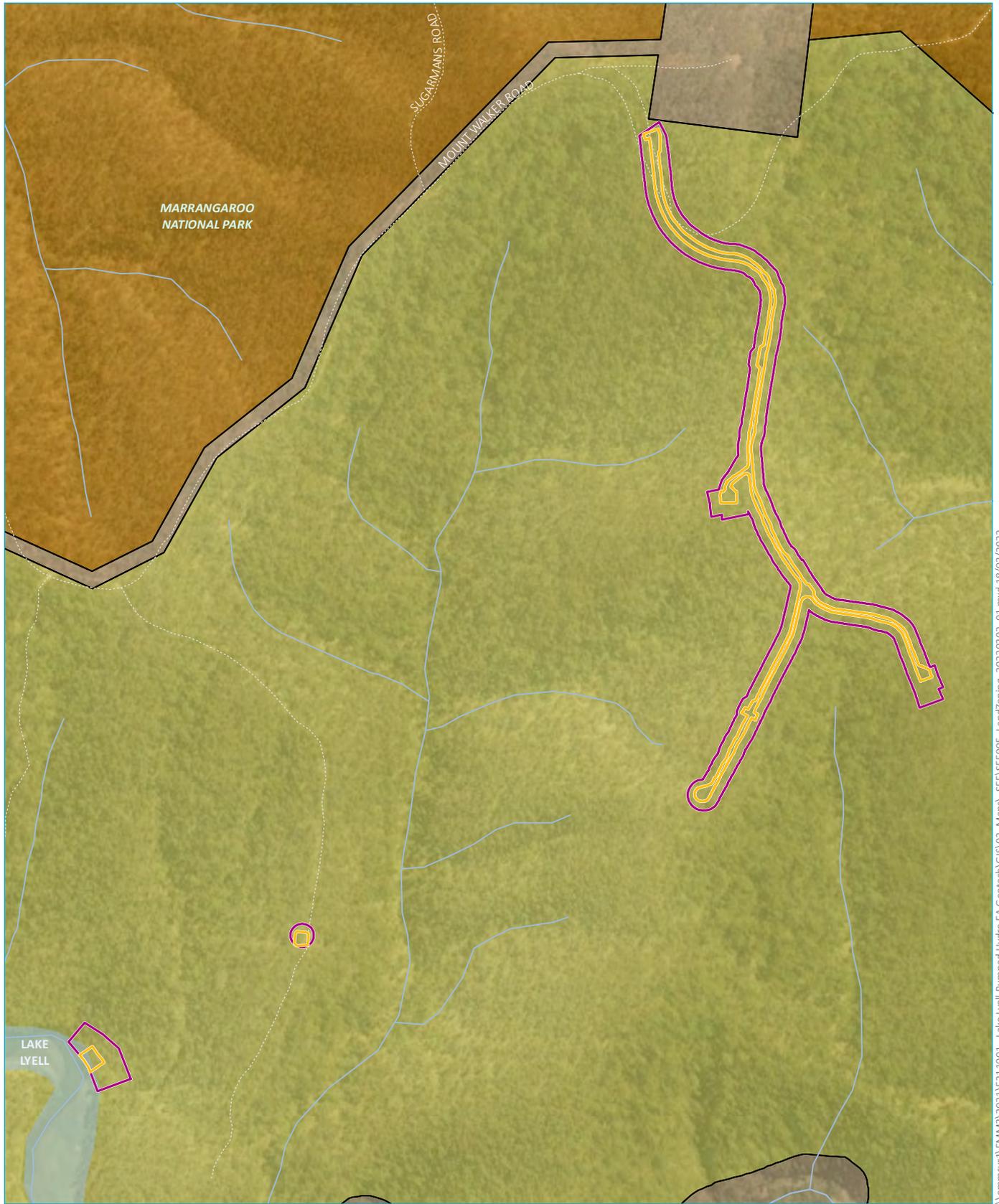


Photograph 2.3 Mount Walker Road within investigation envelope

2.5 Site analysis – suitability of the site

The site is considered to be suitable to support the proposed development as:

- the proposed development constitutes an ancillary development to electricity generating works, a deemed development type which is permitted in SP2 zone (outlined further in Section 4.2.1);
- the proposed development comprises a temporary package of works which would not create lasting amenity impacts or other land use conflicts within the locality; and
- the proposed development can be undertaken with minimal environmental impacts (outlined in Section 5), with the implementation of mitigation measures (outlined in Section 6).



Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DPIE (2022); DFSI (2017)



KEY

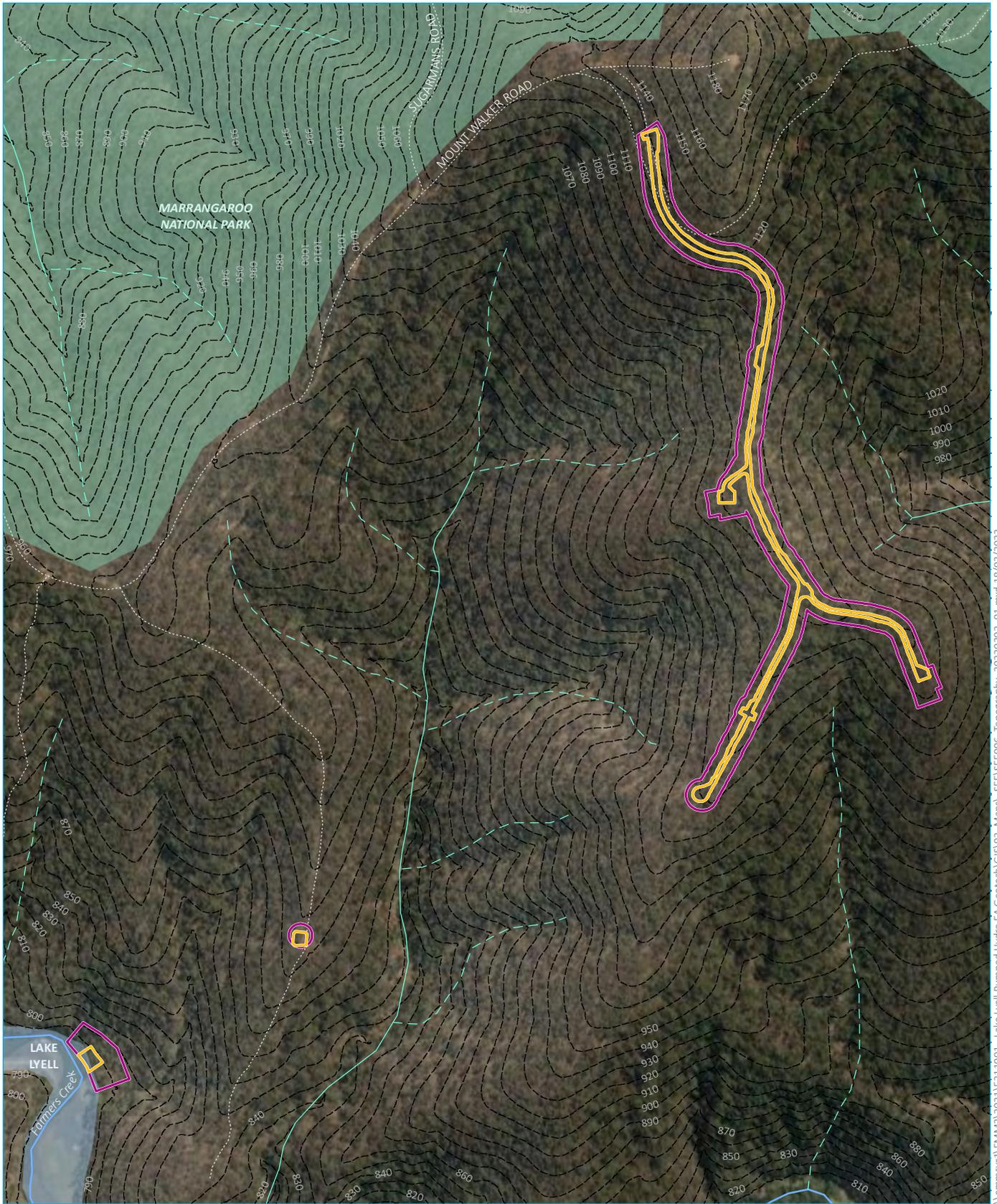
- | | |
|--|---|
|  Investigation envelope |  C1 - National Parks and Nature Reserves |
|  Indicative disturbance footprint |  RU2 - Rural Landscape |
|  Vehicular track |  SP2 - Infrastructure |
|  Named waterbody | |

Land zoning

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 2.1



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Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DPI (2015); DFSI (2017)



KEY

- | | |
|--|---|
|  Investigation envelope |  Strahler stream order |
|  Indicative disturbance footprint |  1st order |
|  Vehicular track |  2nd order |
|  10 m contour |  4th order |
|  Named waterbody | |
|  NPWS reserve | |

Topography

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 2.2



3 Description of the proposed development

3.1 Disturbance footprint

The disturbance footprint is the area that would be directly impacted via ground disturbance. The disturbance footprint is approximately 9,681 m² (0.97 ha) with impacts at each of the disturbance locations described in Table 3.1.

Table 3.1 Disturbance locations and associated footprint

Site/bore reference	Target depth below ground level	Easting	Northing	Maximum area of disturbance required (approx. incl drill pad)
BH101	65 m	229825	6290640	110 m ²
BH102	50 m	230079.4	6290412	110 m ²
BH103	80 m	229865.3	6290818	110 m ²
BH104	305 m (VWP at 100, 150, 200, 250m depths)	229849.5	6290363	110 m ²
BH105	455 m	229793.4	6290255	110 m ²
BH106	200 m	229280.2	6290069	291.5 m ²
BH106a	140 m	229280.2	6290069	
BH107	40 m	229010.9	6289917	501.7 m ²
BH108	115 m (VWP at 40m)	229010.9	6289917	
Access road	N/A	229793.4	6290255	8,337.8 m ²
Total				9,681 m²

Note: VWP – Vibrating Wire Piezometer

3.2 Investigation envelope

The disturbance footprint is the total area required to carry out the proposed development (0.97 ha). The disturbance footprint has been identified following preliminary design and engineering, desktop environmental review and field investigations. A broader ‘investigation envelope’ has been assessed to allow refinement of specific drilling locations and/or access to further avoid or minimise environmental or engineering constraints that may be identified on site.

This approach allows for sensitive environmental areas and known constraints to be avoided where possible, further reducing the environmental impact of the development.

The disturbance footprint for the proposed development within the investigation envelope (summarised in Table 3.1) will not exceed 0.97 ha; the location of the disturbance footprint within the investigation envelope may vary slightly to avoid sensitive environmental aspects if required. Figure 3.1 demonstrates this approach.

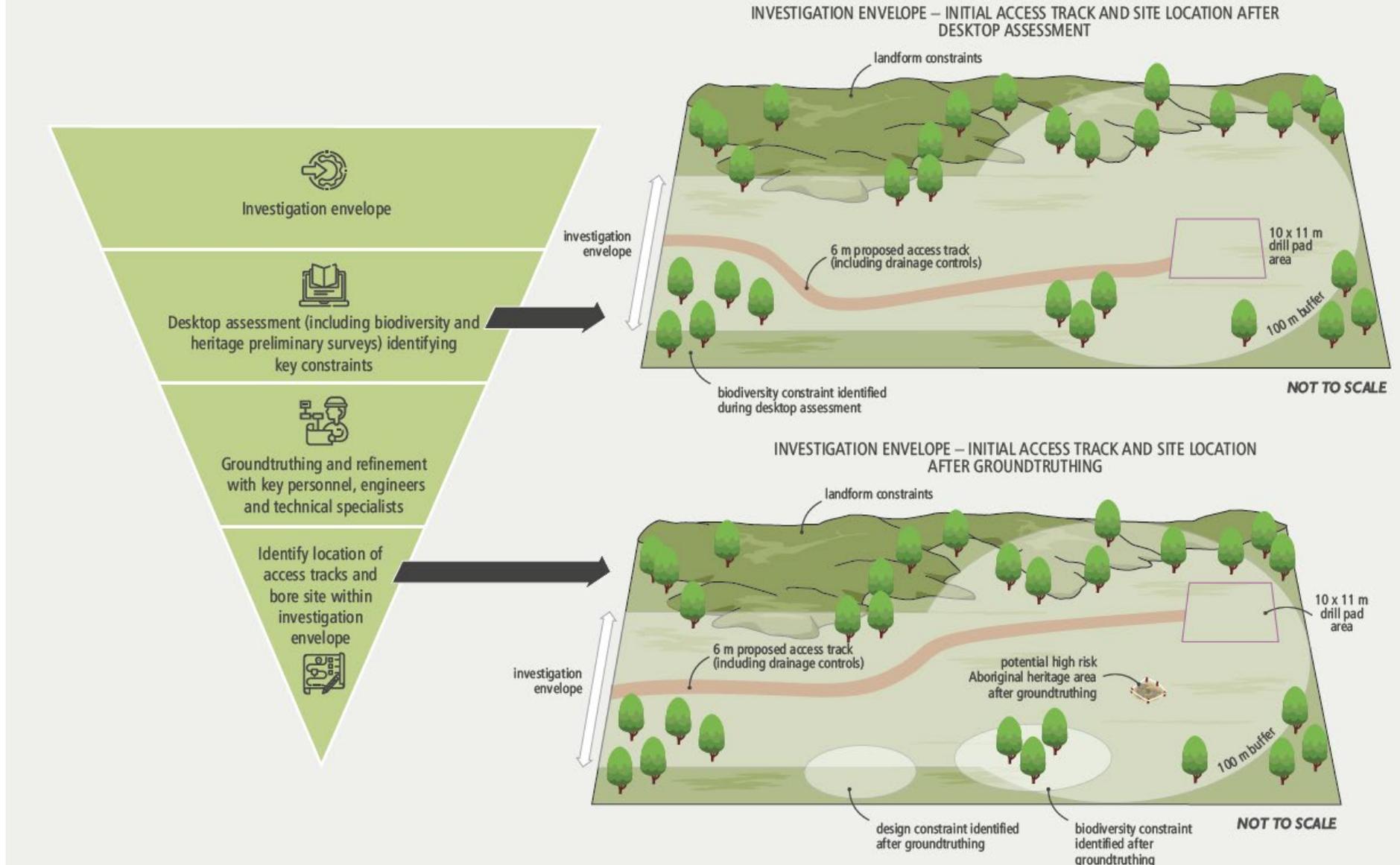


Figure 3.1 Survey approach using the investigation envelope

3.3 The proposed development

The purpose of the proposed development is to better understand ground conditions at the site, including assessing:

- surface and subsurface geological conditions;
- *in situ* geological, geotechnical and hydrogeological characteristics of the area; and
- rock characteristics to determine potential availability of suitable construction materials.

