Hume Battery Energy Storage System Project

Environmental Impact Statement

IA213400_Hume BESS EIS | Final

31 July 2020

Meridian Energy Australia

Hume Battery Energy Storage System Project

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
01	23/07/2020	Draft	Thomas Muddle and Ada Zeng	Thomas Muddle	Nikki Wallace	Thomas Muddle
02	31/07/2020	Final	Thomas Muddle and Ada Zeng	Thomas Muddle	Nikki Wallace	Thomas Muddle

Statement of Validity

Details	Hume Battery Energy Storage System
Applicant name	Meridian Energy Australia Pty Ltd
Applicant address	Level 15, 357 Collins Street Melbourne, VIC, 3000
Land to be developed	62 Murray Street, Lake Hume Village, NSW, 3691
Formal identifier	Lot 2 Deposited Plan 1165089 (BESS and network connection) Lot 1, 2, 3 and 4 DP1135602 (switchyard connection).
Proposed development	SSD-10460– Development for the purposes of the Hume Battery Energy Storage System including: ▪ Installation, commissioning, and operation of a 20MW/40MWh Lithium-ion type batteries ▪ Construction and operational access track ▪ Ancillary upgrades to the existing substation switchyard ▪ Underground 11 kV electricity cabling infrastructure from the existing switchyard to the battery compound ▪ Installation of fencing around the perimeter of the battery compound.
Prepared by	Jacobs Group (Australia) Pty Ltd
Address	Level 4, 12 Stewart Avenue, Newcastle West, NSW, 2302 Australia
Author	Thomas Muddle Bachelor of Environmental Science, University of Newcastle and Graduate Diploma of Urban and Regional Planning, University of New England.
In respect of	State Significant Development 10460
Certification	I certify that I have prepared the contents of the Environmental Impact Statement in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* and the Secretary's Environmental Assessment Requirements dated 30 November 2018 and supplementary Environmental Assessment Requirements issued 28 April 2020. This Environmental Impact Statement contains all available information that is relevant to the environmental assessment of the development and to the best of my knowledge the information contained in the Environmental Impact Statement is not false or misleading.
Signature	
Name	Thomas Muddle
Date	28 July 2020

Glossary of terms and abbreviations

Terms and abbreviations	Description and definitions
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
AEMO	Australian Energy Market Operator
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ALWBM	Australian Landscape Water Balance Model
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASC	Australian Soil Classification
ASGS	Australian Statistical Geography Standard
BAM	Biodiversity Assessment Method
BCD	Biodiversity and Conservation Division of the Department of Planning, Industry and Environment
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BFPL	Bush Fire Prone Land
BOS	Biodiversity Offset Scheme
CEMP	Construction Environmental Management Plan
CIV	Capital Investment Value
CLM Act	Contaminated Land Management Act
CMP	Conservation Management Plan
CNVG	Construction Noise and Vibration Guideline
COAG	Council of Australian Governments
CSSI	Critical State Significant Infrastructure
CTMP	Construction Traffic Management Plan
DAWE	Department of Agriculture, Water and the Environment
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Climate Change and Water NSW
DELWP	Department of Environment, Land, Water and Planning Victoria

DER	Distributed energy resources
DISER	Department of Industry, Science, Energy and Resources
DPE	Department of Planning and Environment NSW
DPIE	Department of Planning, Industry and Environment NSW
EESG	Environment, Energy and Science Group of the DPIE
EIS	Environmental Impact Statement
EMF	Electromagnetic fields
ENA	Energy Networks Australia
EPA	Environment Protection Authority NSW
EPBC Act	Environment Protection and Biodiversity and Conservation Act 1999
EPL	Environment Protection Licence
ERP	Estimated resident population
FCAS	Frequency Control Ancillary Services
FFR	Fast Frequency Response
FORANE® 410A	A non-ozone depleting refrigerant
FTE	Full Time Equivalent
GDE	Groundwater Dependent Ecosystem
GMA	Groundwater Management Area
GPS	Global Positioning System
GSG	Great Soil Group
GSSCA	Greater Capital City Statistical Area
HGL	Thurgoona Hydrogeological Landscape
HPS	Hydro Power Station
HVAC	Heating, ventilation and air conditioning
ICNG	Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICOMOS	International Council on Monuments and Sites
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
ISP	Integrated System Plan
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
MDBA	Murray-Darling Basin Authority

MNES	Matters of National Environmental Significance
MW	Megawatt
Mwh	Megawatt hour
NEM	National Energy Market
NGIS	National Groundwater Information System
NML	Noise management level
NPI	Noise Policy for Industry
NPW Act	National Parks and Wildlife Act
NSCAS	Network Support and Control Ancillary Services
NSP	Network Service Provider
NSW	New South Wales
NTS Corp	Native Title Service Provider for Aboriginal Traditional Owners in NSW and ACT
NVIA	Noise and Vibration Impact Assessment
OEH	Office of Environment and Heritage
PAD	Potential archaeological deposit
PCT	Plant community type
PHA	Preliminary Hazard Analysis
POEO Act	Protection of the Environment Operations Act 1997
PPF	Principal profile form
PSAT	Pollution Source Assessment Tool
PVC	Polyvinyl chloride
RAP	Registered Aboriginal Parties
RBL	Rating background level
REP	Regional Environmental Plan
RET	Renewable Energy Target
RFS	Rural Fire Service
RMS	Roads and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SES	State Emergency Service
SHR	State Heritage Register
SRAS	System Restart Ancillary Services
SSD	State significant development

SSI	State significant infrastructure
SWL	Sound power level
SWMP	Surface Water Management Plan
TAFE	Technical and further education
TCFD	Task Force on Climate-related Financial Disclosures
UNFCCC	United Nations Framework Convention on Climate Change
VIA	Visual Impact Assessment
VIC	Victoria
WAL	Water access licence
WRPA	Water resource plan area

Contents

Executive Summary

Project summary

Meridian Energy Australia Pty Ltd (a subsidiary of Meridian Energy Limited) (collectively, Meridian) is an electricity generator and retailer operating in Australia and New Zealand. Meridian's focus is on producing and retailing energy from exclusively renewable sources, including hydro and wind energy. Meridian is the current owner and operator of the Hume Dam Hydro Power Station (HPS), located at Lake Hume in southern NSW.

The HPS was commissioned in 1957, originally comprising of two 25 Megawatt (MW) turbines. These turbines were upgraded in 2000 to 29MW each. Meridian took over operation of the HPS following acquisition of GSP Energy Pty Ltd in 2018. The Hume Dam Hydro Power Station is currently Meridian's largest hydro power project in Australia based on annual energy production, transmitting power to both Albury in NSW, and Wodonga in Victoria.

Meridian is proposing the development of the Hume Battery Energy Storage System (BESS), to be connected to the existing switchyard currently servicing the HPS (the Project). The HPS is connected to both the AusNet (66kV) and TransGrid (132kV) networks, and there is currently capacity for additional supply to be connected. The proposed installation of a 20 Megawatt (MW) /40 Megawatt-hour (MWh) BESS would be located within WaterNSW landholding that currently houses the existing HPS and aims to respond to the needs of the National Energy Market and unlock new revenue streams, while supporting local and regional socio-economic growth.

The Project aims to showcase the relevance and opportunities offered by the solution of BESS coupling with an existing hydropower generation asset that has its dispatchability restricted by water release regulations. Under the expected operation mode, by charging the battery during low electricity demand period with hydropower output, the BESS can provide a range of services based on market signalling. As a result, the economic benefits of the electricity generated by the hydropower station is maximised. The Project is the first of its kind in Australia and is an important proof-of-concept for providing valuable new solutions for dispatchable electricity generation. The newly adopted technology solution would bring the Hume hydropower station into the 21st century and can be replicated at other run-of-river hydropower stations in Australia, effectively future proofing these older hydropower stations for generations to come.

Statutory context

The Project is located within the Albury Local Government Area and is zoned RU2 Rural Landscape. Under clause 34 of Division 4 of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP), electricity generation works is permissible to be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. Land which is zoned RU2 is prescribed zones for the purposes of clause 34 of ISEPP. Accordingly, the Project is permissible with development consent.

The Project meets the definition of 'electricity generating works' provided in the *Standard Instrument (Local Environmental Plans) Order 2006*. Given the Project is a development for electricity generating works and has a capital investment value of more than $30 million, the Project is accordingly classified State significant development (SSD) under the *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP SRD) and is subject to assessment and approvals under Part 4 Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This Environmental Impact Statement (EIS) has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE) on 14 May 2020. The EIS focuses on key issues of biodiversity, heritage, land, visual, noise, transport, water,

hazards, socio-economic and waste impacts. The EIS has not found any issues that would preclude the approval of the Project by the consent authority.

A summary of the findings from the assessment of key issues identified in the SEARs is provided in the following sections.

Biodiversity

A Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the Biodiversity Assessment Method (BAM) to assess the biodiversity impact and offsetting obligation of the Project under the *Biodiversity Conservation Act 2016* (BC Act).

The Project design has taken into consideration the principles of avoidance and minimisation. A number of alternatives were considered prior to selecting the current design. Direct impacts, indirect impacts and impacts on prescribed matters have been avoided and minimised where possible and further efforts are proposed as part of the detailed design process. A range of mitigation and management measures have been incorporated into the Project to reduce impacts on biodiversity during construction and operation.

No Serious and Irreversible Impacts were identified within the Development Site.

Biodiversity credit obligation have been calculated using the Biodiversity Assessment Calculator and presented in the BDAR. Offsets were identified as being required for the Squirrel Glider, however the impact area is so small that no credits were generated by the calculator. A summary of the biodiversity credit requirements for the development include:

- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266) – Poor: 1 credit
- River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) – Poor: 1 credit
- Squirrel Glider (*Petaurus norfolcensis*) – 0 credits

Heritage

Aboriginal heritage findings

An Aboriginal Cultural Heritage Assessment Report (ACHAR) has been prepared to assess potential Aboriginal and historic heritage impacts of the Project. This included consultation with the local Aboriginal community in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010).

A search of the Aboriginal Heritage Information Management System (AHIMS) register was carried out on 23 June 2020 for the Project area and no previously recorded sites are present within Lot 2 DP1165089. Thirty-six previously recorded sites are present within the wider search area.

The field survey was carried out on 15 November 2019 and 26 June 2020. The survey investigated the areas that would potentially be impacted by the Project and was undertaken by a team of one archaeologist and three Site Officers from the Registered Aboriginal Parties (RAPs).

The field survey identified no Aboriginal objects within the Project area. One area of potential archaeological deposit (PAD) was identified within the Project area. The significance of the PAD could not be assessed based on the data gathered during the archaeological survey and further test excavations have been proposed.

For the purpose of this assessment, a precautionary approach has been adopted, and it is assumed that the landform retains archaeological potential unless there is compelling evidence of severe site disturbance. As such, the PAD would be directly impacted by the Project. No known or potential items within a wider search area outside the Project area would be impacted.

The ACHAR concluded that, since no Aboriginal objects or places have been identified in the Project area, no construction or operational impacts would be expected to such items. However the PAD would be directly impacted and the proposed test excavations would be carried out prior to construction to assess if there are any subsurface materials present and consider the significance of the site if any are found.

Non-Aboriginal heritage findings

A Statement of Heritage Impact (SoHI) has been prepared to assess potential non-Aboriginal heritage impacts of the Project. Searches of National, State and Local heritage databases identified nine heritage items within the vicinity of the Project, and a site inspection carried out on 26 June 2020 was able to ground-truth the known heritage site values.

A review of a Conservation Management Plan prepared for the Hume Dam included four heritage items in close proximity to the Project. These include Nissan huts, the Road layout, Culverts, drainage and retaining walls, and Archaeology associated with upgrade works (1950-1961). These heritage items would require protective fencing to prevent any risks of accidental damage.

The SoHI and site inspection concluded that no listed heritage items or features are likely to be impacted by the construction and operation of the Project.

Land

The SEARs for land is focused on the potential for land use conflicts.

Current land uses and land zoning were reviewed and potential land use conflicts have been assessed. Consultation was also carried out with WaterNSW to inform the impact assessment. The current land use surrounding the Project area includes tourist village and accommodation, recreational uses, heritage conservation of Hume Dam and associated works areas, farming and grazing land, sewerage treatment and habitat protection to preserve Sugar Gliders.

The nearest residential property is located north of the Project area, across Trout Farm Road and the Project footprint is not currently used for economic purposes and has recently been fenced for potential grazing purposes to manage bushfire risks.

Land use conflicts for the Project are summarised as follows:

- Land use conflicts associated with noise would be limited to the construction phase of the Project and be limited to a maximum of nine months. Reasonable and feasible mitigation measures are available and would be implemented to minimise noise impacts (Refer to Chapter 12).
- Visual impacts would occur during both construction and operation but not to an extent they would unreasonably infringe on amenity of surrounding land uses (Refer to Chapter 11).
- Air quality impacts would be unlikely to extend off-site and would be managed so as not to infringe on amenity of surrounding land uses. Batteries do not emit gasses during normal operations and the Project would not have odorous qualities, characteristics or attributes with potential to interfere with local amenity.

- A minor increase in traffic on local roads is predicted but not to the extent that it would restrict or interfere with access for the general public (Refer to Chapter 13). Traffic management within the WaterNSW lands would be subject to a traffic management plan to be agreed with WaterNSW.
- The minor increase in impervious surface within the overall catchment would lead to a minor increase in run-off but with proposed mitigation measures this would not cause land-use conflicts (Refer to Chapter 14).
- A conflict with the use of the site for habitat and connectivity for squirrel gliders has been identified. Impacts have been assessed in accordance with the Biodiversity Assessment Method and would be mitigated as described in Chapter 7.

Short term land use conflicts are considered manageable with the standard mitigation measures proposed for the Project and no long-term land use conflicts are considered to exist for the Project.

Visual

The Project is located on land owned by WaterNSW in Albury City Council set back from the Murray River north of the Hume Dam. The surrounding area is dominated by the Hume Dam which is a visual landmark, as well as grassland and grazing farm land with few residential properties. The Project area is not visually prominent within the landscape due to the rolling hills in the surrounding landform and mature trees.

The Project involves localised modification to landform levels using a combination of cut and fill and introduces relatively low-level structures. However, it is considered that the nature of the works would not significantly alter the vertical prominence of the site within the landscape. The Project site does not appear as visually prominent within either residential or publicly accessible areas within the immediate locality. Views of the Project are summarised as follows:

- Filtered views into the site are available from a section of Trout Farm Road directly north and northwest of the site, with screening provided by trees and embankment adjacent to the road.
- The site is not visible from either the single residential property to the north or the residential leisure village to the east.
- The length of the dam walkway has visibility of the site as part of 360 degree panoramic views. The site is viewed over a distance of approximately 700 metres from the dam and is partially filtered by intervening vegetation.
- The site is also visible within distant views from the west and southwest from the River Murray and the River Murray Reserve although views are likely filtered by landform and intervening vegetation.

Moderate impacts upon views from the Hume Dam and an adjacent viewing platform were identified based upon the high sensitivity to change resulting from the recreational value of views from the structure. The magnitude of change upon the view from the dam is however considered to be low, given the distance over which the changes would be seen and the relatively small scale of the proposed changes. It is considered that the Project would form part of the grouping of buildings and infrastructure associated with the dam and therefore integral to its function and of interest to visitors.

Impacts from the three viewpoints on Trout Farm Road experience negligible impacts due to the visual screening provided by intervening landform and trees.

Noise and vibration

Existing environment

The nearest noise sensitive receivers are located around 300 metres from the Project and includes residential properties and temporary accommodation. Heritage items which may be sensitive to vibration impacts are located around 150 metres south of the BESS compound, but within 10 metres from the trenching works for the underground cable (Nissan huts).

The prevailing winds and temperature inversions could potentially cause noise-enhancing meteorological effects, which require consideration as part of the impact assessment.

In the absence of monitored background noise levels, minimum rating background levels (RBLs) are used for the purposed of noise assessment.

Findings

Overall sound power levels (SWLs) were estimated for each construction phase and have been determined based on sequencing and plant and equipment provided by Meridian. Key construction activities including civil works and mechanical or structural activities have the highest predicted noise levels. Other activities including additional construction traffic movements also have noise emissions.

The day time noise management level (NML) was predicted to exceed 45 dB(A) at some residential receivers during both civil works phase and mechanical or structural works phase. At the nearest residential receiver, located around 200 metres north of the Project, an 12 dB(A) exceedance during day time hours is predicted in the absence of mitigation and additional mitigation measures. This is considered to be to be moderately intrusive.

Considering the worst-case scenario of an 28 additional vehicle movements generated during construction of the Project, the resulting increase in noise levels at the most-affected receiver would be around 0.1 dB(A), which would not exceed the criteria for additional management measures under relevant traffic noise guidelines.

Some vibration impacts would be generated from construction equipment, however, the nearest sensitive receivers are located further than the setback distances and it is concluded that vibration impacts would be unlikely during the Project.

Operational noise levels would be considerably less than the lowest criterion of 35 dB(A) and would be at an acceptable level below sleep disturbance criteria at nearby residential and industrial receivers.

With the implementation of standard noise mitigation measures, significant noise impacts are unlikely.

Transport

Existing environment

The Project area is bordered by Trout Farm Road and Murray Street. Other roads in the vicinity are Riverina Highway and Bonegilla Road. The Level of Service (LoS) criteria ranks all the surround roads as the highest level of operation condition and all roads operate with ample spare capacity.

Findings

Both light and heavy vehicles accessing the Project site would use Murray Street and Riverina Highway to and from Albury. The traffic impact of oversized vehicles on the existing road network is considered minimal.

The main activities involved during Project construction that would generate traffic include the delivery of construction materials, equipment, plant components and construction personnel accessing the site. The volume of construction traffic associated with the Project is low and would have minimal impact on local roads including Murray Street and Trout Farm Road.

During Project operation there would be light vehicle access to the site for maintenance of the Project twice a year, otherwise the operation of the Project is expected to generate less traffic than during construction.