The activities to be carried out as part of the proposed development are further detailed in the following sections.

3.3.1 Access establishment

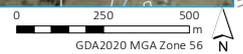
Existing site access tracks would be utilised as much as practicable and improved wherever necessary to provide safe access to the drill pads.

Site access to the proposed development would be via Mount Walker Road, in part through Marrangaroo National Park. The primary access route is from Great Western Highway and Girraween Drive near Marrangaroo. The site access route is shown on Figure 3.2 and existing road condition and traffic is discussed in Section 5.6. An alternative access route to the site is available via Sugarmans Road to the north, though this route may be restricted during high rainfall events due to the type of crossing of the Coxs River.

The site would also be accessed via water, to carry out drilling of BH107 and BH108 on the shores of Farmers Creek arm of Lake Lyell as shown in Figure 3.3.



Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DFSI (2017, 2021); GA (2011)



KEY

- Investigation envelope
- Indicative disturbance footprint
- Named waterbody
- NPWS reserve
- Borehole
- Preferred access route
- Major road
- Minor road
- Vehicular track
- Named watercourse

Access to BH101-106

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 3.2



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Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DFSI (2017)

- KEY**
- Investigation envelope
 - Indicative disturbance footprint
 - Alternate launching ramp
 - Main launching ramp
 - Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Named waterbody
 - NPWS reserve
 - State forest

Access to BH107/108 by barge

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 3.3



i Maintenance of existing access tracks

From the site access points described above, any existing access tracks between the investigation envelope and Girraween Drive would be maintained for use during the geotechnical works period. Minor disturbance to existing access tracks may be required to facilitate safe site access for workers. Examples of minor disturbance includes:

- temporary placement of clean fill material across drainage depressions to enable vehicles to safely cross without becoming bogged and causing further impacts; and
- filling in of eroded sections of the access track with clean, free draining rock fill, to facilitate safe access for vehicles.

No grading, widening or other modification of existing tracks is proposed. No vegetation clearing would be undertaken. The access route includes land owned and managed by private landholders, as well as Crown land and land managed by NPWS. These landholders may carry out works independent of the proposed development. Consultation with and consent of all relevant landowners directly impacted by the development would occur to facilitate access to the drill pads.

ii Establishing an additional access track

The establishment of a new access track to borehole locations BH101–BH105 is required. Relevant plans and drawings for the new access track is provided at Attachment A. The final location of these new access tracks would be determined as per the method outlined in Section 3.2 within the investigation envelope and would avoid identified environmental constraints (see Figure 3.1).

Approximately 1.3 km of new access track is required and would require clearing of up to a 6 m wide corridor, depending on earthworks and drainage requirements.

The new access track would be established by:

- clearing of vegetation; and where required;
- installation of drainage, erosion and sediment control structures; and
- levelling earthworks (ie, minor excavation).

Due to the topography, some cut is required from the Mount Walker Trail to establish the new access track. A mixture of cut and fill is required for the remainder of the access track. Where required to manage stormwater runoff, appropriate sediment and drainage controls would be installed (such as sediment fences, table drains, or other measures as suitable).

iii Water access

BH107 and BH108 are located on land directly adjacent to the Farmers Creek Arm of Lake Lyell. To avoid and minimise the need to clear new access tracks, these boreholes are proposed to be accessed via water. Drilling plant and equipment would be transported via barge, from an existing boat launch on Lake Lyell near the existing dam.

Two launch options are being considered, (as shown on Figure 3.3), with the main launch location being the concrete-based ramp at the southern end of Lake Lyell near the Lake Lyell camping area. An alternate, more remote option is located just over a kilometre to the north west and is also a formed concrete-based boat launch ramp. An earthen launch ramp is also located at the end of Sir Thomas Mitchell Drive (not shown on the figure) and may be considered for transport of light loads. While closer in proximity, this ramp is more limiting in terms of barge manoeuvrability and due to the shallower profile at this location may not be accessible during lower lake levels. Ultimately, the selection of the barge launch location would be determined by the contractor based on the type and size of barge acquired.

Once the barge has been launched from an existing ramp, it would navigate north across Lake Lyell in accordance with the regulations applying to the navigable waterway, including relevant speed limits and exclusion zones. In proximity to the shoreline at BH107/108, the speed of the barge would be reduced and care taken to minimise wash and turbulence to reduce potential impacts on aquatic and riparian habitat.

The barge would be required to be temporarily secured at the shoreline to BH107 and BH108 to allow plant and equipment to be transferred to land. Appropriate controls (such as placement of geotextile fabric) will be implemented to minimise impacts on the riparian habitat during the transfer.

3.3.2 Borehole drilling

Borehole drilling is required to sample lithologies and develop a more detailed geological model of the site. A total of nine boreholes are proposed for the geotechnical investigation to various target depths, to a maximum of around 455 m. Borehole drilling would include both vertical and inclined fully-cored holes (as shown in Figure 3.4).

Whilst the boreholes themselves would be small, each ~96 mm in diameter, they would require a work area, or drill pad, to be established to accommodate the drill rig and associated sampling and testing services. These drill pads would need to be a near-level surface and may, therefore, require cut and fill activities in several locations. Drill pads would measure up to a maximum of about 10 m x 11 m (110 m²). Seven drill pads are required to drill the nine boreholes.

Groundwater sampling would be attempted during drilling activities. To enhance the hydrogeological model, two of the boreholes are proposed to be installed with Vibrating Wire Piezometers (VWPs). VWPs would be installed to pick up fractured rock water levels and any upper water levels perched on residual or weathered rock surfaces.

During the coring process some drilling fluid would be used. Drilling fluid will be water-based and may include some simple, non-toxic additives, producing a benign fluid which has been used for similar applications elsewhere, eg, for water storage supply structures. Any drilling fluids used will be recovered and taken offsite for disposal at a licenced facility.

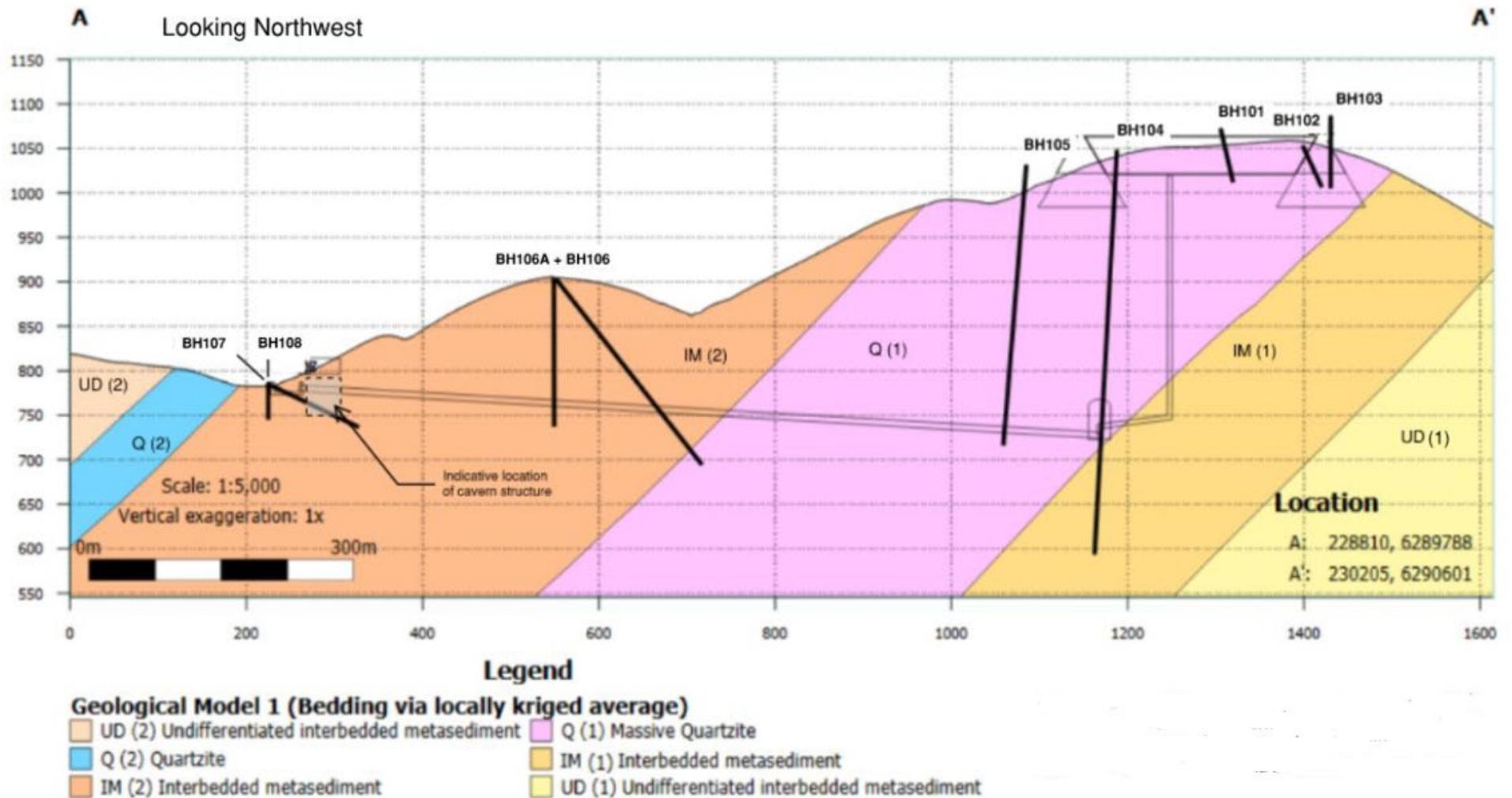


Figure 3.4 Schematic cross-section with proposed borehole locations and targeted geology (source: Arup 2021)

3.3.3 Seismic refraction survey

The purpose of the seismic refraction survey is to:

- map near-surface shear wave velocity (proxy for strength) of subsurface geological units;
- map near-surface bedrock layers and provide information on the weathering profile and strength of rock;
- identify the near-surface presence of any potential geological structures, such as faults or folds; and
- assist with assessing constructability.

The seismic survey involves the temporary installation of geophones connected via a cable and impacting a portable metal plate with a sledge hammer at a minimum interval of roughly every 5 m. No shot holes or explosives are required.

Seismic refraction survey would be undertaken on foot, with all equipment carried by hand. No ground disturbance, clearing or trimming of vegetation is proposed and as such the survey would include areas within and outside of the investigation envelope assessed in this SEE, but all contained within EA owned land.

The survey lines would be positioned to generally align with the proposed borehole locations to help inform and refine the interpretation of the geological model. The lengths of individual lines and spacing between geophones may be restricted by site constraints and configuration may be modified accordingly.

3.3.4 Services, plant and equipment

Services, plant and equipment required to undertake the proposed development and associated activities are likely to include:

- small dozer or excavator to construct the proposed access track and drill pads;
- hand and power tools for vegetation management;
- one or two drilling rigs;
- one barge for transporting a drilling rig and support equipment to and from BH107 and BH108;
- one water truck/cart for transporting water to and from the drilling activities;
- one service vehicle to remove waste from the drilling process;
- service vehicles (light 4WD vehicles) to transport operators and engineers to and from the various activities;
- mobilisation of site-based equipment likely to consist of generator, air compressor, site services and ablution facilities, containment vessels (to capture drilling fluids/drill chips); and
- wireline logging/testing vehicles with logging, testing and sampling equipment, tool kits and supplies.

A small site office is also required and would be established at the least-impactful site along the new access track, within the disturbance footprint. The site office would likely comprise a modular-type demountable.

3.3.5 Site rehabilitation

At completion of the geotechnical investigation works it is anticipated that the new access track would be retained for use by EA for future site investigations, as well as providing for additional fire trail access and fire break in the event of bushfire. No rehabilitation of the access track is therefore proposed. The access track would be managed by EA and drainage and erosion controls maintained to minimise off-site impacts.

The need for rehabilitation of drill pads would depend on whether the PHES project ultimately proceeds. If the PHES facility proceeds, all of the drill pads would be subsumed by more extensive clearing for the PHES facility development, expected to follow within 2–5 years. If the project does not appear likely to proceed, then all drill pads associated with this program can be remediated. At a minimum, drill pads will be partially rehabilitated with groundcover species, surfaces stabilised, and erosion and sediment controls maintained while awaiting a decision on the future of the PHES. While some of the sites are already largely devoid of vegetation, rehabilitation measures on completion of the drilling program will assist in reducing the likelihood and magnitude of erosion, scour and redeposition and any associated water quality impacts.

At least two of the borehole sites (probably BH104 and BH107) will have some ongoing monitoring installed, so a portion of the cleared drill pad for each will need to remain accessible while that monitoring continues.

3.4 Workforce and accommodation

The number of people on-site for the proposed development is expected to vary significantly over the duration of the work, and separate work crews may be mobilised depending on the program timetable developed by the contractor. Overall, a maximum daily workforce of up to 30 personnel may occur during peak activities. However, a typical daily workforce of 8–10 personnel is expected.

No on-site accommodation is required. The workforce would travel to and from site daily from nearby accommodation within the Lithgow region.

3.5 Water requirements and management

No surface water take from Farmers Creek or Lake Lyell is proposed. All water needed for site works, including drilling and site facilities would be sourced from Lithgow Council water filling stations and trucked to site. It is estimated an average of approximately 3–5 kL of water per week would be required for the duration of the works.

3.6 Waste management

All waste from the works, including general waste, green waste, drilling fluids, and other waste generated during the works will be removed from site and disposed of at a suitable licenced facility.

3.7 Duration and timing

The geotechnical drilling program is estimated to take between 3 and 6 months, which may be dependent on weather and equipment availability. It is anticipated that, normally, no more than two boreholes would be drilled at the same time, and may only be one at a time. However, this is expected to be at the discretion of the drilling contractor, as it would be principally determined by availability of suitable rigs and personnel.