It is concluded that the overall traffic impacts on the surrounding road network, public transport and active transport networks would not be significant.

A traffic management plan would be prepared in consultation with WaterNSW to manage internal access conflicts that may eventuate.

Water

The potential surface water and groundwater impacts of the Project, including water supply requirements and erosion and sediment control measures have been assessed as part of this EIS.

Existing environment

The Project area is located in the Murray-Darling River Basin within the Thurgoona Hydrogeological Landscape. Freshwater runoff is an important water source in the local landscape and, along the river valleys and slopes, the soils are generally deep and poorly drained.

The Project area is around 300 metres north of the River Murray and there are no mapped watercourses within the Project area. The Project is also located downstream of the Hume Dam and Lake Hume reservoir, and would not affect hydrology and water quality within the dam.

The Project area is located along a ridgeline and drainage through the area would flow into the River Murray in a westerly to south-westerly direction via a terrestrial wetland located around 200 metres south-west of the Project.

Findings

During construction the water from the Project compound, construction laydown area and access track would be directed to the existing drainage line which discharges into the River Murray. Appropriate erosion and sediment controls would be implemented to avoid and minimise runoff using energy dissipators and scour protection to direct runoff into a sediment basin. Following construction, drainage features and disturbed areas would be reinstated and rehabilitated to achieve pre-construction natural flow characteristics.

Up to 60,000 litres of water is expected to be required for compaction and dust suppression activities during construction. The Project would source water from standpipes and be carted to site using a tanker under a water authority agreement. A 45,000 litre fire water tank would also be filled during construction. No water is required for the operation of the Project.

The Project would increase impermeable surfaces in the area, which would lead to an overall increase in surface water runoff and potentially increased erosion risks. The Project area is relatively minor compared to total catchment size and the Project is unlikely to result in significant impacts to local hydrology and water quality. As such, the overall impact to surface water quality is considered low in magnitude during both construction and operation.

Hazards

Existing environment

The BESS compound would be located:

- On small ridgeline mapped as Category 2 vegetation in relation to bushfire risks but over 150 metres from category 1 vegetation located downslope to the west
- Approximately 200 metres from the nearest industrial building (WaterNSW warehouse)
- Over 200 metres from residential development
- At an elevation above where flooding could impact the BESS.

Hazardous substances

The Project does not involve the use of dangerous goods or otherwise hazardous substances in excess of screening criteria within The Hazardous and Offensive Development Application Guidelines - Applying SEPP 33 (Department of Planning, 2011) and does not alter how such chemicals are stored or handled associated with existing site operations. As such, the Project does not intensify the existing risk profile of the site and is not considered a potentially hazardous or offensive development.

Bushfire risk

The BESS would be provided with a fire detection and suppression system that would operate to remove the risk of spontaneous combustion within the BESS spreading either within the BESS compound or to surrounding vegetation. With operational spontaneous combustion managed through this fire detection and suppression system, the following bushfire risks are identified for the Project:

- Construction of the Project could introduce additional fire ignition risks
- Construction and operation of BESS may not be adequately considered in the bushfire emergency response management
- Additional on-site infrastructure may not be adequately protected from existing bushfire threats.

BESS components would generally be provided with a 20 metre cleared buffer to surrounding land with permanent access to surrounding BESS components to provide both access and a defendable space.

The western end of the BESS compound is the proposed location of the construction compound which would be completely cleared associated with the Project. Opportunity to increase asset protection from this side is available and would be considered in the detailed design if necessary. A 45,000 litre water tank dedicated for fire fighting purposes would also be positioned outside the BESS compound and directly situated adjoining the main gate entry for easy access.

An emergency response plan would be prepared in consultation with WaterNSW, NSW Rural Fire Service, and local land services. This would be provided to the Local Emergency Management Committee.

EMF

Underground electrical cables typically have no electric fields as these are effectively screened by ground cover while magnetic fields at the centreline are higher, but disperses much more rapidly, than for overhead cables. The source of a magnetic field is the current flowing through a conductor (the underground cable). The magnetic field decreases with the distance from the conductor.

The net current within the underground electrical cable installation would not exceed 2000 Amperes. Based on the Energy Networks Australia EMF Management Handbook (ENA, 2016), the resulting compliance distance will be less than 0.4 metres for Occupational exposure to EMF and less than two metres for General Public exposure. As the cables would be buried approximately one metre deep, and not in publicly accessible locations, the exposure to any people at ground level will be below the applicable ICNIRP reference limit for magnetic fields.

Socio-economic

A socio-economic assessment has been undertaken with the method informed by the requirements of the *Social impact assessment guideline for State significant mining, petroleum production, and extractive industry development* (DPE, 2017) (DPE social impact guideline).

Lake Hume Village is a small tourist village located about 300 metres east from the project site. It comprises a tourist park, a resort, and several cottages and villas. Beach and boat ramp facilities are available via Lake Hume Village, allowing access to Murray River and Lake Hume. One rural residential dwelling is also located 200 metres north of the project site across Trout Farm Road.

Lake Hume supports a large and diverse range of values and uses including water for irrigation, urban use (towns and cities), domestic and stock use, recreation and tourism opportunities. Lake Hume is valued by local and regional communities for its environmental, scenic amenity, cultural heritage and recreational values and supports numerous sport and recreation clubs. Hume Dam is of state historical significance for its role in the management and conservation of water within the Murray basin and as one of the great engineering projects of the inter-war period and one of the greatest water conservation projects in Australia.

Community services and social infrastructure

The project does not directly impact on existing community services or social infrastructure in the study area.

The Albury LGA is provided with a high level of community services and facilities, including health and medical services, emergency services, cultural facilities and recreation, leisure and sporting facilities. Given the number of construction workers required for the project, potential impacts on existing services and facilities due to increased demand are unlikely.

Employment

The project would impact positively on employment through the creation of direct employment opportunities through the construction phase. The project is also likely to generate indirect jobs in local, regional and national businesses and industries from increased economic activity and spending at businesses providing goods and services to support construction activities.

Accommodation

It is expected that construction workers from outside local and regional communities would be accommodated in short-term visitor accommodation in Lake Hume Village or Albury. This would increase demand for temporary

accommodation options, such as cabin and motel accommodation. The peak occupancy rate for visitor accommodation in the Albury LGA was 56.6%. The use of some of the available, under-utilised tourist accommodation for temporary workforce accommodation would provide economic benefits

Community values

During construction, potential impacts on community values may be associated with:

- Increased noise and construction traffic, resulting in temporary disruptions to amenity for residents and visitors in Lake Hume Village
- Increase in construction traffic using local roads, resulting in possible road safety risks for motorists, pedestrians and cyclists, particularly within Lake Hume Village, and influencing perceptions of road safety for some people.

Any impacts are likely to be minor and are expected to be appropriately managed with the implementation of environmental and traffic management measures and consultation and communication with local communities.

Construction of the project would not impact on access to Lake Hume for fishing, boating or other water-based activities.

Waste

During construction, waste would be generated associated with the following activities:

- Clearing of vegetation for access track and BESS compound and works area
- Earthworks to create BESS compound and access track
- Trenching for cable installation
- Demolition of redundant shed at Switchyard
- Installation of foundations for BESS and switch room building
- Installation of above ground civil, mechanical and electrical plant and equipment
- Worker facilities including office, lunchroom and ablutions.

The operation of the Project is not anticipated to generate waste. Battery cores would be taken back by the technology provider for re-purposing while steel components would be recycled.

Waste avoidance would be achieved as follows in relation to the design and construction of the Project:

- Selection of battery technology being delivered in an assembled state avoids significant volume of packaging waste
- Use of pre-assembled battery technology minimises construction duration reducing the generation of putrescible waste and liquid waste associated with worker
- Project layout has been refined to minimise excavation by the introduction of a benched BESS platform reducing the volume of cut material requiring management.

Resource recovery would be achieved as follows in relation to the Project:

- Battery cores would be returned to the technology provider for reprocessing
- The Project design would seek to achieve balanced cut and fill with only material unsuitable for re-use requiring off-site disposal

- Cleared vegetation would be distributed to surrounding vegetation, mulched for use in rehabilitation or taken to the local green waste processing facility
- The use of recycled products would be explored as part of detailed design but use would be limited based on local availability and suitability
- Packaging materials would be segregated for recycling where possible

Any necessary waste disposal would be undertaken using licenced waste transporters and facilities. Local disposal options are available for all anticipated waste streams.

Justification

The benefits of the Project, being the improved electricity dispatchability and storage capacity outcomes for the operation of Hume Dam HPS offered by coupling BESS with existing hydropower generation asset, are considered to outweigh any identified adverse impacts in the short and long term. While some environmental impacts cannot be avoided, in all cases they would be minimised through the design process and implementation of mitigation measures.

The suitability of the site

The Project is for the purpose of electricity generation and the land is appropriately zoned for this purpose. The objectives of the RU2 zoning where the majority of the Project would be located are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base
- To maintain the rural landscape character of the land
- To provide for a range of compatible land uses, including extensive agriculture.