The program seeks to maximise working hours during daylight hours and over a seven-day working week due to operational efficiencies required to complete drilling activities. Due to the distance to the nearest residential dwelling (>800 m) and the temporary nature of the works, impacts from out of hours works are expected to be minimal. As such, work hours are proposed as follows:

- 6.00 am to 6.00 pm Monday to Sunday; and
- No drilling or earthworks on public holidays.

Appropriate noise monitoring and management will be implemented as specified in Section 6. No drilling or earthworks will occur during night-time hours. Contractors may access the work area outside of these hours for security purposes, respond to emergencies and undertake maintenance and repairs on auxiliary equipment.

4 Strategic and statutory context

4.1 Need for the proposed development

EA is investigating the feasibility of developing a 335 MW Pumped Hydro Energy Storage (PHES) project on land it owns adjacent to Lake Lyell. Currently very little is known about the surface and subsurface geology across the proposed project area, so a geotechnical program (incorporating coring, downhole evaluation and a seismic survey) is required to establish whether or not the ground conditions are potentially suitable to support such a facility, and to inform its optimal design, especially with regard to the extent to which it can be situated below surface (to reduce impact on visual amenity).

4.2 NSW planning framework

The EP&A Act and NSW *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) form the statutory framework for planning approval and environmental assessment in NSW. This legislation is supported by environmental planning instruments (EPIS) including State environmental planning policies (SEPPs) and local environmental plans (LEPs).

4.2.1 Legal permissibility

i Environmental Planning and Assessment Act 1979

Section 1.5(1) of the EP&A Act provides that “development” in NSW includes any of the following:

- (a) the use of land,
- (b) the subdivision of land,
- (c) the erection of a building,
- (d) the carrying out of a work,
- (e) the demolition of a building or work,
- (f) any other act, matter or thing that may be controlled by an environmental planning instrument.

Section 1.4(1) of the EP&A Act defines “work” as follows:

work includes any physical activity in relation to land that is specified by a regulation to be a work for the purposes of this Act, but does not include a reference to any activity that is specified by a regulation not to be a work for the purposes of this Act. The carrying out of a work includes—

- (a) the renewal of, the making of alterations to, or the enlargement or extension of, a work, or
- (b) enclosing a public place in connection with the carrying out of a work.

The proposed development would meet this broad definition of a “work” under the EP&A Act and would therefore constitute “development” under the same.

Section 4.2(1) of the EP&A Act states that:

- (1) **General** if an environmental planning instrument provides that specified development may not be carried out except with development consent, a person must not carry the development out on land to which the provision applies unless—
 - (a) such a consent has been obtained and is in force, and
 - (b) the development is carried out in accordance with the consent and the instrument.

Maximum penalty—Tier 1 monetary penalty.

- (2) For the purposes of subsection (1), development consent may be obtained—
 - (a) by the making of a determination by a consent authority to grant development consent, or
 - (b) in the case of complying development, by the issue of a complying development certificate.

Section 4.2.1ii below confirms the proposed development’s permissibility against the Lithgow LEP in accordance with Section 4.2(1) of the EP&A Act.

ii [Lithgow Local Environmental Plan 2014](#)

Exempt development is defined in Section 3.1(3) of the *Lithgow Local Environment Plan 2014* (the ‘Lithgow LEP’) as:

To be exempt development, the development—

- (a) must meet the relevant deemed-to-satisfy provisions of the Building Code of Australia or, if there are no such relevant provisions, must be structurally adequate, and
- (b) must not, if it relates to an existing building, cause the building to contravene the Building Code of Australia, and
- (c) must not be designated development, and
- (d) must not be carried out on land that comprises, or on which there is, an item that is listed on the State Heritage Register under the Heritage Act 1977 or that is subject to an interim heritage order under the Heritage Act 1977.

Geotechnical investigations are not separately defined as exempt development, therefore the legal pathway is a DA to Lithgow City Council under Part 4 of the EP&A Act.

The investigation envelope is zoned SP2 Infrastructure (Electricity Generating Works) under the Lithgow LEP. The following objectives and permissibility for SP2 are outlined below:

SP2 Infrastructure

1 Objectives of zone

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.
- To maintain or improve the water quality of receiving water catchments.

2 Permitted without consent

Nil.

3 Permitted with consent

Aquaculture; Recreation areas; Roads; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose.

4 Prohibited

Any development not specified in item 2 or 3.

The dominant land use that aligns to the proposed development is 'electricity generating works':

Electricity generating works means a building or place used for the purpose of—

- (a) making or generating electricity, or
- (b) electricity storage.

Lake Lyell and the surrounding land is zoned SP2 Infrastructure for the purposes of electricity generating works. The PHES scheme proposed by EA would meet the definition of electricity generating works.

The proposed development is required to inform the feasibility of the Lake Lyell PHES and is, therefore, a subservient use for that purpose. The proposed development is, therefore, considered ordinarily incidental or ancillary to development for the purpose of electricity generating works and is permissible with consent.

This SEE has been prepared to accompany the DA for Lithgow City Council's determination under Section 4.2(2)(a) of the EP&A Act to facilitate development consent of the proposed development.

iii Environmental Planning and Assessment Regulation 2000

Schedule 3 of the EP&A Regulation lists those development types which meet the criteria for assessment as designated development (where an environmental impact statement (EIS) is required to be prepared).

However, the proposed development does not meet the criteria for classification as designated development under Schedule 3 and therefore the DA does not need to be accompanied by an EIS.

4.2.2 Other state approvals and licences

i Biodiversity Conservation Act 2016

A Biodiversity Development Assessment Report (BDAR) is required to accompany a DA if the proposed development is likely to 'significantly affect threatened species' and the Biodiversity Offset Scheme (BOS) will apply. Section 7.2 of the NSW *Biodiversity Conservation Act 2016* (BC Act) states that a development will 'significantly affect threatened species' if:

- (a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in section 7.3, or
- (b) the development exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or
- (c) it is carried out in a declared area of outstanding biodiversity value.

The BOS threshold is established by section 7.2(1)(b) of the BC Act and clause 7.1(1) of the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation).

The threshold has three components:

- whether the amount of native vegetation being cleared exceeds a threshold area;
- whether the development involves clearing of native vegetation or prescribed impacts on an area mapped on the biodiversity values map published by the Minister for the Environment; and
- where the clearing has the potential to generate a significant impact on a threatened entity (such as a listed ecological community, species or population).

The proposed development does not trigger entry into the BOS for points 1 and 2 above for the following reasons:

- native vegetation clearing extent will not exceed the clearing threshold of 1 ha (for minimum lot size 40 ha); and
- there is no impact in areas mapped within the biodiversity values map.

Accordingly, the BOS threshold has not been triggered and a formal BDAR is not required to be prepared.

A biodiversity assessment has been prepared with a focus on quantifying impacts on threatened ecological communities, species or populations as a result of the proposed development and included in Appendix B (refer also to Section 5.1). The assessment concludes that the proposed development will not have a significant impact on a listed ecological community, species or population.

ii National Parks and Wildlife Act 1974

Aboriginal objects, whether recorded or as yet undiscovered, are afforded statutory protection under the NSW *National Parks and Wildlife Act 1974* (NP&W Act). The Aboriginal heritage desktop assessment (refer to Section 5.2 and Appendix C) did not discover any recorded artefacts within the investigation envelope.

The assessment undertaken to inform this SEE concluded that the investigation envelope intersects with areas assessed to have low archaeological potential based on desktop research, field investigation and predictive modelling. As such, there is no need to apply for an Aboriginal Heritage Impact Permit under Section 90 of the NP&W Act. No approval is required under the NP&W Act.

iii Biosecurity Act 2015

The NSW *Biosecurity Act 2015* (Biosecurity Act) and its subordinate legislation commenced on 1 July 2017. The *Biosecurity Strategy 2013–2021* and Biosecurity Act (which repealed the NSW *Noxious Weeds Act 1993*) provide a streamlined, clear framework for safeguarding primary industries, natural environments and communities from a range of pests, diseases and weeds. The broad objectives of this Act and for biosecurity in NSW are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants by:

- preventing their entry into NSW;
- quickly finding, containing and eradicating any new entries; and
- effectively minimising the impacts of those pests, diseases, weeds and contaminants that cannot be eradicated through robust management arrangements.

The Biosecurity Act provides a flexible and responsive statutory framework to help achieve these objectives.

iv Wilderness Act 1987

There are no declared wilderness areas (in accordance with Section 8 of the NSW *Wilderness Act 1987*) in proximity to investigation envelope. The proposed development is not located in and will not impact on any of the declared wilderness areas.

v Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) defines 'environmental heritage' as those places, buildings, works, relics, moveable objects and precincts of State or local heritage significance. A property is a heritage item if it is:

- listed on the State Heritage Register (SHR), a register of heritage places of particular importance to the people of NSW; or
- listed on the State Heritage Inventory (SHI), an electronic database of statutory listed heritage items. The SHI includes items on the SHR, Section 170 heritage registers of State Government agencies and heritage places listed on LEPs.

A permit under the Heritage Act would be required if impacts are proposed to heritage items. The potential to impact on any heritage listed items has been considered in Section 5.7.2 of this SEE. As such, the proposed development is not anticipated to impact on any heritage items defined within the Heritage Act and no approval is required under the Act.

vi Fisheries Management Act 1994

The NSW *Fisheries Management Act 1994* (FM Act) provides for the protection, conservation and recovery of fish stocks, key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation as well as management of threats to threatened species, populations and ecological communities defined under the FM Act. In particular, the FM Act has mechanisms for the protection of fish, fish habitats, mangroves, seagrasses and seaweeds on public water land and foreshores.

Lake Lyell, the Coxs River and its tributaries (including Farmers Creek) are considered to potentially contain key fish habitat (Hawkesbury-Nepean Key Fish Habitat Map) (DPI, 2022). This SEE addresses potential impacts to native fauna, including fish, in Section 5.

vii Water Management Act 2000

The site falls within the Water Sharing Plan for the *Greater Metropolitan Region Unregulated River Water Sources* and is therefore subject to the provisions of the NSW *Water Management Act 2000* (WM Act).

Section 91 of the WM Act provides that there are two types of activity approvals which may apply to works within NSW, being Controlled Activity Approvals and aquifer interference approvals.

Controlled Activity Approvals are required where works are proposed to be undertaken on waterfront land. Waterfront land is defined under the Dictionary to the WM Act as being:

- (a) the bed of any river and a line drawn parallel to 40m inland from the highest river bank, or
- (b) the bed of any lake and a line drawn parallel to 40m inland from the highest lake shore, or
- (c) the bed of any estuary and a line drawn parallel to 40m inland from the estuary mean high water mark, or
- (d) the bed of coastal waters and a line drawn parallel to 40m inland of the mean coastal high water mark.

River is furthermore defined under the WM Act to include:

- (a) any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved, and
- (b) any tributary, branch or other watercourse into or from which a watercourse referred to in paragraph (a) flows, and
- (c) anything declared by the regulations to be a river, whether or not it also forms part of a lake or estuary, but does not include anything declared by the regulations not to be a river.

Clause 3(2) of the NSW *Water Management (General) Regulation 2018* (WM Regulation) clarifies that the following are declared to be a river under the WM Act:

- (a) any watercourse, whether perennial or intermittent, comprising an artificial channel that has changed the course of the watercourse,
- (b) any tributary, branch or other watercourse into or from which a watercourse referred to in paragraph (a) flows.

As the proposed development includes works on waterfront land, controlled activity approval under Section 91 of the WM Act will be required. The Natural Resources Access Regulator (NRAR) is an independent regulator responsible for issuing all controlled activity approvals in accordance with the WM Act for work carried out on waterfront land. Attachment D includes information to support a controlled activity approval application to NRAR.

In terms of aquifer interference, the proposed development meets the criteria for a defined minimal impact aquifer interference activity under Section 3.3 of the *Aquifer Interference Policy (Department of Primary Industries: Office of Water, 2012)*, as they would fall within the following description:

Core holes, stratigraphic (chip) holes, geo-environmental and geotechnical bores, works or activities (the latter as listed in AS 1726) intersecting the water table if they are decommissioned in such a way as to restore aquifer isolation to that which existed prior to the construction of the bore, work or activity and that the decommissioning is conducted within a period of 28 days following completion of the bore, work or activity.

Subclause 7(2)(f), Part 1 of Schedule 4 to the WM Regulation further clarifies that a person is not required to obtain an access licence to take water under the WM Act where the relevant activity comprises an aquifer interference activity for the purposes of a geotechnical investigation, and no more than three megalitres of water is taken in a calendar year.

Therefore, even though groundwater would be taken from the drilled boreholes, no additional water access licence is required to be obtained. For this exemption to be applied, the following conditions must be followed:

- record water taken for which the exemption is claimed;
- make the record not later than 24 hours after water is taken;
- make the record in an approved form and manner; and
- keep the record for a period of 5 years; and
- give the record to the Minister in an approved form and manner:
 - not later than 28 days after the end of the water year in which the water was taken, or
 - if the Minister directs the person in writing to give the record to the Minister on an earlier date, by that date.

viii [Roads Act 1993](#)

The *Roads Act 1993* (Roads Act) applies to public roads and specifies the relevant roads authority and when permits are required. The proposed development does not involve works to or occupation of a public road. A permit under Section 71 of the Roads Act is not required.

ix [Protection of the Environment Operations Act 1997](#)

The proposed development does not constitute a scheduled activity as listed in Schedule 1 of the NSW *Protection of the Environment Operations Act 1997* (POEO Act) and therefore does not trigger an Environment Protection Licence (EPL) application through NSW Environment Protection Authority.

x [Rural Fires Act 1997](#)

The objects of the NSW *Rural Fires Act 1997* (RF Act) include the prevention, mitigation and suppression of bush and other fires and the Act establishes various coordination committees.

EA will take steps to prevent the occurrence or spread of fire to adjacent land, to be further detailed in the Construction Environmental Management Plan (CEMP). If a fire occurs in the location of the proposed activities, EA and its contractors will take all possible steps to extinguish the fire and, if required, inform emergency services as soon as possible to alert the rural fire service (RFS) and the NPWS.

Section 100B of the RF Act requires that a Bushfire Safety Authority must be obtained for subdivision on bushfire prone land facilitating rural residential or residential development, or for any development on bushfire prone land for a 'special fire protection purpose.'

As set out in Section 5.10, the investigation envelope is categorised as bushfire prone land. The proposed development does not seek to subdivide the site, and does not comprise a special fire protection purpose as defined in Section 100B(6) of the RF Act. As such, no further consideration of the RF Act is required.

xi [Environmental planning instruments](#)

A number of State and regional policies are relevant to the proposed development, these are set out in Table 4.1.

Table 4.1 Consistency of relevant State policies and plans

Policy/Plan	Relevance to the proposed development
<i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i>	This SEPP sets out a range of provisions relating to transport and infrastructure, including electricity generation and supply. The proposed development involves investigations for the purpose of electricity generation and on land zoned for electricity generation.
<i>State Environmental Planning Policy (Resilience and Hazards) 2021</i>	<p>Subclause 4.6(1) of this SEPP provides that a consent authority may not consent to a DA unless:</p> <ul style="list-style-type: none"> • it has considered whether the land is contaminated, and • if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and • 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. <p>It is unlikely that anthropogenic land contamination exists within the investigation envelope. As the proposed development does not relate to a change of use specified in Subclause 4.6(4) of SEPP 55 (eg residential, educational, health, or recreational) there is moreover no requirement to undertake a preliminary investigation report in support of the proposed development.</p>
<i>State Environmental Planning Policy (Biodiversity and Conservation) 2021</i>	<p>Chapter 4 of this SEPP encourages the conservation and management of natural vegetation that provides habitat for Koalas. Koalas are listed under the BC Act as a vulnerable species. Chapter 4 of the SEPP was reviewed to determine whether this Policy would apply to the proposed development. This has been summarised in Section 5.1.2ii.</p> <p>Chapter 8 of this SEPP relates to the Sydney drinking water catchment. The proposed development is located within the upper Cocks River catchment, which is part of the Sydney drinking water catchment. This SEPP specifically requires all proposed developments within the Sydney drinking water catchment to demonstrate a neutral or beneficial effect (NorBE) on water quality. Guidelines for the assessment of a NorBE on water quality have been published by WaterNSW (2021) and provide clear direction on what a NorBE means, how to achieve it and how to assess and application. As defined by the guidelines, a NorBE on water quality is demonstrated when a project:</p> <ul style="list-style-type: none"> • has no identifiable potential impact on water quality; or • will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site; or • will transfer any water quality impact outside the site to a location where it is treated and disposed of to a standard approved by the consent authority. <p>Councils in the catchment carry out NorBE assessments for DAs that have a lower risk to water quality and refer more complex DAs to WaterNSW for concurrence.</p>

xii Lithgow Development Control Plan 2021

The *Lithgow Development Control Plan 2021* (the DCP) provides guidance to developers, including site requirements for development and natural environment and hazards (which are relevant to the proposed development). An assessment of the proposed development against the DCP is provided in Table 4.2.

Table 4.2 Assessment of the proposed development against the DCP

DCP component	The DCP requirement	Comment/relevance to proposed development	Compliance
2.2 Site analysis, local character and context	The development needs to demonstrate that the chosen site is suitable for the proposed development and that the layout and design will avoid, or minimise/mitigate any significant impacts on the environment and on other land uses in the vicinity of the site. Site analysis should be undertaken early in the design process and the development/design justified in terms of its response to that analysis. To demonstrate a suitable response to the site analysis, Council may require an applicant to lodge a number of supporting studies/plans.	Site description for relevant aspects of the environment and context is provided in Section 2 and Section 5 of the SEE. The site is considered suitable for the proposed development.	Yes
2.3 Slope response, earthworks and retaining walls	The development needs to demonstrate that the chosen site is sited, designed and uses construction techniques that respond to topographical and hydrological features of the site.	The proposed development has been designed to minimise impacts and allows for further refinement to respond to on-site constraints. See Section 3.	Yes
2.4 Stormwater management	If development is to take place within an area affected by <i>State Environmental Planning Policy</i> (Sydney Drinking Water Catchment) 2011, the development must demonstrate a neutral or beneficial impact upon water quality.	The proposed development is located within the Sydney drinking water catchment. This SEE has considered water quality impacts and will have a neutral or beneficial impact upon water quality (see Section 5.3).	Yes
2.5 Vehicle access and parking	The development must demonstrate safe and functional vehicle access/egress that minimises impacts on public roads, provide adequate off-street parking, design for circulation for the largest design vehicle to access the site and minimise impacts to neighbouring sites.	The proposed development is on private land and allows for suitable turning areas for the largest vehicle to access the site. Access and transport impacts have been considered in Section 5.6.	Yes
2.6 Pedestrian access, mobility and safety	The development must demonstrate safety and pedestrian connectivity of access.	Not applicable. The development is not for a purpose to improve pedestrian access or connectivity.	N/A
2.7 Designing for crime prevention	The development must incorporate crime prevention into the planning and design of neighbourhoods.	Not applicable. The proposed development is not of a type listed in the DCP. A crime risk assessment is not warranted.	N/A
2.8 Utilities, easements and infrastructure	The development must not impact on existing utility services, minimise impacts of utility services on the environment, and ensure the development has access to services.	Not applicable. There are no utilities or easements within the investigation envelope. The development is not a permanent structure and is not providing new utilities or easements.	N/A.
2.9 Solid waste management	The development must ensure appropriate management of waste.	The proposed development would appropriately manage waste and remove waste to offsite location (see Section 5.12)	Yes
2.10 Amenity/buffers for sensitive uses	The development must incorporate adequate buffer between sensitive land uses and higher impact land uses.	The proposed development would have minimal impacts to amenity and has been assessed in Section 5.6.1 and 5.8.1.	Yes

Table 4.2 Assessment of the proposed development against the DCP

DCP component	The DCP requirement	Comment/relevance to proposed development	Compliance
2.11 Water and energy efficiency	The development must demonstrate energy and water efficiency.	The proposed development will utilise fuel and diesel generators and water would be brought to site as discussed in Section 3.5.	Yes
3.2 Bush fire prone land	The development must demonstrate the design and management of any proposed development complies with the <i>Rural Fire Act 1997</i> and <i>RFS Planning for Bush Fire Protection 2019</i> .	The proposed development is on bush fire prone land and has been assessed in Section 5.10 and Section 6.	N/A
3.3 Vegetation and management	The development must assess clearing of vegetation and ensure it is assessed via the relevant biodiversity approval pathway.	A flora and fauna assessment has been prepared and provided in Appendix B and summarised in Section 4.4	Yes
3.4 Land and soils	The development must address the risk of certain development with regard to contaminated land, sensitive land areas, erosion and sedimentation and other geological or soil-related issues.	The suitability of the site has been provided in Section 3 and further assessment in Section 5.	Yes
3.6 Ground and surface water protection	The development must demonstrate groundwater, riparian land and watercourses are protected from on-site storage of significant volumes of hazardous liquids or waste.	Assessment is provided in Section 5 and measures to protect riparian land and watercourses in Section 6.	Yes

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation that governs the protection of the environment. An approval under the EPBC Act is required for the proposed development if:

- it will have or is likely to have a significant impact on matters of national environmental significance (MNES); or
- it will have or is likely to have a significant impact on the environment inside or outside the Australian jurisdiction.

Table 4.3 outlines the MNES results identified in the Protected Matters Search Tool completed for the proposed development (and include a 1 km buffer around the investigation envelope). The results are included in Appendix B.

Table 4.3 Matters of National Significance results

Matters of National Significance	Results	Comment
World Heritage Properties	None	Not applicable
National Heritage Places	None	Not applicable
Wetlands of International Importance	None	Not applicable
Great Barrier Reef Marine Park	None	Not applicable
Commonwealth Marine Areas	None	Not applicable
Threatened Ecological Communities	3	An assessment of vegetation communities is provided in Attachment B and confirmed that no EPBC listed species threatened ecological communities are present within the investigation envelope.
Threatened Species	39	Threatened species have been assessed for potential impacts in Section 5.1 and Appendix B. Impacts are not considered likely to be significant for any EPBC listed species.
Migratory Species	13	Migratory species have been assessed for potential impact in Section 5.1 and Appendix B. Impacts are not considered likely to be significant for any EPBC listed species.

The proposed development is not considered to have a significant impact on matters of national environmental significance. As such, referral to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) is not required for the proposed development.

4.4 Consultation

Stakeholder engagement and consultation for the broader PHES commenced in advance of the development of this SEE and have been led by EA. EA has provided the community and public information via its website (<https://www.energyaustralia.com.au/about-us/energy-generation/energy-projects/lake-lyell-pumped-hydro>).

With regard to this SEE, EA has consulted with relevant stakeholders with regard to negotiating access agreements for use of roads during the proposed development, namely:

- Crown Lands;
- NPWS; and
- private landowners.

Other groups identified as having an interest in the proposed development and consulted during the development of the SEE include the Bathurst Local Aboriginal Land Council, who participated in the site survey for the Aboriginal heritage due diligence assessment (provided at Appendix C).

5 Likely impacts on the environment

5.1 Biodiversity

This section is based on the biodiversity assessment completed for the investigation envelope by EMM and included as Appendix B, as well as provides further consideration of aquatic ecology.

Database analysis was undertaken to identify biodiversity values of the investigation area, and this included a search of relevant databases as well as broadscale vegetation mapping and aerial photography. Field surveys were also conducted across the investigation envelope in December 2021 by a highly experienced ecologist and included:

- vegetation mapping and condition assessment; and
- habitat assessments for threatened species.

No targeted surveys were undertaken, however vegetation mapping and floristic plot surveys provided ample opportunity to detect conspicuous threatened plant species. The findings of the desktop analysis and field surveys were used to assess the likelihood of threatened flora, fauna and ecological communities to occur within the investigation envelope. No field surveys were performed for aquatic ecology as no work within the waterway is proposed.

5.1.1 Existing environment

i Plant community types

Site investigations identified the presence of two plant community types (PCTs) and discrete areas of cleared or disturbed non-native vegetation within the proposed development site. The PCTs are shown in Figure 5.1 and are:

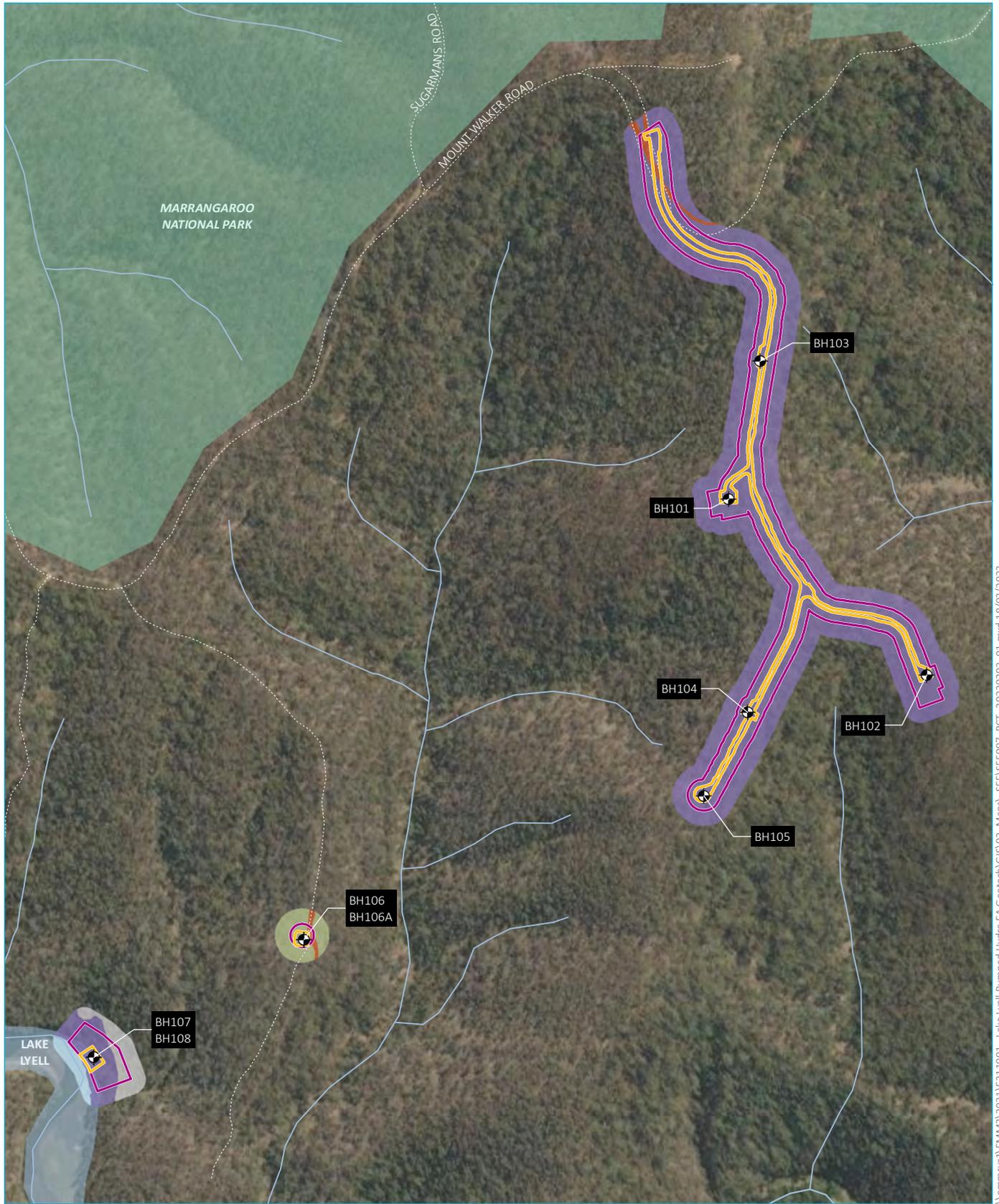
- Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion (PCT 1197); and
- Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion (PCT 1093).

The two community types comprise about 0.95 ha of the vegetation within the investigation envelope. The remaining area (0.02 ha) comprises cleared or disturbed non-native vegetation.

ii Threatened ecological communities

Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion (PCT 1197) is listed in the NSW BioNet Vegetation Classification system as associated with three listed threatened ecological communities (TECs) under the BC Act. However, analysis suggests vegetation at the site aligns with one TEC: The Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions endangered ecological community (EEC).