The Project is considered a compatible use of this land and does not conflict with ongoing operations or existing surrounding land uses as described in Chapter 10.

Social costs and benefits

The Project would have some localised social impacts and local and regional benefits as described in Chapter 1. Offsite social impacts would be limited to temporary increase in traffic and noise impacts during construction. Construction of the project would not impact on access to Lake Hume or Murray River for fishing, boating or other water based activities.

The Project does introduce a new facility which would be visible from existing view points associated with the Hume Dam. Visual impacts would be limited due to the distance, intermittent screening vegetation and the existing presence of similar infrastructure in the vicinity of the Project as described in Chapter 11.

The Project does not introduce land use conflicts to any surrounding land uses and would not be audible off site at any sensitive receptor locations during operation. Additional workers during construction and operation would require accommodation but this would not exceed the capacity of the local townships. Positive social impacts include the flow-on effects of those workers accessing goods and services in the region and overall increase in reliability of the National Energy Market.

Biophysical costs and benefits

The Project involves approximately 1.2 hectares of ground disturbance and 0.44 hectares of poor quality native vegetation clearing. These impacts would be offset in accordance with the BC Act in accordance with any

approval conditions. Water management during construction and operation would be designed to prevent water quality impacts to the Murray River and to otherwise balance pre and post development flows to prevent erosion.

Economic costs and benefits

The Project has an estimated capital investment value of $32 million. This would be spent on the engagement of labour, materials, project components, plant and equipment. Plant, materials and equipment would be procured locally to the extent possible noting that battery components would be imported and some specialised labour would be required. Local benefits would also include spending by additional workers required for the Project on accommodation, food and services in the local area.

More broadly, the Project facilitates the connection of dispatchable electricity and network services identified as critical to energy security within the NEM and supports the transition to a low carbon energy future.

Public Interest

Community and stakeholder engagement has been undertaken as described in Chapter 5. The Project represents a cost-efficient private investment in the provision of dispatchable electricity and other network services into the NEM and would maximise the long-term social and economic benefits of the Hume Power Station while minimising the short term negative impacts on communities and the environment during construction.

The additional traffic and noise generation during construction have been found not to result in significant offsite impacts with the implementation of standard mitigation measures. While biodiversity and heritage impacts are anticipated, these would be minimised and mitigated to the extent possible. Biodiversity offsets would also be provided in accordance with the BC Act aimed at resulting in a neutral or beneficial biodiversity outcome.

As a result, the Project is considered to be in the public interest.

A response to submissions report would be prepared to address any issues raised in submissions and this report, along with submissions, is required to be considered by the relevant consent authority (being the Independent Planning Commission or the Minister for Planning and Public Spaces by delegate) in determining whether to approve the Project and, if so, on what conditions.

Summary and conclusion

This EIS provides a description of the Project, existing information on environmental context and potential for environmental impacts. This EIS has been prepared addressing the SEARs issued by the NSW DPIE on 14 May 2020 and focuses on key issues of biodiversity, heritage, land, visual, noise, traffic, water hazards, socio-economic and waste impacts. Based on the findings of the EIS the Project is considered able to be approved by the consent authority. The overall Project benefits including dispatchable electricity and other network services are considered to outweigh the environmental and limited social impacts.

1. Introduction

1.1 Project overview

Meridian Energy Australia Pty Ltd proposes to develop the Hume Battery Energy Storage System (BESS) Project (the Project), to be constructed on WaterNSW land near the pre-existing Hume Dam Hydro Power Station (HPS) in New South Wales (NSW). The project is proposed to be undertaken in the Albury City Council Local Government Area (LGA), with an estimated capex cost of $32 million.

1.1.1 Project history

The HPS was commissioned in 1957, originally comprising of two 25 Megawatt (MW) turbines. These turbines were upgraded in 2000 to 29MW each. Meridian took over operation of the HPS following acquisition of GSP Energy Pty Ltd in 2018. The HPS is currently Meridian's largest hydro power project in Australia based on annual energy production, transmitting power to both Albury in NSW, and Wodonga in Victoria.

The HPS has a generation output of approximately 203GWh each year and uses the water from Hume Dam to produce electricity using the following process and technology:

- The dam is built to store water behind it and forms a reservoir
- Water is released from the dam at intervals which passes through turbines, which is connected to the generator
- The turbine blades are turned by moving water, which converts flowing water into mechanical energy and drives the generator, which converts mechanical energy into electricity
- The electricity produced by the generator is transformed to system voltage and fed to the transmission system via the station switchyard
- The water is discharged to meet downstream water needs as a priority over energy generation.

Meridian has been investigating the feasibility of a BESS to enable the storage of the hydropower electricity. This would be done by converting electrical energy into chemical energy, which can then change back to electrical energy. This could then be released through the transmission system when needed.

1.1.2 Project objective

The main Project objective is to help address the limited dispatchability of run of river hydro power, while enabling the HPS and the connected electricity grid to be more responsive to fluctuations in demand.

This project aims to showcase the relevance and opportunities offered by coupling BESS with an existing hydropower generation asset that has its dispatchability restricted by water release regulations. Under the expected operation mode, charging the battery during low electricity demand periods with hydropower output, the BESS can provide a range of services based on market signalling. These may include the provision of:

- Wholesale energy market services
- Frequency Control Ancillary Services (FCAS), for all regulation and contingency services
- Fast Frequency Response (FFR) service
- System Restart Ancillary Services (SRAS)
- Network Support and Control Ancillary Services (NSCAS), for all service types
- Demand management services for local NSPs

- Reliability support services for local NSPs, both planned and unplanned services. This is to be facilitated via islanding and grid-forming capabilities of the BESS solution.

1.2 Project summary

The Project works would include the following elements:

- Installation, commissioning, and operation of a 20MW/40MWh BESS
- Construction and operational access track from existing internal WaterNSW access road
- Ancillary upgrades to the existing substation switchyard to connect the BESS to the National Energy Market
- Underground 11 kV electricity cabling infrastructure from the existing switchyard to the BESS
- Construction of fencing around the perimeter of the BESS compound.

The BESS would have storage capacity to facilitate maximum discharge for a two-hour period. During operation, power generated by the HPS would be used to charge the BESS during periods of low energy demand. This energy would then be available for distribution to the National Energy Market in periods of higher demand. The BESS would also be able to charge from the NEM in circumstances where the HPS is not generating.

The BESS would be connected to the existing TransGrid transmission lines to Albury and the existing Ausnet transmission line to Wodonga. The connection would be established via a short below ground cable to the existing switchyard which would require minor augmentation.

The maximum disturbance area for the project, including temporary construction areas and permanent footprint, would be approximately 1.2 hectares. Permanent infrastructure is anticipated to require less than one hectares. Batteries are expected to be mounted on concrete footings and be containerized or otherwise enclosed. Environmental controls for hazardous substances management would be provided and would be suitable for the selected technology, in accordance with applicable guidelines.

The BESS is intended to have an operational life of 20 years and, depending on the selected technology, components may be replaced and or upgraded to extend this timeframe. Following the end of economic life, above ground components would be removed and land rehabilitated to achieve a safe, stable and non-polluting condition. End of life or defective battery cells would be returned to the provider for recycling or appropriate disposal.

Further details are provided in Chapter 2.

1.3 Site and surrounds

The proposed Project site is located in southern NSW on the border of NSW and Victoria. It would be adjacent to Lake Hume Village, lying within the Albury City Council LGA. Lake Hume Village is located approximately 10 km east of Albury-Wodonga, 19km south of Bowna and 120km south-west of Wagga Wagga in NSW. The site is adjacent to the Murray River and is about 300m north of the existing Hume Dam Hydro Power Station.

The proposed Project site is on land currently owned by WaterNSW, which also hosts WaterNSW offices, the Hume Dam Hydro Power Station (HPS), and a WaterNSW-owned switchyard already in use by Meridian. Transmission lines extend from the switchyard to Albury in NSW and Wodonga in Victoria. The location of the Project site is shown in Figure 1-1.

Legend

Project footprint

State boundary

0 2 4 km

1:100,000 at A4

Data sources

Jacobs 2020
NSW Spatial Services 2019
Geoscience Australia 2019
Service Layer Credits:
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Figure 1-1 Project location

Date: 31/07/2020 Path: \\jacobs.com\ANZ\IE\Projects\04_Eastern\IA213400\22_Spatial\GIS\Directory\Templates\EIS\IA213400_GIS_F001_ProjectLocation_r1v1.mxd
Created by : XX | QA by : XX

Lake Hume Village is located around 300 metres east of the proposed Project site, consisting of mainly recreational and residential areas with less than 100 dwellings. The landscape local to Lake Hume Village and surrounds is characterised by the Murray River, residential dwellings, natural parklands, open space, and tourist areas including resort and villas. The closest residential dwelling is located around 200m from the proposed BESS and 90m from the existing site entry.

The Project site is bordered by Trout Farm Road and Murray Street, and existing access to the site is via Murray Street in Lake Hume Village. Construction of a new internal access track from the existing WaterNSW access road to the BESS compound would be required.

Existing development near the Project site include WaterNSW facilities associated with the operation of the Hume Dam, Hume Dam Maintenance works (which began in August 2019 and is scheduled to finish by the end of 2021) and Meridian operation of Hume Hydro Power Station.

The site has been subject to historic disturbance associated with the initial construction of Hume Dam and its subsequent upgrades. As a result, the site is sparsely vegetated and largely free of habitat for native fauna.

The Project site lies within the Upper Murray catchment that contains rivers such as the Mitta Mitta, Geehi, Swampy Plains and Tooma Rivers that feed into the River Murray. This upper catchment takes in the headwaters of the Murray and its tributaries and contains rugged mountain country, alluvial valleys in the east and extends about 300km to the Hume Dam in the west. The catchment covers about 2% of the area of the Murray-Darling River Basin but provides about 17% of the water, and also contains the Snowy Mountains Hydro-electric Scheme.

The elevation of the river is over 1000m in the snowy alpine regions and drops to an elevation of 150m at Hume Dam. The Hume Dam forms Hume Reservoir which is one of two major headwater storages for the River Murray, where the flows from the Upper Murray, Mitta Mitta River and some water from the Snowy Scheme are regulated through the reservoir. The Project site is next to the Hume Dam Hydro Power Station, on the north side of the Dam embankment (Murray Darling Basin Authority, 2018).

The locality has been subject to historic disturbance associated with the initial construction of Hume Dam and its subsequent upgrades. The underlying geological sediment consist of Quaternary Alluvium silt, sand, gravel, boulders and glacial moraines to the west of Lake Hume Village, and igneous Lower Devonian granite, granodiorite and tonalite dominate the lithology of Lake Hume Village and surrounds (DPIE Geoscience, 2019).

The soil landscape of the Project area above the granitic lithology consists of highly disturbed coarse sandy loam, coarse loamy sand, coarse medium heavy sandy clay. The soil type includes Haplic Brown Chromosol (ASC), Yellow Earth (GSG) and DY2.62 (PPF). The landscape has generally low local relief and the surface condition is gravelly, dry, well drained with high erosion rate (DPIE, 2020).

Vegetation at the Project site is sparse, mostly consisting of woodland grass understorey in a largely cleared area. The vegetation in the Upper Murray catchment includes expansive river red gum forests on land alongside the Murray and its tributaries, and black box stands in areas of semi-permanent wetlands on the plains (MDBA, 2020).

Two areas within the land owned by WaterNSW were considered in the Scoping Report as part of the preliminary environmental assessment. The selected location is the Northern Area, selected due to subterranean infrastructure within the southern area introducing constructability issues.

1.4 Proponent

Meridian is the proponent for the Project and the current operator of the Hume Dam Hydro Power Station, which is located next to the proposed site of development. WaterNSW own the land on which the new development is proposed to be built, as well as the existing switchyard which is proposed to be upgraded as part of project works. This switchyard is currently in use by Meridian for the Hume Dam Hydro Power Station.

Meridian Energy Australia Pty Ltd is a subsidiary of Meridian Energy Limited, a New Zealand based electricity generator and retailer. Meridian generates electricity exclusively from renewable energy sources, including hydro and wind energy. Meridian is 51% owned by the New Zealand Government and is Australasia's largest 100% renewable energy generator owning and operating ten hydro power stations and seven wind farms across New Zealand and Australia.

Meridian is deeply committed to providing energy solutions in a sustainable manner, generating and retailing electricity from exclusively renewable sources. Meridian is dedicated to 'working to build a better future for our team and the customers we sell power to' through sustainable business operation. Meridian conducts yearly carbon footprint analyses of their operations and monitor the activity of their electricity generating projects to ensure minimal environmental impact. Meridian's retail business Powershop Australia is certified as a carbon neutral retailer of electricity. The Hume BESS Project is a natural continuation of Meridian's commitment to providing reliable renewable energy solutions in Australia and New Zealand.

1.5 Report structure

This environmental impact statement (EIS) has been prepared to address legislative requirements of the EP&A Act and Regulations including the Planning Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE) on 14 May 2020. The EIS has not found any issues that would preclude the approval of the Project by the consent authority.

The EIS structure is as follows:

- Chapter 1 provides a general Project overview and describes the environmental and historic context in which it would occur
- Chapter 2 provides the full description of the Project including activities associated with construction, operation and decommissioning, where relevant, of each Project component based on current available design information
- Chapter 3 provides the statutory context for the Project
- Chapter 4 provides a strategic justification of the development focusing on the suitability of the proposed site with respect to potential land use conflicts with existing and future surrounding land uses
- Chapter 5 provides a summary of consultation undertaken by Meridian with the relevant local, State or Commonwealth Government authorities, exploration licence and mining lease title holders, service providers, community groups and affected landowners
- Chapter 6 provides a summary of how the likely environmental impacts were identified
- Chapters 7 -17 provide, or summarise the findings of attached technical environmental assessments of key issues identified in the SEARs which include Biodiversity, heritage, land, visual, noise, transport, water, hazards and risks, socio-economic and waste impacts
- Chapter 18 provides a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS
- Chapter 19 presents an evaluation of the Project as a whole, drawing conclusions on the overall merits of the Project
- Appendix A provides the Project SEARs

- Appendix B provides a SEARs compliance and cross reference table
- Appendix C provides current designs for the Project
- Appendix D provides the Project Biodiversity Development Assessment Report
- Appendix E provides the Project Aboriginal Cultural Heritage Assessment Report
- Appendix F provides the Project Statement of Heritage Impact
- Appendix G provides the Project Visual Impact Assessment
- Appendix H provides the Project Noise and Vibration Impact Assessment
- Appendix I provides the Project Transport Assessment

2. Project description

This Chapter provides a full description of the Project including activities associated with construction and operation of each Project component based on current available design information.

2.1 Project summary

The purpose of the Project is to help address the limited dispatchability of hydro power while enabling the HPS and the connected electricity grid to be more responsive to fluctuations in demand. This would generally be achieved through the construction and operation of a 20 MW / 40 MWh battery energy storage system on WaterNSW land in proximity to the existing HPS and connected to the National Energy Market via minor alterations to the existing HPS switchyard.

A summary of Project aspects for assessment is provided in Table 2-1 based on worst case consequences likely to result from overlapping project components. Further details of each Project element are provided in subsequent sections.

Table 2-1: Project summary

Project Element	Summary of the Project
Site Description	
Local Government Area	Albury
Project location	Lake Hume Village
Formal Identifier	Lot 2 Deposited Plan 1165089 (BESS and network connection) and Lot 1, 2, 3 and 4 DP1135602 (switchyard connection).
Zoning	RU2 Rural zoning
Permanent footprint	60 metres by 80 metres BESS compound fully fenced off and secured via a locked entrance gate. Approximate eight-metre-wide access track with additional batters and drainage infrastructure from WaterNSW access road to BESS compound. Switch room with building footprint of five by four metres located within the existing transformer bay replacing an existing shed.
Access	Access off Murray Street via existing WaterNSW access road and upgraded and new access track to BESS compound.
Specifications	
Capacity	Approximately 20MW of generation capacity with two-hour discharge duration.
BESS compound components	▪ 80 battery stacks with approximate dimensions of 2.5 metres in height and a footprint of 2.6 by 2.2 metres each arranged in groups of five and housing lithium-ion type battery cells, associated control systems and HVAC units ▪ Eight Power Inverters ▪ Four 6MVA 630V to 11kV Step-up Transformers ▪ Two auxiliary transformers ▪ Relay room building of approximate dimensions of 2.7 metres with a building footprint of five by three metres

Project Element	Summary of the Project
	▪ One 45,000 litre fire water tank ▪ Internal perimeter access track ▪ 2.4 metre, chain wire security fencing and locked gate.
Grid connection	Underground 11 kV electricity cabling infrastructure from the existing switchyard to the BESS. Switch room building with approximate dimensions of 3.2 metres in height and footprint of five by four metres within existing transformer bay replacing redundant shed. Minor works to existing cable pit to connect cable to existing transformers connected to the existing TransGrid and Ausgrid networks.
Construction	
Construction activities	The following construction activities are proposed: ▪ Installation and maintenance of environmental controls ▪ Upgraded construction access track from existing WaterNSW internal access road to BESS location ▪ Cut and fill to form BESS pad and construction laydown area ▪ Trenching and installation of cable from BESS to Switchyard ▪ Structural works to support BESS facilities ▪ Delivery, installation and electrical fit-out of BESS ▪ Testing and commissioning activities ▪ Minor works to connect BESS to existing switchyard ▪ Removal of construction equipment and rehabilitation of construction areas.
Cut and fill	Cut and fill is expected to be balanced. Based on the proposed layout it is estimated around 10,000 m^3 of material will be cut and filled to create a generally level pad and construction laydown area and access track.
Project construction footprint (maximum disturbance footprint assessed)	Including the BESS permanent impact area, a construction footprint in the order of 100 by 140 metre is required as illustrated in Figure 2-1. Construction disturbance would be rehabilitated once construction activity is complete. Underground cable would require trenching with approximately 1.2 metres in depth and 0.6 metres in width and involve a temporary construction area four metres wide for 50 metres from BESS compound to access track, collocated with new access track to WaterNSW access road and the 1.2 metre works area adjacent to WaterNSW access road for 240 metres to the Switchyard.
Construction Workforce	Up to 40 Full Time Equivalent (FTE) (at peak) to be preferentially sourced locally where appropriate skill sets are available and otherwise accommodated within existing temporary accommodation.
Construction Hours	Standard construction hours (Monday-Friday 0700-1600, Saturday 0800-1300 and no Sunday or public holiday work)
Construction schedule	Nine Month Construction Period and subject to obtaining and complying with planning and secondary approvals seeking to commence in early 2021 with peak