The occurrence of PCT 1197 on the site is not entirely typical of the EEC as it does not occur on basalt, contains a higher diversity of canopy species and contains a number of shrub species more typically associated with lower soil fertility. It is therefore, considered marginal for alignment with the EEC. For the purposes of this assessment, taking a precautionary approach, all areas of PCT 1197 in the investigation envelope are nonetheless assumed to be consistent with the EEC.



Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DFSI (2017); GA (2011)

KEY

- Investigation envelope
- Indicative disturbance footprint
- Borehole
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve

- Waterbody
- Minimal native vegetation
- Plant community type**
- 732 | Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion
- 1093 | Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion
- 1197 | Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion

Plant community types

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 5.1



\\emmsvr1\EMMS\2021\211001 - Lake Lyell Pumped Hydro EA Geotech\GIS\02_Maps\SEE\SEE007_PCT_20220302_01.mxd 18/03/2022

iii Threatened species and habitat

No threatened species (flora or fauna) were recorded in the investigation envelope during inspections conducted to date. However, five threatened flora species and 36 threatened fauna species have been assessed as likely to occur within the investigation envelope based on available potential habitat and species distribution.

The vegetation and associated habitat present is generally in good condition though some exotic species of herbs, shrubs and grasses are present at relatively low densities. Large rocky outcrops, cliffs and crevices are absent from the investigation envelope, limiting its potential as habitat for some species. Mature eucalypt woodland and forest containing hollow-bearing trees in the investigation envelope provide ample potential breeding and den sites for birds, hollow-roosting bats and arboreal mammals. Patches of Blackthorn (*Bursaria spinosa*) in the investigation envelope represent potential habitat for the threatened Bathurst Copper Butterfly (*Paralucia spinifera*). The habitat present is unlikely, however, to contain any features of importance for animal species at risk of Serious and Irreversible Impacts (SAII).

In addition to threatened species listed on the BC Act and EPBC Act, the DAWE (2020) released a provisional list of animal species identified as requiring urgent management intervention following the 2019/2020 bushfire season in southern and eastern Australia (20 March 2020). While the list primarily comprises species already listed under the EPBC Act, it also includes species which are not currently listed as threatened under the BC Act, FM Act or EPBC Act but have more than 30% of their range within burnt areas. The Platypus is listed as “*Species that are provisionally included as high priority whilst more information is gathered*”. As it is not formally listed, the species hasn’t been assessed in the Flora and Fauna Assessment (Appendix B) however, it has been assessed and included in this SEE.

Anecdotal evidence from the community suggests Farmers Creek provides habitat for a local Platypus population. While Platypus are not a threatened species, they are a protected native fauna species. Formal records of Platypus sightings are known within parts of the Coxs River catchment, including downstream of Lake Lyell and upstream of Lake Lyell within Farmers Creek (some 3.5 km from the site).

The Platypus is a semi-aquatic mammal that depends entirely on freshwater systems, exhibiting a preference for aquatic habitats comprising a riparian zone with consolidated earth banks stabilised by large trees, overhanging vegetation, abundant in-stream organic matter, coarse woody debris, and coarse channel substrates, as well as a combination of wide stream sections and shallow pools (Bino, et al., 2019). Foraging is undertaken in both low flow pools and high flow riffle habitat within streams, preferably at depths of less than 5 m and with coarse bottom substrates (Bino, et al., 2019). Studies conducted by the Australian Platypus Conservancy (Serena & Williams, 2010) indicates that a statistically significant relationship between platypus numbers and foraging activity and the presence of higher numbers of indigenous trees within the riparian zone exists.

iv Aquatic species and habitat

Farmers Creek is considered to be key fish habitat and may provide suitable habitat for other aquatic species such as amphibians, waterbirds and benthic invertebrates. Farmers Creek flows to Lake Lyell, an artificial reservoir created from the impoundment of the Coxs River.

No threatened fish species are predicted to occur in the vicinity of the proposed development (DPI 2021). While not within the mapped distribution range, Macquarie Perch has previously been recorded in the Coxs River catchment, but never upstream of Lake Lyell. Lake Lyell dam currently blocks fish passage for species migrating from below the dam wall to the upper reaches of the Coxs River, and is also stocked with brown and rainbow trout which are known to compete with Macquarie Perch.

Fish stocking of Lake Lyell with Australian Bass, Brown Trout, Rainbow Trout and Tiger Trout has occurred since 2010 (DPI Fisheries 2021). Fish stocking of Brown Trout and Rainbow Trout upstream in the Coxs River within Marrangaroo National Park has also occurred since 2015 and 2020, respectively.

The shoreline adjacent to the investigation envelope at BH107/108 is characterised by a mix of sandy soils with some complex rock structures and native and introduced macrophytes. Vegetation within the riparian zone includes species of *Juncus* as well as established *Casuarina*, *Acacia* and *Eucalyptus* species. These trees provide shade to the riverbank. Woody debris is evident on the riverbank as well as submerged within the waterway.

There are no other areas of aquatic habitat within or adjacent to the investigation envelope.

5.1.2 Potential impacts

Vegetation clearing for the activity would result in direct impacts including a reduction in:

- native vegetation, including a threatened ecological community;
- habitat for flora and fauna; and
- populations of flora and fauna, possibly including threatened species. These impacts are discussed in more detail below.

Indirect impacts are related to vegetation clearing for proposed development and comprise:

- habitat fragmentation, barrier and edge effects;
- weed proliferation;
- erosion and sedimentation; and
- increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour).

i Plant community types and threatened ecological communities

The PCTs impacted by the proposed development is summarised in Table 5.1, including impacts to 0.90 ha of vegetation aligning to the Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions EEC. A test of significance (ToS) has been prepared for this community and found that a significant impact was unlikely to occur as a result of the proposed development (refer to Appendix B).

Table 5.1 Vegetation types impacted within the disturbance footprint.

Plant community type	Area (ha) in disturbance footprint	BC Act conservation status	EPBC Act conservation status
1197 - Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion	0.92	V	-
1093 - Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion	0.03	-	-
Cleared/disturbed non-native vegetation	0.02	-	-
Total	0.97		

ii Threatened species and habitat

There is some flexibility in the precise locations of the access track and geotechnical drilling sites. During on-ground delineation of access track and drill pads, particular features of higher habitat value can be largely avoided by shifting locations by a few metres within the investigation envelope. Features to be avoided wherever practicable include:

- hollow-bearing trees and mature trees;
- termite mounds;
- large rocks;
- large fallen trees; and
- mature blackthorn (*Bursaria spinosa*) plants ie potential habitat for the Bathurst Copper Butterfly.

By avoiding these features, loss of sheltering and breeding sites and the potential for the injury of individuals of threatened animal species would be largely avoided.

ToS and Assessments of Significance (AoS) under the BC Act and EPBC Act (respectively) were undertaken to determine the severity of impacts to species known or considered likely to utilise the site (refer to Appendix B). These assessments concluded that given the relatively small disturbance footprint (less than 1 ha) and the ability of the proposed development to avoid critical habitat features for threatened fauna and locations of threatened flora if revealed, the proposed development is unlikely to have a significant impact on any of the species assessed.

While the Platypus is not currently listed under the FM Act or the EPBC Act, there is currently a lack of knowledge regarding species abundance at a local catchment level (Australian Museum, 2019) and the species is subject to similar impacts as threatened fish, including waterway bank erosion, channel sedimentation, regulated waterways, barriers to water flow (eg dams and weirs), riparian zone degradation and loss of riparian vegetation (Bino, et al., 2019; Temple-Smith & Grant, 2003).

Access to the site will require a barge to transport plant and equipment to the site of BH107/108. The proposed development would result in the loss of riparian vegetation to allow access and drilling activities. However, mitigation measures would be implemented to prevent bank erosion and sedimentation (see Section 6). Disturbance on waterfront land would be kept to a minimum during the proposed development. As some ongoing downhole monitoring is planned in BH107, the site would only be partially remediated at the completion of the work, to enable continuing access to the immediate area around the borehole. However, measures will be taken to mitigate potential erosion and sediment runoff. If it transpires that development of the PHES facility is not going to proceed, this (and any other) drill site will be reinstated subsequent to that decision. Impacts to Platypus are not anticipated.

iii State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 recently came into effect and replaces the former *State Environmental Planning Policy (Koala Habitat Protection) 2020* (Koala SEPP 2020) and *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021). The relevant koala protection provisions aim to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. These provisions do not apply to the proposed development as:

- only a single tree species listed in Schedule 1 of the Biodiversity and Conservation SEPP, Ribbon Gum (*Eucalyptus viminalis*) was recorded in the investigation envelope and the species comprises less than 15% of the canopy in terms of both foliage cover and abundance; and
- the land in the proposed development does not constitute core koala habitat and no Koala Plan of Management is in force for the City of Lithgow LGA.

5.2 Aboriginal heritage

This section is based on an Aboriginal heritage due diligence assessment, which is included as Appendix C.

5.2.1 Existing environment

Aboriginal people are known to have focused their activities around waterways and on elevated landform elements like ridgelines, as these locales provided natural resources essential for daily life (eg, fresh water, aquatic and terrestrial sources of food) as well as dry areas for camping and travel. The investigation envelope is bounded by a watercourse and runs along a ridgeline comprised of a narrow crest surrounded by adjoining slopes. These two landscape features contribute to the archaeological sensitivity of the investigation envelope. The investigation envelope has had limited previous disturbance, with almost all remnant vegetation present except for the clearing of access tracks and fire trails. An extensive record of Aboriginal occupation has been established for the region and is documented in several archaeological studies. The archaeological record suggests the region is dominated by rock shelters, rock art and/or stone artefact scatters of various densities. Rock shelters and rock art would be found in areas of steep relief where stone outcrops and/or overhangs are present, while stone artefact scatters would be constrained primarily to slightly elevated, flat areas surrounding fresh water sources.

The Aboriginal Heritage Information Management System (AHIMS) provides a database of previously recorded Aboriginal objects, sites and places. An AHIMS search of investigation envelope was undertaken on 6 December 2021 which identified 81 sites within an area of approximately 380 km² centred on the site. Of the 81 sites identified within the search, none are within the investigation envelope. The two nearest registered sites are on the other side of Farmers Creek, approximately 330 m and 500 m to the south and south west of the investigation envelope. A breakdown of registered sites by site types are shown in Table 5.2.

Table 5.2 AHIMS extensive search results

Site Type	Number of sites	Representation (%)
Aboriginal Ceremony and Dreaming	1	1.23
Burial	2	2.47
Burial; undefined artefact scatter	1	1.23
Culturally modified tree	2	2.47
Isolated artefact	13	16.05
Low density artefact scatter (2–14)	1	1.23
Rock art (engraved)	1	1.23
Rock art (pigment)	3	3.70
<i>Rock art (pigment); undefined artefact scatter</i>	1	1.23
Rock shelter with deposit	6	7.41
Undefined artefact scatter	49	60.49
Water hole; low density artefact scatter (2–14)	1	1.23
Total	81	100

A site inspection was undertaken of the proposed drill pads for the geotechnical investigations to identify previously documented sites in the region and to further investigate the investigation envelope based on the site predictions. Overall, the investigation envelope lacked evidence of any form of stone outcrops or overhangs in which cultural materials may be present, nor does it exhibit environmental characteristics where stone artefacts may be expected.

5.2.2 Potential impacts

Several parts of the investigation envelope are on moderate to steep slope landforms, and as such are prone to erosion limiting the potential for stone artefacts to remain if they were ever present. Based on the due diligence assessment (refer to Appendix C), it is assessed that the investigation envelope intersects with areas assessed to have low archaeological potential based on the desktop research and field investigation (refer to Figure 5.2).

The borehole sites are all located outside areas of moderate or high modelled potential archaeological sensitivity and portions of the investigation envelope contain existing disturbed areas such as access tracks. The proposed approach is to route the new access track and locate bore sites away from any unexpected finds during construction.



Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DFSI (2017)

KEY

- Investigation envelope
- Indicative disturbance footprint
- +
 Borehole
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve
- Archaeological potential
- Low archaeological potential

0 100 200 m
GDA 1994 MGA Zone 56

Archaeological potential

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 5.2



5.3 Surface water, flooding and drainage

5.3.1 Existing environment

The development footprint is located within the upper Coxs River catchment, which forms part of the greater Hawkesbury-Nepean catchment. The Coxs River is a perennial river and was dammed by Lake Lyell in the 1980s to provide water security to Wallerawang Power Station (decommissioned in 2014) and Mount Piper Power Station. Lake Lyell has a capacity of approximately 32,000 ML and supports a range of values and uses, including aquatic ecosystems and recreation (eg, boating, fishing and swimming), as well as industrial water supply to Mount Piper Power Station.