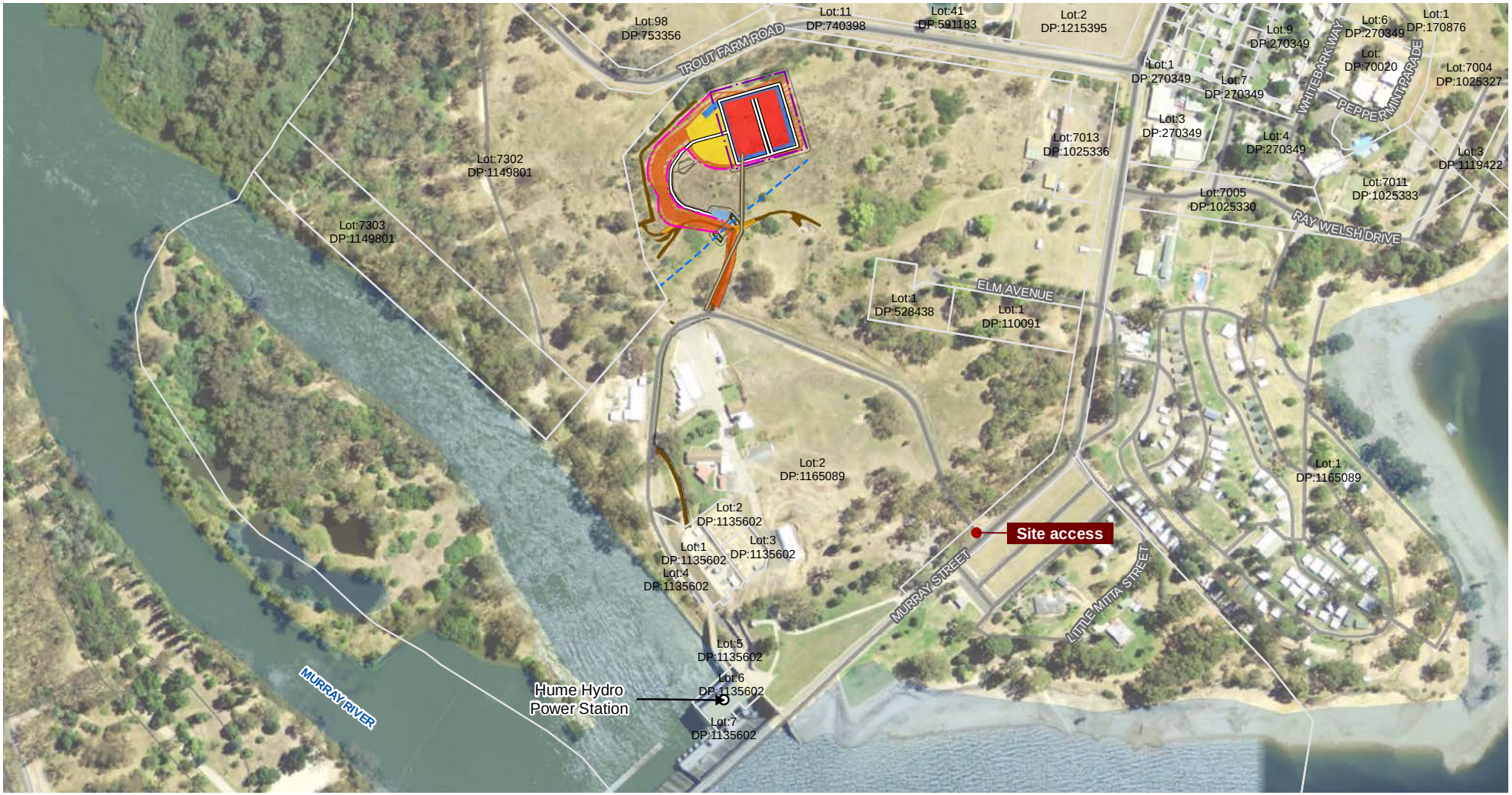
Project Element	Summary of the Project
	construction period four months after commencement and targeting May to June 2021.
Daily traffic volumes	Up to 48 light vehicles movements and 8 heavy vehicles movements per day on average. (Movements refers to one direction, so each delivery equates to two movements). Vehicle movements for associated activities are as follows: ▪ Civil works – 24 light vehicle and eight heavy vehicle movements per day over month 1-5 ▪ Mechanical / Structural – 24 light vehicle and eight heavy vehicle movements per day over month 3-4 ▪ Electrical - 24 light vehicle and four heavy vehicle movements per day over month 5-6 ▪ Testing and Commissioning - 20 light vehicle and no heavy vehicle movements per day over month 7-8.
Plant and Equipment	The following plant and equipment will be required for construction: ▪ Civil - Grader, two diggers, Bobcat, loader and drilling rig over an approximate eight week period ▪ Mechanical / Structural – 150-tonne crane over a one week period and five-tonne forklift and 12 tonne Franna crane over a 20 week period ▪ Electrical – utes and vans and 12-tonne Franna crane over a 20 week period ▪ Testing and commissioning – utes, vans and 5 tonne forklift over a 20 week period.
Materials and components	The following materials and components will be required and delivered as follows: ▪ Five tonnes of steel in one delivery ▪ 100 m^3 of concrete in 20 deliveries ▪ 5000 metres of cables delivered in five to ten drums ▪ 26 deliveries of batteries cores in 40 foot containers ▪ 15 containers of other equipment ▪ Four 6MVA 630V to 11kV step-up transformers and two auxiliary transformers in five deliveries ▪ Eight power inverters in four 40-foot containers ▪ One, Three by three metre control room ▪ Two other deliveries of miscellaneous equipment.
Construction water supply	Up to 60,000 litres of water is expected to be required predominantly for compaction and dust suppression activities. Water would be sourced from standpipes and carted to site with a tanker under agreement with water supply authority. A 45,000 litre fire water tank would also be filled during construction.
Operations	
Operational life expectancy	The Project has a target life of 20 years with components anticipated to be replaced or upgraded as required and life may be extended if feasible at the time.

Project Element	Summary of the Project
Operational workforce	The Project would be an unstaffed facility managed remotely by Meridian. Annual maintenance would be undertaken by up to two people over a one-week period each year.
Daily Operation Traffic Movements	Periodic Maintenance only involving one vehicle attending site over a one-week period every six to 12 months.
Typical operating scenario	The BESS is expected to operate on a 24 hour per day 7 day per week basis typically as follows: ▪ Two hours discharge on batteries per day ▪ Three hours charging on batteries per day ▪ 24x7 operation while on the DC interconnector and not running through the batteries.
Facility Noise Emission Level	79 dBA at 1 metre from project fence.
Fire suppression system	Battery stacks to be fitted with an automatic, internal, fire detection and suppression systems adhering to Australian standard AS214-2018 and using substances not classified as dangerous or otherwise hazardous. One, 45,000 litre tank would be located adjacent to the main entry of the BESS compound for use in bush firefighting.
Operational water supply	No water is required for the operation of the Project. The fire water tank would be filled by tanker and toped up on an as needed basis.

2.2 Project Layout

The Project layout is illustrated in Figure 2-1 and includes four main works areas being:

- BESS compound
- Access track and drainage features
- Underground 11 kV electricity cabling infrastructure from the existing switchyard to the BESS
- Switchyard connection works.



Legend

- Project area
- Existing vehicle access road
- Proposed Battery Energy Storage System (BESS)
- Proposed hardstand laydown area
- Proposed ramp
- Proposed vehicle access
- Embankment
- Re-grade ex-track
- Culvert
- Rip Rap
- Sediment pond
- Topsoil stockpile
- Cadastre
- B.E.S.S fence line
- Natural water course
- Sediment fence
- Stormwater
- Proposed cable trench line

0 100 200 m

1:5,000 at A4

Data sources
Jacobs 2020
NSW Spatial Services 2019
Service Layer Credits:
© Department of Customer Service 2020

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Figure 2-1 Project layout

2.2.1 BESS compound

The BESS compound would be located on the ridgeline to the north of the WaterNSW land as illustrated in Figure 2-1. The area consists of a gently sloping landform that is largely free of vegetation other than groundcover. Works in the BESS compound would include:

- Mobilisation and establishment of temporary construction facilities and laydown area
- Cut, fill and compaction activities to create a level pads, access track and ramps
- Installation of drainage
- Excavation and installation of small concrete footings or foundations to support inverters, transformers, battery stacks and relay room and control structures
- Delivery and installation of BESS components
- Landscaping and installation of permanent security fencing.