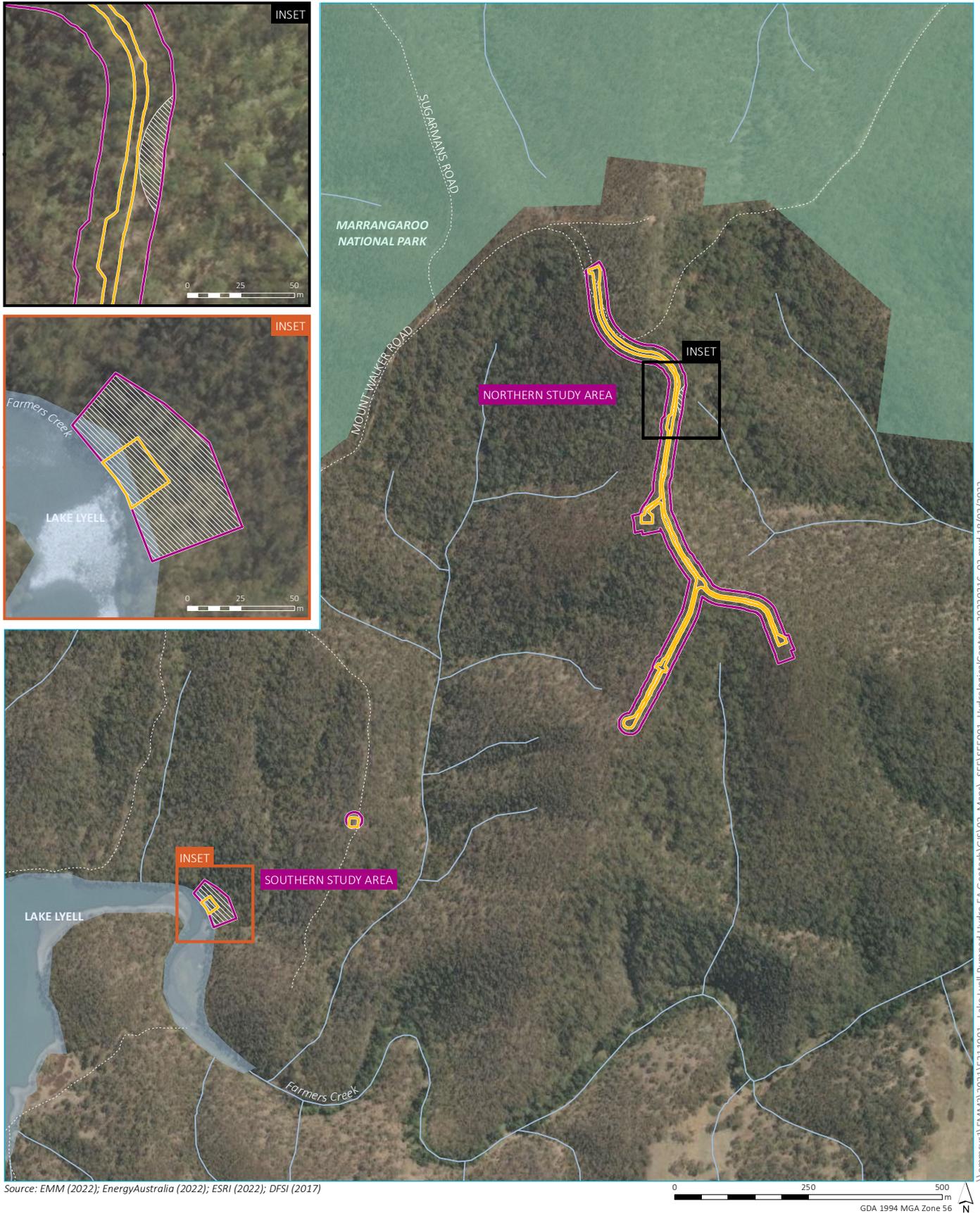
Farmers Creek is a south-west flowing tributary of the Coxs River that flows for approximately 18 km through the township of Lithgow into Lake Lyell. Farmers Creek in the vicinity of the development footprint is a fourth order watercourse and is fed by several first and second order ephemeral watercourses in the area surrounding the northern investigation envelope. The southern investigation envelope is adjacent to the shore of the Farmers Creek arm of Lake Lyell.

Farmers Creek is a perennial watercourse that is impacted by historical land clearing for urban and industrial development upstream of the proposed development. The creek is also affected by urban stormwater and treated wastewater discharge in the vicinity of Lithgow. In the area surrounding the development footprint, the riparian vegetation of Farmers Creek and its tributaries is generally in good condition, with relatively minor weed infestation and minimal vegetation clearing.

With the exception of EA's existing supply of cooling water from Lake Lyell, there are no known surface water users within the area that may potentially be affected by the proposed development.

The WM Act defines waterfront land as the bed of any river, lake or estuary and any land within 40 m of the riverbanks, lake shore or estuary mean high water mark. Figure 5.3 presents the hydrological context of the site, including an indication of the extent of waterfront land (as defined by the WM Act) within the investigation envelope.

As the proposed development includes works on waterfront land, controlled activity approval under Section 91 of the WM Act will be required. The Natural Resources Access Regulator (NRAR) is an independent regulator responsible for issuing all controlled activity approvals in accordance with the WM Act for work carried out on waterfront land. Appendix D includes information to support a controlled activity approval application to NRAR.



Source: EMM (2022); EnergyAustralia (2022); ESRI (2022); DFSI (2017)

KEY

- Investigation envelope
- Indicative disturbance footprint
- Vehicular track
- Watercourse/drainage line
- Named waterbody
- NPWS reserve
- Extent of waterfront land within environmental assessment boundary

Hydrological context

Lake Lyell Geotechnical Drilling Program
Statement of environmental effects
Figure 5.3



5.3.2 Potential impacts

Key potential sources of impact to surface water resources comprise the following:

- ground disturbance during bulk earthworks and other site activities leading to exposure of soils and potential erosion and mobilisation of sediment into receiving watercourses;
- contamination of surface water resources as a result of accidental spillage of materials such as hydrocarbons, drilling muds and additives and other chemicals used to support construction activities, or discharge of groundwater intercepted during drilling; and
- partial blockage or redirection of floodwaters as a result of poorly considered construction activities, fencing or storage/stockpile areas, resulting in inundation of construction areas or downstream properties, damage to plant and equipment, and potential risk to life.

i Sedimentation

One of the key risks to surface water quality during construction is the disturbance of soil, leading to an increase in erosion and sediment-laden runoff into watercourses or Lake Lyell. Uncontrolled sediment-laden runoff has the potential to increase turbidity and nutrients entering downstream watercourses which may have ecological and water quality impacts. Potential impacts during the construction phase would primarily relate to the occurrence of a significant storm event when drill pads or the access track are exposed and/or ground is disturbed from the action of machinery.

Impacts will be minimised by operating under a CEMP that will incorporate erosion and sediment controls and the application of the NOW (2012) *Guidelines for Controlled Activities* during the design, drilling and testing phases of the proposed development. The CEMP will include the implementation of industry standard erosion and sediment control measures in accordance with *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004). These control measures may take the form of sediment traps, silt barriers and bunding or covering of soil stockpiles.

In addition, landform rehabilitation measures on completion of construction and/or drilling programs would assist in reducing the likelihood and magnitude of erosion, scour and redeposition and associated water quality impacts. At a minimum, work sites will be partially rehabilitated with surfaces stabilised and erosion and sediment controls maintained while awaiting a decision on the future of the PHES.

The use of access tracks during and after rainfall events may also increase erosion and subsequently increase sediment load and the turbidity of runoff. These risks will be managed via appropriate controls to be documented in the CEMP which, for example, may include temporarily restricting heavy vehicle access following significant rainfall events.

ii Flooding

The risk of the proposed development being affected by or affecting flooding is low. To minimise potential flood impacts, laydown areas and equipment compounds would not be located within or in close proximity to watercourses. The majority of the site lies along a ridgeline that is unlikely to be impacted by any material overland flow. However, the location of BH107/108 may be subject to inundation from minor overland flow generated on the steep slopes immediately to the north and east. The risk posed by flooding would be managed by appropriate location of the drilling site to avoid overland flow paths, and by monitoring weather conditions and forecasts. The location of BH107/108 is above the full supply level of Lake Lyell such that rising lake levels during a flood event are unlikely to inundate the work site. However, when flood risk is predicted, active work sites would be secured and personnel moved off site. Construction activities would not recommence until floodwaters had receded. Detailed measures to effectively manage the risk of flooding will be provided in the CEMP.

iii Water quality

Small volumes of hydrocarbons, drilling muds and additives and other chemicals used to support construction activities may be stored and used by plant and equipment. Unexpected releases of these potential pollutants may occur during refuelling, transport and delivery of substances and washdown of plant and equipment. In addition, there is a risk of drilling fluids and solids, as well as groundwater intercepted during drilling, being discharged to the surface or to Lake Lyell.

The impact to surface water quality as a result of accidental spillage of chemicals or discharge of groundwater would depend on the particular pollutant and volume spilled, weather conditions and the flow rate of any receiving watercourse. There will be no bulk storage facility located in the assessment envelope. Therefore, any incident spills are likely to be minor at worst. Detailed measures to effectively manage the risk of spills will be provided in the CEMP and would likely include:

- ensuring the handling and storage of fuels, flammable materials, chemicals and hazardous materials in appropriately sized, segregated, bunded stores within designated and secured work sites;
- refuelling and washdown of plant and equipment within designated bunded areas or off site;
- emergency spill response kits within work sites, refuelling areas and vehicles;
- incident and emergency spill response procedures; and
- containment of all drilling fluids and solids, as well as groundwater intercepted during drilling, and removal to a licensed facility as required.

Access to the BH107–108 work site adjacent to the shore of Lake Lyell has the potential to increase suspended sediment levels and turbidity within the lake as a result of boat movements on and off the lake foreshore. Strict site management measures will be developed to ensure sedimentation and erosion from the drilling pad and associated approach path does not occur and, therefore, the potential for impacts to the lake is low. Following the successful construction and drilling of each borehole, all equipment will be demobilised from site, and erosion and sediment controls will be deconstructed following the completion of rehabilitation. Detailed controls to minimise the potential impact to water quality in Lake Lyell will be outlined in the CEMP.

In the unlikely event that they did occur, potential impacts associated with turbidity plumes and increased suspended sediment levels are expected to be localised to the work area and to disperse rapidly, with negligible ongoing impacts.

Potential adverse impacts on water quality within Lake Lyell and the Farmers Creek catchment are expected to be avoided through the use of controls described above. As such, the proposed development is assessed to have a neutral effect on water quality within the Sydney drinking water catchment area, in accordance with *State Environmental Planning Policy (Biodiversity and Conservation) 2021*.

5.4 Groundwater

5.4.1 Existing environment

The site is situated within Upper Devonian metasediment units of the Lachlan Fold Belt (*Sydney 1:250,000 Geological Map, S1 56–5*). It is on the eastern flank of the Lachlan Fold Belt, adjacent to the Sydney Basin. No alluvium is mapped within the site, however some very localised alluvium could be expected adjacent to Lake Lyell. The main groundwater resources in the region comprise the regional, naturally fractured rock groundwater system associated with the Lachlan Fold Belt. Any alluvium could host very localised and minor groundwater.

The regional fractured rock groundwater system is likely to be present within the vicinity of the site. Part of the intention of the proposed development is to further understand the groundwater system to inform design components and ongoing environmental technical assessments. The groundwater is understood to be contained within, and moving through, natural fractures in the rock that are present due to the folding and faulting of the rock formations. Groundwater is typically recharged by direct rainfall infiltration.

There are no registered landholder bores within 2 km of the proposed drilling locations. The depth to groundwater from two registered bores targeting the fractured rock unit near the site (approximately 2.3 km and 2.4 km to the south east, and at ~981 mAHD and ~944 mAHD respectively) is >17 metres below ground level (mbgl).

5.4.2 Potential impacts

No permanent hydrogeological impacts would result from the geotechnical drilling program. The boreholes would be drilled in accordance with the *Minimum Construction Requirements for Water Bores in Australia* (2020).

Potential impacts could include localised groundwater quality impacts immediately adjacent to the borehole annulus, however the boreholes will be developed and cleaned after drilling to remove all drilling muds and additives. Drilling muds and additives will be stored in dedicated, above ground containers and all used product will be disposed of at a licensed facility. The drilling method restricts the inflow of groundwater and, therefore, no significant volume of groundwater take is expected. Any groundwater influx is expected to be well below the 3 ML requirement for incidental take.

5.5 Soils and land use

5.5.1 Existing environment

The Soil Landscapes of Central and Eastern NSW database, mapped by the former Department of Planning, Industry and Environment (DPIE), places the investigation envelope within in the Mount Walker Soil Landscape (DPIE 2020). Mount Walker soils generally feature shallow (up to 30 cm) gravelly brown loam topsoil (A horizon) overlying sandstone bedrock or reddish-brown silty clay loam subsoil (B2 horizon) on crests and upper slopes. Lower slopes usually exhibit less than 30 cm of gravelly brown loam (A1 horizon) overlying up to 30 cm of yellow-orange fine sandy loam topsoils (A2 horizon), with subsoil consisting of yellow-brown clay (B2 horizon).

Based on eSPADE modelling (DPIE v2.1) most of the soils within the investigation envelope are kandosols, likely to have moderately low inherent fertility and of Class 7 modelled land and soil capability (LSC), being extremely severe limitations for most land uses. Class 7 land includes slopes of 33%–50% and includes areas with extreme soil erodibility.

Additionally, it is unlikely that anthropogenic land contamination exists within the investigation envelope, as the land consists of undisturbed native vegetation given the steep terrain (though there is disturbance due to earthworks and vegetation clearing for the access track).

5.5.2 Potential impacts

The drilling and seismic program is aimed at improving the understanding of local ground conditions. The geotechnical investigations are limited to the establishment of boreholes and associated access and drill pads, and all areas disturbed, with the exception of the new access track, would be stabilised at completion until a decision on whether the PHES will proceed. The new access track would be retained for future use by EA. The site is remote, on private land owned by EA and provided access is restricted, there is limited potential for the drilling works to lead to any increased risks of instability, such that could affect public safety.

Ground disturbance would be limited to minor disturbance associated with vehicle movements over access tracks and at the drill pads. This disturbance would not result in any permanent reduction in land capability.

The temporary and localised nature of the proposed development would not result in any permanent changes to existing land uses. Further, the geotechnical investigations do not preclude any future uses, or alter land and soil capability.

There is considered to be very low potential for previously unidentified contaminated sites to be encountered during the proposed development. Standard mitigation measures will be implemented to minimise the potential risk for increased soil erosion and mass movement due to ground disturbing activities; these are outlined in Section 6.

5.6 Traffic and access

5.6.1 Existing environment

The main transport route to the site is from Girraween Drive and the Great Western Highway at Marrangaroo, as shown on Figure 3.2. The route involves a combination of public and private roads. The majority of access route from Great Western Highway is via unsealed roadway.

The posted speed limit of Great Western Highway at Marrangaroo is 100 km/hr. The posted speed limit of Girraween Drive as it passes through the residential area of Marrangaroo is 50 km/hr. There are dedicated turning lanes in both the northbound and southbound direction from Great Western Highway to Girraween Drive.

Recorded Annual Average Daily Traffic (AADT) between 2020–2022 is available for two sites in the region on Great Western Highway:

- Station 6105 approximately 21 km north-west of Girraween Drive; and
- Station 6191 approximately 11.5 km south of Girraween Drive.

The data suggests that average daily traffic along Great Western Highway through Marrangaroo is likely to be between 3,500 and 4,500 vehicles in each direction. On average up to 20% of total vehicles are expected to be heavy vehicles.

The access route from the end of Girraween Drive to Mount Walker Road and to the site comprises unsealed tracks. Mount Walker Road is a fire trail managed by NPWS and the RFS. There is no data available on the usage of this trail network, however it is acknowledged that trails in the area are utilised by recreational four-wheel drivers and bikers. Locked gates at some private property boundaries currently restrict access to unauthorised users.