Figure 2-2 provides an artist's impression of a BESS stack installation (not located at the project location), and Figure 2-3 provides BESS elevations. Current design information is attached in Appendix C.

Figure 2-2: Artist's impression of BESS components

2.2.2 Access track and drainage structures

An access track from the WaterNSW internal access road would be constructed and maintained as a permanent BESS compound access as illustrated in Figure 2-1. The track would generally follow the existing dirt track to the extent possible. The existing track would be upgraded and new track installed to provide an eight metre wide track with associated permanent drainage and batters to achieve necessary grade.

Water from the BESS compound, construction laydown and access track would be directed to the existing drainage line running south-west to the River Murray. Drainage would be established to achieve the management requirements of Managing Urban Stormwater: Soils & Construction (Landcom, 2004) during construction and post construction would be converted to permanent water management features capable of maintaining water quality and quantity as per the existing situation through the implementation of any necessary permanent water management features. Construction drainage would include diversion bunds to direct water away from the BESS compound, diversion bunds and drains along the upslope side of the access track provided with energy dissipaters and scour protection directing runoff to an approximate 100 cubic metre sediment basin.

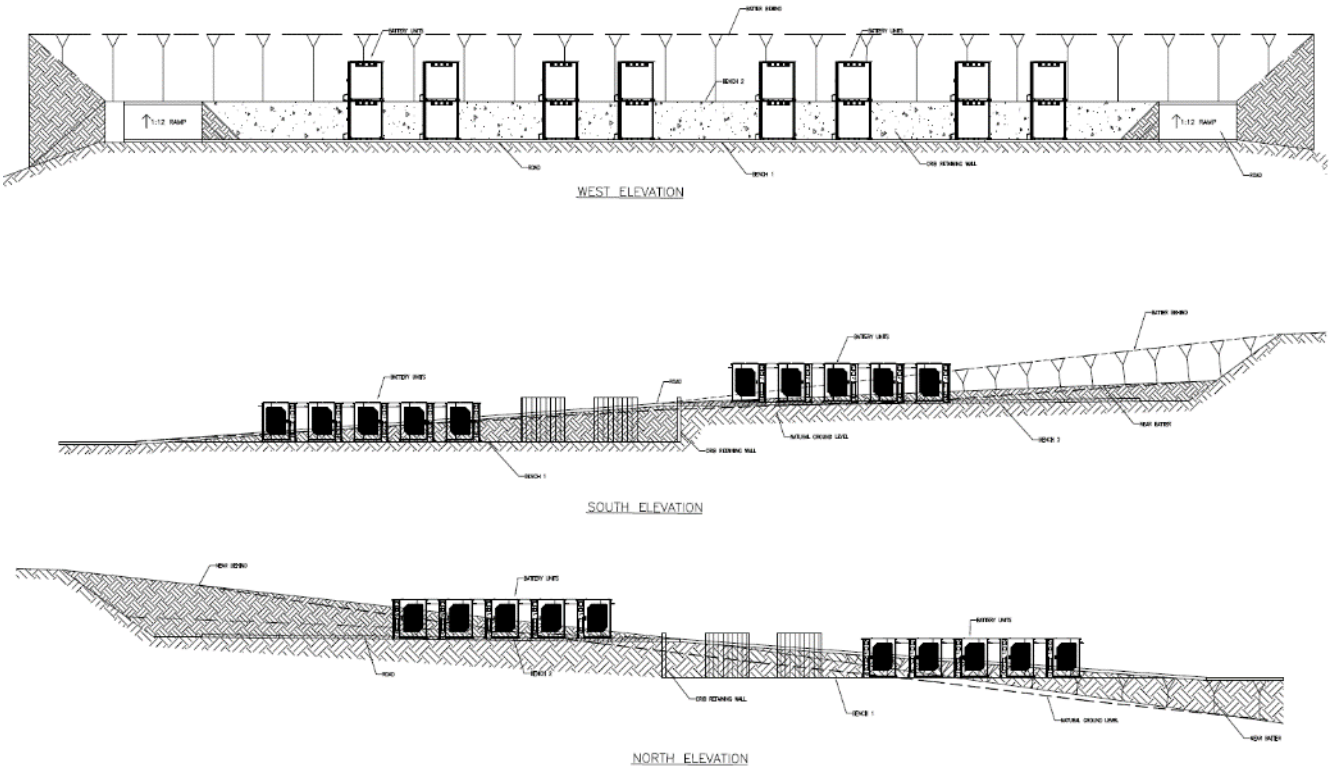


Figure 2-3: BESS compound Elevations

Following completion of construction, all disturbance areas not housing permanent infrastructure would be rehabilitated with native vegetation, drainage features would be retained and maintained to prevent erosion and the sediment basin converted to a bioretention basin or similar sized to achieve pre-development flow characteristics.

2.2.3 Network Connection

Hume Hydro-Electric Power Station (HPS) is located on the border of Victoria and New South Wales and connects to both AusNet Services' 66 kV network and TransGrid's 132 kV network. HPS contains two 29 MW hydroelectric generators first commissioned in 1957. Each generator has a dedicated 40 MW high-voltage step-up transformer that converts 11 kV inputs to 66 kV and 132 kV outputs into the Ausnet and TransGrid networks. 11 MW of spare capacity exists within each step-up transformer due to the transformer being oversize for the existing HPS generators. The project proposes connection to both the Ausnet and TransGrid networks using this identified spare capacity within the step-up transformers.

New infrastructure required to connect the BESS to the HPS and step-up transformers would involve:

- Underground 11 kV electricity cabling infrastructure from the existing switchyard to the BESS.
- Switch room building with approximate dimensions of 3.2 metres in height and footprint of five by four metres within existing transformer bay replacing redundant shed.

Minor works are also required to existing cable pit to connect cable to existing step-up transformers connected to the existing TransGrid and Ausnet networks.

2.2.3.1 Cable works

Approximate 400 metres of trenching would be required for the installation of the underground 11 kV cabling from the BESS to the switchyard. The trench would be approximate 1.2 metres deep and 0.6 metres wide for direct burial of cables. The alignment of the cable infrastructure is generally indicated in Figure 2-1 noting the road crossing may vary to accommodate heritage impact avoidance, and access disruption

Cables would be laid on 50 millimetres of thermal bedding and consist of two 11 kV cables each with trefoil arrangement spaced 0.3 metres from each other. Cables would be covered by 75 millimetres of thermal bedding over which a PVC cover would be lain. Above the PVC layer, the trench would be backfilled using excavated material from the trench, provided with a flagging layer at approximately 0.3 metres deep, compacted and revegetated to match pre-existing conditions.

The trench would be excavated using a backhoe and backfilled with excavated material immediately after completion of cable installation. The trench alignment would be rehabilitated to achieve existing conditions.

One crossing of the WaterNSW access road is required and this would be located to avoid disruption to WaterNSW access, avoid existing culverts where heritage values have been identified and be undertaken within one day or otherwise provided with road cover to facilitate access. Cable installation would be as per the above with the exception that backfill would include a 40 millimetre wearing course, 80 millimetre Binder course and 150 millimetre base course above the marker tape.

2.2.3.2 Switchyard works

Due to the existing capacity within the step-up transformers which form the point of connection of the Project to Minor works at the Switchyard are required to facilitate connection to the existing network as follows:

- Connection of the network cable to the Switchyard will require the installation of a brick switch room accommodating switchgear within the existing Transformer bay. To facilitate this, an existing, redundant shed would be removed. The switch room would house standard electrical equipment to facilitate the connection of the BESS to the existing network.
- Other than the building construction and fit out, connection works are limited to minor works to the existing cable pit at the step-up transformer to connect wiring.

2.3 Construction duration and timing

Construction of the Project is expected to proceed as follows:

- Installation and maintenance of environmental controls
- Upgraded construction access track from existing WaterNSW internal access road to BESS location
- Cut and fill to form BESS pad and construction laydown area
- Trenching and installation of cable from BESS to Switchyard
- Structural works to support BESS facilities
- Delivery, installation and electrical fit-out of BESS
- Testing and commissioning activities
- Minor works to connect BESS to existing switchyard
- Removal of construction equipment and rehabilitation of construction areas.

The construction project is anticipated to take nine months consisting and include a five-month civil works component and overlapping two month mechanical and structural component followed by two months of electrical works and three months of testing and commissioning.

All works would be limited to standard construction hours of:

- Monday-Friday 0700-1600,
- Saturday 0800-1300
- No works on Sunday or public holidays

2.4 Upgrades or Decommission

Over the life of the project, various components may require or benefit from upgrade or replacement. This is most likely to involve the replacement of battery cores within the BESS stacks but may also involve the repair or replacement of other infrastructure. If required, works intensity would not exceed, and is likely to be significantly lower than construction works described above. Should additional generation capacity also be attainable from improved technology without increasing disturbance footprint or exceeding assessed performance outcomes this may also be undertaken.