5.6.2 Potential impacts

Tracked, skid mount and/or truck mounted mobile drilling rigs would be used to access the site locations via the existing and established access tracks for the geotechnical investigations. Other plant and equipment will include rigid and trailer transport for drilling rigs, light four-wheel drive vehicles, support trucks, and an excavator, dozer or wheel loader for placement of construction of the access track and drill pads.

Traffic movements to and from site are expected to peak during mobilisation and de-mobilisation activities, as once drilling rigs and key equipment are transported to site, they would remain there for the majority of the duration of works. It is not anticipated that there would be any noticeable increases in traffic on the external road network during the deployment of the drill rigs, given the current percentage of heavy vehicles utilising Great Western Highway and light vehicles travelling to and from site are negligible in the context to the high average daily traffic counts. There may be some impact for NPWS, RFS and recreational users on Mount Walker Road, however these impacts are temporary and of short duration.

5.7 Air and noise

5.7.1 Existing environment

The ambient noise environment in the region is defined by natural elements and limited human activity. The investigation envelope is remote, accordingly minimum rating background noise levels (RBLs) as outlined in the NSW Environment Protection Agency (EPA) *Noise Policy for Industry* (NPfI) could reasonably be adopted.

The nearest dwellings to the investigation envelope are located about 900 m to the south of the investigation envelope, off Sir Thomas Mitchell Drive. The nearest residential community is in Bowenfels (about 2.5 km to the east of the site). There is also a Japanese Bath House used for recreational accommodation, located approximately 2 km south of the investigation envelope, adjacent to Lake Lyell. A limited number of other dwellings or buildings are scattered throughout the local area.

A review of the National Pollution Inventory (NPI) and NSW EPA EPL register was completed and indicates that there are a number of existing industrial air pollution emission sources within 50 km of the investigation envelope, primarily related to industrial developments in Lithgow and a number of surrounding mine, quarry and power generation sites to the north and east.

5.7.2 Potential impacts

Due to the remote location and temporary nature of the works, it is unlikely that residences or the general public will be affected. The drill rig would create localised noise and minor emissions of engine exhaust, dust and odours during operations. There may also be noise from general worksite activities associated with the drilling works. This would be infrequent and of limited duration and would not present a permanent impact on the surrounding environment. The required drilling vehicles would remain at the proposed site locations, so it is unlikely there would be any material ongoing traffic related noises impacting the local community.

The works may take up to six months (depending on weather and availability of resources at the time), and largely would occur progressively. As such, the proposed works are categorised as 'short-term' as defined in *Interim Construction Noise Guidelines* (ICNG), and quantitative noise assessment is not required on this occasion.

Some works are required outside the standard construction hours to allow drilling, however this is limited to day time and will not occur during night time hours. Security, response to emergencies and maintenance may also be required but are low noise generating activities. The CEMP will include measures to minimise any potential impacts of construction activities during non-standard work hours. Reasonable and feasible mitigation measures have been recommended in Section 6 to ensure compliance with the ICNG and to minimise impacts arising from drilling activities. There would be no permanent changes to noise or addition to existing background as the nature of the works is temporary.

Drilling activities also have the potential to generate vibration impacts. The nearest residences are located over 900 m from the drilling activities, and the potential for vibration impact from drilling is negligible at these distances.

5.8 Historic heritage

5.8.1 Existing environment

Searches of the following heritage registers have been completed:

- Australian Heritage Database, including the National and Commonwealth heritage lists, as well as the World Heritage List;
- State Heritage Inventory, including the State Heritage Register, Section 170 registers and local heritage items;
- Schedule 5 of Lithgow LEP; and
- Register of the National Estate (non-statutory).

Several sites listed on the Lithgow LEP are located to the east of the proposed development within the Lithgow area. No sites are within the investigation envelope or adjacent to access routes to the proposed development.

Historical maps of the Lidsdale Parish show the investigation envelope was part of a 120 acre portion (Portion 104) granted to J Flanagan in the 1800s. The property was later absorbed into Portion 103, and the boundary was extended. Maps from the mid-1900s list Mary Ann Williams as the lessee of Portion 103. The property at this stage was utilised for some form of agricultural pursuit with a building and pens located in the south-western section. The portion must have been desirable for some purpose, as it fell within a 'classified area' boundary, which were generally more expensive to lease.

It is likely that the land was at least partially cleared in the early 1900s, as it was later slated for soil conservation to prevent erosion. Aerial photographs from 1966, 1984 and 1991 confirm that modern disturbances have been limited to the establishment of Lake Lyell and the unnamed fire trail adjoining Mount Walker Road.

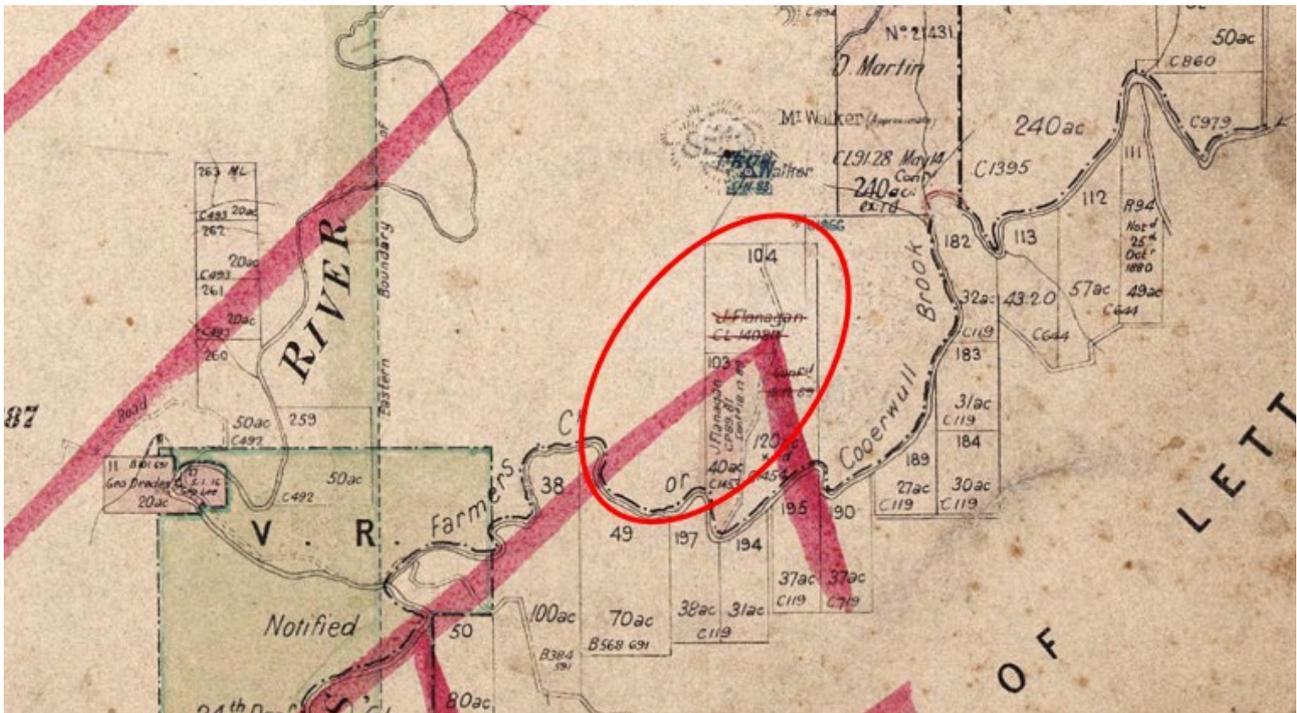


Figure 5.4 Approximate location of the investigation envelope outlined in red on a historical parish map dating to 1892 (source: HLRV)

5.8.2 Potential impacts

The investigation envelope is not within a heritage conservation area, nor have any items of historic heritage been identified within or adjacent to the investigation envelope. There is unlikely to be any direct impact on the known historic heritage values identified in proximity to the investigation envelope during the proposed development. It's considered that there is low potential for unregistered historic heritage items to be present within the investigation envelope.

5.9 Visual amenity

5.9.1 Existing environment

The investigation envelope is largely located on a ridgeline on the southern side of Mount Walker, adjacent to the Marrangaroo National Park. The area includes incised valleys and is densely vegetated on slopes ranging from 780 to a peak of 1,190 m (at the Mount Walker Trig station).

The area is rugged and remote with vehicle access limited to an unnamed fire trail from Mount Walker Road or via boat from Farmers Creek and Lake Lyell. There are no recreational sites located within the investigation envelope, although Mount Walker Road and the surrounding tracks are currently used for recreational activities such as four-wheel driving and biking. Lake Lyell campground is located some 2.5 km to the south of the site.

5.9.2 Potential impacts

It is anticipated only parts of the investigation envelope would be visible from Mount Walker Road or from Farmers Creek, in particular at BH107/108 and the associated barge transport to the site which would be visible from recreational water users during construction. The works involve the removal of some trees, however this would be minimised where possible (see Section 5.1.2). Due to the remote locations of the site and access tracks, the temporary nature of the works associated with the proposed development and surrounding native bushland, it is unlikely the proposed development would affect the visual amenity of any local receivers regarding views, privacy or overshadowing.

5.10 Public safety

5.10.1 Existing environment

The investigation envelope is within a private undeveloped parcel of land. The remote location of the investigation envelope means that public access is very limited, with vehicle access only via unnamed fire trail from Mount Walker Road, and all other access is unmarked and by foot only or via water access (to site of BH107/108).

The investigation envelope is on bushfire prone land and is partly within the Strategic Fire Advantage Zone (SFAZ) as identified in the *Lithgow Bush Fire Risk Management Plan 2020* (Lithgow BFRMP). The purpose of this zone is to:

- provide strategic areas of fire protection advantage which will reduce the speed and intensity of bush fires, and reduce the potential for spot fire development; and
- aid containment of wildfires to existing management boundaries.

The Lithgow region was affected by major bushfires during the 2019/2020 fire season, Gosper's Mountain Fire being the largest recorded fire in the Lithgow Bush Fire Management Committee area. The State Mine Fire at Marrangaroo also impacted the region previously in 2013. The main source of ignition of unplanned fires is reported to be lightning strikes; this ignition source causes around half of Australia's bushfires. Fires ignited by lightning can be difficult to suppress as they often occur in inaccessible remote areas. Other main sources of ignition include escaped fires from legal and illegal burning by private landowners/occupiers (Lithgow BFMC, 2020).

5.10.2 Potential impacts

The risk to public safety associated with use of the site access is considered low due to the low volumes of related traffic and limited public access. Access to the site during construction would be limited to authorised personnel only.

As the proposed development does not involve the construction of permanent buildings, a formal bushfire impact assessment (in accordance with *Planning for Bush Fire Protection, A guide for Councils, planners, fire authorities and developers* (PBP) (RFS, 2019)) is not strictly required and has not been completed. Instead, consideration has been given to the how the objectives can be addressed through the implementation of relevant and available mitigation measures for the type of temporary works proposed.

The proposed development does not involve works that would be considered hot works. Further, the proposed development does not involve significant ignition sources other than refuelling. Nevertheless, as the investigation envelope is within a designated bushfire prone area and the site locations are surrounded by densely vegetated, largely undisturbed bush land (which have limited access and is relatively isolated). Bushfire risks will be managed through the implementation of available mitigation measures, such as development of an Emergency Management Plan as part of the CEMP and restricting work and access during periods of elevated bushfire risks.

5.11 Social and economic

The proposed development would occur within a remote area away from local communities, adjacent to Marrangaroo National Park. The works are on land owned by EA and no private properties would be directly impacted, except for provision of access where agreements are in place.

The nearest regional centre to the works is Lithgow, located about 4.5 km to the east of the site. The nearest residences to the investigations are in the suburbs of Bowenfels and Marrangaroo to the east and north of the site, except for rural residences sparsely populated approximately 900 m – 1.5 km to the south of the site off Sir Thomas Mitchell Drive.

Potential impacts to the community and nearby residences are associated with amenity including traffic, noise and dust. Given the separation between the works and these residences, these impacts are expected to be negligible.

The proposed development would not have an impact on the safety of the community. Site access would be clearly marked and, where required, temporary controls would be put in place to ensure the public cannot access these areas. Barge launch and transport activities for access to and drilling of BH107/108 would be visible to recreational water users and potentially from campers depending on which barge launch facility is ultimately used. However, barge transport would be carried out in line with the relevant regulations for the navigable waterway, including speed limits and avoiding exclusion zones. As such, the risk of impacting the public would be appropriately managed.

The number of workers that would be temporarily accommodated within the community over the works period may be up to ~30 personnel at any one time. This number would also depend on the success of attempting to source workers who already reside in the area. Personnel would seek short-stay accommodation in Lithgow or the surrounding suburbs. There are abundant accommodation options in Lithgow. Although relatively minor, the proposed development is expected to have some positive economic benefits in the local area associated with capital spend on accommodation, goods and consumables for at least a six-month period.

The proposed work would not negatively affect economic factors, including employment, industry and property values. No specific mitigation measures for socio-economic impacts are required. However, consultation with potentially affected residences along the access route is recommended before works commence.

5.12 Waste

Minor amounts of solid waste and some recyclable wastes would be generated during the proposed development, including staff food wastes and office/packaging-type wastes and drilling consumables. This waste will be removed off-site by the contractor and disposed of at approved general waste and recycling facilities.

Cuttings generated during the proposed development will be stored in a delineated and fenced off laydown area and used/spread on site (if suitable). Any drilling fluids will be contained and captured and taken offsite for disposal.

Green wastes generated during the proposed development will be separated into:

- native vegetation, which is to be mulched and reapplied to the site as part of rehabilitation works, and
- priority weeds, which are to be disposed of in the general waste bins.

For any low-hanging branches and trees that are to be removed, where practicable, these will be recovered and placed on the site during rehabilitation works so as to provide microhabitat for fauna and flora species.

The work program site supervisor/manager and/or EA representative would complete a visual inspection of the drill pad to ensure no extraneous materials have been left on site, including any rubbish following the completion of the program.

6 Proposed environmental management measures

The following controls, along with any additional determination conditions, will form the basis for developing the site-specific Construction Environmental Management Plan (CEMP) with corresponding sub-plans within it for the proposed development, which will be developed prior to works commencing and once the drill pads and access track have been confirmed.

The CEMP will be a working document, subject to ongoing change and updates as necessary, should circumstances change during the work. The CEMP will include the following information as a minimum:

- details of all positions and contact details of all key personnel;
- audit and reporting program to ensure all actions/measures are implemented;
- training requirements, including site induction requirements to ensure that all personnel understand the principles of environmental management and requirements of the CEMP;
- emergency and incident response procedures;
- list of approvals to be obtained before activities commence;
- consultation requirements (government and community) and complaint handling procedures;
- actions for meeting environmental objectives based on the mitigation measures identified in this REF and any statutory or regulatory obligations; and
- details of the person responsible for the implementation of each action.

The construction contractor will be responsible for implementing the CEMP requirements.

Table 6.1 Summary of proposed environmental management measures

Environmental aspect	Proposed mitigation measure	Timing
General	No works to occur outside of the investigation envelope. Total clearing and disturbance is limited to 0.97 ha. The area of work should be clearly delineated before the start of any clearing activities.	Prior to construction
	Incident and emergency spill response procedures should be documented in the CEMP.	Prior to construction
	Hydrocarbon spill kits will be stored at works sites (and on plant and machinery where practical). Personnel will have training in basic spill response.	Construction
	Hazardous liquids such as fuels and chemicals will be stored securely in accordance with Australian Standards.	Construction
	Check machinery daily to ensure there are no oil, fuel or other liquids leaking from the machinery. If leak/s are detected, stand machinery down until leak is repaired.	Construction
	Where site rehabilitation of disturbed areas is proposed: <ul style="list-style-type: none"> • restore cut/fill pads to near original condition, respread and stockpiled topsoil and carry out supplementary re-seeding if required to prevent erosion; and • remove of temporary access works and site controls, if any. 	Post-construction
Biodiversity	Site personnel should be adequately informed of environmental management procedures including, but not limited to, issues relating to flora and fauna management, weed control, erosion and sediment control and water quality management.	Prior to construction
	Preparation of a construction environmental management plan. The plan should incorporate the design, construction and post-construction environmental management measures proposed. This should include (but not be limited to) issues relating to vegetation management, weed control, and erosion and sediment control and should include plans clearly showing areas to be cleared, trees to be retained and any other ‘no go zones’.	Prior to construction
	The locations of habitat features to be avoided within the investigation envelope, including hollow-bearing and potentially hollow-bearing trees, termite mounds; large rocks, large fallen trees; and Blackthorn (<i>Bursaria spinosa</i>) plants, should be physically marked by an ecologist prior to the finalisation of the location of the disturbance footprint to facilitate maximum avoidance of these features.	Prior to construction
	The removal of hollow-bearing trees, dead trees and large trees (>0.5 m diameter at 1.3 m above ground level), should be avoided wherever practicable by designing the precise location of access road and geotechnical investigation areas with consideration of the ‘structural root zone’ of trees as described in the relevant Australian Standards, <i>AS 4970-2009 - Protection of trees on development sites</i> (Standards Australia 2009). Trees to be removed and retained should also be physically marked to avoid confusion during clearing operations.	Prior to construction

Table 6.1 Summary of proposed environmental management measures

Environmental aspect	Proposed mitigation measure	Timing
Biodiversity	A weed control protocol will be included in the CEMP. This will aim to stop the spread of environmental weeds, particularly those listed as High Threat Weeds. This protocol will include wash down procedures during the construction phase (ie wash down plant and vehicles before entering the site) and weed suppression within the impact footprint.	Prior to construction
	The boundaries of areas to be cleared and trees to be retained are to be clearly defined on ground and 'no go zones' clearly signposted to prevent unauthorised clearing and vehicular and/or foot traffic. No go zones should include any trees to be retained and threatened plant species to be retained within the investigation envelope.	Prior to construction
	Vehicles, machinery and equipment must be clear of soil and plant debris before they arrive on site to minimise the potential for the introduction of weeds and pathogens.	Construction
	Pre-clearance surveys for native animal species should be undertaken immediately prior to vegetation clearing and earthworks. Any fauna present should be translocated to adjacent habitat outside of the disturbance footprint.	Construction
	An environment representative or ecologist should be present during the removal of any large (>50 cm DBH) trees, identified hollow-bearing trees, large fallen trees and rock outcrops to assist any fauna using these habitats to move into nearby habitat areas and seek veterinary assistance for any injured animals.	Construction
	Where practicable, removal of hollow-bearing trees should be undertaken in Autumn (March to May), outside the main breeding period for hollow-dependent fauna likely to occupy the site and when bat species are likely to be active and able to flee (ie, not in torpor). If hollow-bearing trees are to be removed during the breeding season of threatened hollow-dependent animals (September to February) or in winter (June to August) when bats are likely to be in a state of torpor, monitoring of breeding activity or the presence of bats should be carried out by an ecologist/s approximately one week prior to the proposed tree removal as a part of pre-clearing surveys. If nesting activity or the presence of bats is recorded, additional mitigation measures will be recommended, as necessary.	Construction
	If safe to do without significant risk to plant operators, hollow-bearing trees should be knocked several times with an excavator on the day prior to removal to encourage animals to move away immediately or overnight. Knocking should also be repeated immediately prior to the removal of hollow-bearing trees.	Construction
	Where safe for staff and practicable with regard to tree height and terrain, tree limbs containing hollows should be removed using tree-climbing techniques and/or an elevated work platform to allow hollows to be gently lowered to the ground, thus minimising the risk of injury to fauna.	Construction

Table 6.1 Summary of proposed environmental management measures

Environmental aspect	Proposed mitigation measure	Timing
Biodiversity	Where practical to do so, any trees removed should be cut and placed within the investigation envelope to provide habitat. Where this is not feasible, removed trees should be mulched and used in site stabilisation.	Construction
	During the construction phase, all works should be undertaken in accordance with general mitigation measures to be identified in the construction environmental management plan, including: sediment and erosion control, water quality management, air quality management, noise management, waste management, dangerous goods management, etc.	Construction
	When accessing construction sites, contractors should use only designated routes on existing tracks or through areas within minimal native vegetation.	Construction
	Avoid and minimise the removal of native riparian vegetation and the removal of instream habitat structures, if encountered (eg, cobbles, boulders, vegetation, large woody debris) during barge access and transport of drill rig.	Construction
	Snags (large woody habitat) are not to be removed from waterways but should be realigned or relocated as per the <i>Policy and Guidelines for Fish Habitat Conservation and Management</i> (2013).	Construction
	Include replacement of riparian vegetation with native/endemic groundcover species as part of site stabilisation of BH107/108.	Post-construction
	Complete post construction weed control activities in accordance with the weed control protocol.	Post-construction
Aboriginal heritage	In the event of unexpected Aboriginal objects, sites or places (or potential Aboriginal objects, site or places) are discovered during construction, all works in the vicinity will cease and EA will determine the subsequent course of action in consultation with a heritage professional and/or the relevant State government agency as appropriate.	Construction
	In the event that human remains are identified during works, all works in the vicinity will stop immediately and the NSW Police must be contacted. The police will attend site and determine whether the remains are human, and if human, whether they are Aboriginal in origin. No works will proceed at the location where the remains have been found until the nature of the remains is determined, and appropriate measures have been put in place depending on this determination.	Construction

Table 6.1 Summary of proposed environmental management measures

Environmental aspect	Proposed mitigation measure	Timing
Surface water	An Erosion and Sediment Control Sub Plan will be developed as part of the CEMP and specify the management of site activities through: <ul style="list-style-type: none"> • minimising the ground disturbance footprint so as to maintain existing roots and ground level vegetation (ie, grass, shrubs and undergrowth) where practicable; • constructing clean water diversions around drill pads (ie, minimising run-on); • stabilise disturbed areas following completion of the program; • regular inspection and maintaining of controls measures; and • monitoring weather forecasts and limiting unnecessary site access during periods of heavy rain fall. 	Construction
	Erosion and sediment controls will be identified in the CEMP and installed to manage surface runoff. This will be done generally in accordance with the <i>Blue Book (Managing Urban Stormwater, Soils and Construction, Volume 1, (NSW Government, 2004) and Volume 2E, Mines and Quarries (DECC, 2008))</i> .	Construction
	Handling and storage of fuels, flammable materials, chemicals and hazardous materials should be in appropriately sized, segregated, banded stores within designated and secured work sites.	Construction
	Refuelling of plant and equipment will be within designated areas at least 40 m from watercourses, or off site. Where this is not practically achievable (ie, for drill rig at BH107/108) additional controls will be implemented to eliminate potential fuel spills from entering the waterway.	Construction
	CEMP to include procedures for the capture and disposal of drilling mud.	Construction
Groundwater	Where groundwater is intercepted by excavations, a record of any groundwater dewatering (including location and quantity) will be maintained. If alluvial groundwater dewatering is predicted to exceed 3 ML/year, a water access licence will be obtained prior to exceeding that quantity.	Construction
	Develop and implement wet weather procedures to suitably prepare/stabilise disturbed areas when significant rainfall events are forecast.	Construction
Soils and contamination	Develop and implement wet weather procedures to suitably prepare/stabilise disturbed areas when significant rainfall events are forecast.	Construction
Traffic and access	Traffic management measures will be incorporated into the CEMP, including: <ul style="list-style-type: none"> • work vehicles will not obstruct public roadways or restrict access to any private properties; and • code of conduct for drivers. 	Construction
	Dust from drill and hammer machinery (if used) will be minimised by watering if required.	Construction
Air and noise	No fires will be permitted on site.	Construction

Table 6.1 Summary of proposed environmental management measures

Environmental aspect	Proposed mitigation measure	Timing
Air and noise	All employees, contractors and subcontractors are to receive an environmental induction. The induction will include: <ul style="list-style-type: none"> • all relevant specific and standard noise and vibration mitigation measures; • permissible hours of work; • list of nearest landowners and residences; • construction employee parking areas; • designated loading/unloading areas and procedures; and • site opening/closing times (including deliveries). 	Construction
	The CEMP will include measures to minimise any potential impacts of construction activities during non-standard work hours. No work during night hours.	Construction
	Community engagement: <ul style="list-style-type: none"> • a complaints handling process will be included in the CEMP, including contact details and recording of complaint information; and • in the event that a noise or vibration complaint is received, it will be responded to within 24 hours. 	Construction
Historic heritage	In the event that unexpected historical relics (or potential historical relics) are discovered during construction, all works in the vicinity will cease and the proponent will determine the subsequent course of action in consultation with a heritage professional and/or the relevant State government agency as appropriate.	Construction
Visual amenity	Rehabilitation of drill pads will be undertaken to match pre-existing conditions by re-spreading topsoil removed from each drill pad or as otherwise agreed with Lithgow City Council.	Post-construction
Public safety	Any site access arrangements in proximity to the community will be clearly marked and, where required, temporary controls will be put in place to ensure the public cannot access these areas.	Prior to construction
	Emergency procedures will be included in the site Health Safety Management Plan that considers the recommendations where relevant in the <i>RFS Planning for Bush Fire Protection, A guide for Councils, planners, fire authorities and developers (2019)</i> and include: <ul style="list-style-type: none"> • A bushfire management procedure that outlines the measures to be put in place in the event of a bushfire including proposed evacuation routes and procedures to ensure that travel through the work area remains safe for both people evacuating and emergency vehicles entering the site. • Temporary facilities will be routinely serviced to comply with the specific fire safety system requirements (eg, fire extinguishers and fire hose reels), as relevant to the structure type. 	Prior to construction

Table 6.1 Summary of proposed environmental management measures

Environmental aspect	Proposed mitigation measure	Timing
Public safety	Communicate fire weather warnings, severe weather warnings and total fire bans daily during the bushfire danger season to all staff, contractors, and visitors at the site (eg, at daily toolbox meeting). Information can be found on the fire information page (Fire danger ratings and total fire bans) of the NSW RFS website.	Construction
Waste	All general waste will be removed off site and disposed of at approved general waste and recycling facilities.	Construction
	Maximise resource re-use including recycling of construction waste where practical.	Construction
	Any cuttings generated during the proposed development which are not retained as samples will be either cleaned and used/spread on site or taken off-site to appropriate disposal).	Construction
	Green wastes generated during the proposed development will be separated into: <ul style="list-style-type: none"> • native vegetation, which is to be mulched and reapplied to the site as part of rehabilitation works or placed for beneficial reuse within the investigation envelope; and • priority weeds which are to be disposed of in the general waste bins. 	Construction

7 Conclusion

EA are seeking to carry out geotechnical investigations (the proposed development) to inform the feasibility of a PHES at Lake Lyell. The works involve drilling nine boreholes at seven sites and establishment of a new access track, on land owned and managed by EA.

This SEE has been prepared according to the requirements of the Lithgow City Council DA Guide. This SEE provides a full analysis of all environmental, physical and social implications of the proposed development. Supplementary information is also provided in relation to a controlled activity approval for works on waterfront land.

The proposed approach is to establish an envelope around all investigation sites and the required access track, referred to as an investigation envelope'. This investigation envelope is the subject of this SEE.

The environmental constraints identified and assessed within the investigation envelope will inform the location of the final disturbance footprint. The disturbance footprint for each drill pad and the site access track will be located to avoid identified environmentally sensitive areas or features where possible. The actual site and access disturbance footprint for the proposed development within the investigation envelope will not exceed 0.97 ha.

The investigation envelope is considered to be suitable for the proposed development. The potential environmental and amenity impacts of the proposed development are considered to be minimal provided mitigation measures are implemented. The biodiversity and Aboriginal heritage assessments identified the potential for constraints to occur within the investigation envelope, however the residual risk is considered low as the proposed approach allows for the project team to refine the access track and drilling pads in areas to minimise the impact and avoid constraints (such as hollow-bearing trees and patches of Blackthorn (*Bursaria spinosa*)) where possible. Other potential impacts, such as impacts to surface and groundwater, soils and traffic, are considered to be negligible. The site will also be appropriately managed to limit public access and incorporate emergency response measures in relation to bushfire risk.

In conclusion, the proposed development is considered to provide a low residual risk to the local environment and the community. EA and EMM recommend that Lithgow City Council approve the proposed development for the geotechnical program to be carried out within a defined investigation envelope to inform the overall feasibility of the PHES Project at this site. EA will continue to consult with Lithgow City Council and relevant stakeholders in ensuring the proposed development can proceed subject to the conditions of consent.

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