Following the end of economic life, all above ground, built infrastructure associated with the Project would be removed and the site footprint graded and rehabilitated to a safe, sustainable and non-polluting landform. Generally, this would include returning the site to as near to pre-development condition as practicable, such as removing buildings and infrastructure and rehabilitating the site using native species.

3. Statutory context

This Chapter provides the statutory context for the Project, including:

- How the Project meets the provisions and objectives of the EP&A Act and EP&A Regulation
- consideration of the Project against relevant environmental planning instruments
- Any approvals that must be obtained before the proposed Project can commence

3.1 Summary of statutory context

3.1.1 Power to grant approval

The Project involves the construction and operation of a battery energy storage system and meets the definition of the purpose of 'electricity generating works' with a capital investment value of more than $30 million. The Project is declared SSD under the State Environmental Planning Policy (State and Regional Development) 2011, and so requires assessment in accordance with Division 4.7 of the EP&A Act.

Pursuant to s4.5(a) of the EP&A Act, the consent authority for SSD is the Independent Planning Commission if the development is of the kind described in clause 8A(1)(a)-(c) of the State Environmental Planning Policy (State and Regional Development) 2011, or is the Minister for development not of that kind (although the Minister has delegated this function to senior governmental officers).

3.1.2 Permissibility

The Albury Local Environmental Plan 2010 (Albury LEP) applies to land on which the Project is located and the Project site is zoned RU2 Rural Landscape. The Albury LEP Land Use Table lists activities that are permitted without consent, permitted with consent, and prohibited in land zoned RU2. Development for the purposes of 'electricity generating works' is permitted with consent.

Under clause 34 of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. Land which is zoned RU2 Rural Landscape is a prescribed rural zone for the purposes of clause 34 of ISEPP. Accordingly, the Project is permissible.

3.1.3 Other approvals

No other licences and permits under other legislation would be required by the Project prior to commencement of construction. Network connection agreements with TransGrid and AusNet are being progressed separately.

3.2 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the planning and approvals process in NSW. It provides for the making of Environmental Planning Instruments (EPIs) including Local Environmental Plans (LEPs) and State Environmental Planning Policies (SEPPs), which set out requirements for particular localities and/or particular types of development. The applicable EPIs and the Regulations made under the EP&A Act determine the relevant planning approval pathway and the associated environmental assessment requirements for proposed development activities.

3.2.1 Objectives of the EP&A Act

Section 1.3 of the EP&A Act outlines the objects of the EP&A Act as follows:

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

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

(c) to promote the orderly and economic use and development of land

(d) to promote the delivery and maintenance of affordable housing

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

(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage)

(g) to promote good design and amenity of the built environment

(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants

(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State

(j) to provide increased opportunity for community participation in environmental planning and assessment.

Consideration of the objectives of the EP&A Act is provided in Section 19.2 and it is concluded that the Project is consistent with these objectives.

3.2.2 Relevant provisions of the EP&A Act

The relevant provisions of the EP&A Act are identified in Table 3-1.

Table 3-1: EP&A Act mandatory considerations

Statutory Reference Section	Consideration	Section in EIS
4.36 Development that is SSD	The Project is declared SSD through the application of Clause 8 and Schedule 1 of State Environmental Planning Policy (State and Regional Development) being for the purpose of energy generation and having a capital investment value exceeding $30 million.	Refer to Section 3.4.1
4.37 Staged State significant development	The application does not seek consent for a concept development application.	Not applicable
4.38 Consent for SSD	The Independent Planning Commission or the Minister for Planning and Public Spaces (by delegate) is the consent authority for SSD under Division 4.7 of the EP&A Act. The Project is neither wholly or partly prohibited, is not partially permitted without consent.	Refer to Section 3.1

Statutory Reference Section	Consideration	Section in EIS
	As such the consent authority may determine the development application by either granting conditional consent or refusing consent.	
4.39 Regulations—SSD	The regulations establish the form and content requirements for an EIS required to accompany an application for SSD and the advertising and consultation process.	Refer to Table 3-2 for further detail
4.40 Evaluation of development application	Section 4.15 of the EP&A Act applies to the determination of a development application for SSD subject to Division 4.7. Consideration of how the requirements of Section 4.15 have been addressed is provided in Section 21.3 based on the findings of the EIS.	Refer to Table 19-2
4.41 Approvals etc legislation that does not apply	The following authorisations are not required for SSD that is authorised by a development consent granted after the commencement of this Division (and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply): ▪ a permit under Section 201, 205 or 219 of the *Fisheries Management Act 1994* ▪ an approval under Part 4, or an excavation permit under Section 139, of the *Heritage Act 1977* ▪ an Aboriginal heritage impact permit under Section 90 of the *National Parks and Wildlife Act 1974* ▪ a bush fire safety authority under Section 100B of the *Rural Fires Act 1997* ▪ a water use approval under Section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the *Water Management Act 2000*. Consideration of the need for these approvals in the absence of the development being declared SSD is provided below.	Chapter 3
4.42 Approvals etc legislation that must be applied consistently	An authorisation of the following kind cannot be refused if it is necessary for carrying out SSD that is authorised by a development consent under this Division and is to be substantially consistent with the consent: ▪ an aquaculture permit under Section 144 of the *Fisheries Management Act 1994*	Chapter 3

Statutory Reference Section	Consideration	Section in EIS
	▪ an approval under Section 15 of the *Mine Subsidence Compensation Act 1961* ▪ a mining lease under the *Mining Act 1992* ▪ a production lease under the *Petroleum (Onshore) Act 1991* ▪ an environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (POEO Act) (for any of the purposes referred to in Section 43 of that Act) ▪ a consent under Section 138 of the *Roads Act 1993* ▪ a licence under the *Pipelines Act 1967*. Consideration of the need for these approvals is provided below.	

3.3 Environmental Planning and Assessment Regulation 2000

Schedule 2 of the EP&A Regulation stipulates the process to obtain SEARs required to be addressed in the preparation of the EIS and the general form and content requirements. Table 3-2 identifies how this EIS addresses these form and content requirements. The SEARs for the Project are provided in full in Appendix B.

Table 3-2: General form and content requirements for the environmental impact statement

Requirement	Location where this is addressed in the EIS
An environmental impact statement must contain the following information:	
(a) the name, address and professional qualifications of the person by whom the statement is prepared	EIS Certification Page
(b) the name and address of the responsible person	EIS Certification Page
(c) the address of the land:	62 Murray Street, Lake Hume Village, NSW, 3691
(i) in respect of which the development application is to be made or	EIS Certification Page
(ii) on which the activity or infrastructure to which the statement relates is to be carried out	EIS Certification Page
(d) a description of the development, activity or infrastructure to which the statement relates	Refer to Chapter 2
An environmental impact statement must also include each of the following:	
(a) a summary of the environmental impact statement	Executive Summary
(b) a statement of the objectives of the development, activity or infrastructure	Section 1.1.2
(c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to	Section 4.2

Requirement	Location where this is addressed in the EIS
its objectives, including the consequences of not carrying out the development, activity or infrastructure	
(d) an analysis of the development, activity or infrastructure, including:	
(i) a full description of the development, activity or infrastructure	Chapter 2
(ii) a general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected	Section 1.3 and 4.3 and Chapter 10
(iii) the likely impact on the environment of the development, activity or infrastructure	Chapters 7-17
(iv) a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment and	Chapter 18
(v) a list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out	Section 3.1.3
(e) a compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv)	Chapter 18
(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4)	Chapter 19

3.4 State Environmental Planning Policies

3.4.1 State Environmental Planning Policy (State and Regional Development 2011)

The aims of State Environmental Planning Policy (State and Regional Development 2011) (SEPP SRD) are to identify development that is SSD, State significant infrastructure (SSI), critical State significant infrastructure (cSSI) and regionally significant development. Clause 8(1) identifies that development is declared to be SSD for the purposes of the EP&A Act if it is not permissible without development consent under Part 4 of the EP&A Act, and the development is specified in Schedule 1 or 2 of the SEPP SRD.

Clause 20 of Schedule 1 identifies that development for the purpose of electricity generating works using any energy source that has a capital investment value of more than $30 million as SSD. The Project is for the purpose of 'electricity generating works' and has a capital investment value of more than $30 million. The Project is accordingly SSD.

3.4.2 State Environmental Planning Policy (Infrastructure 2007)

The ISEPP aims to facilitate the effective delivery of infrastructure across the State.

Clause 34 of ISEPP permits as follows:

(1) Development for the purpose of electricity generating works may be carried out by any person with consent on the following land—

(a) in the case of electricity generating works comprising a building or place used for the purpose of making or generating electricity using waves, tides or aquatic thermal as the relevant fuel source—on any land

(b) in any other case—any land in a prescribed rural, industrial or special use zone.

(2A) Development for the purpose of the expansion of existing electricity generating works may be carried out by or on behalf of a public authority with consent on any land that is adjacent to the existing works.

(2B) Consent is not required to carry out any such development on land if the development could, but for subclause (2A), be carried out on that land without consent.

The Project works are for the purpose of electricity storage, to facilitate dispatchable electricity generation and is located within land zoned RU2 Rural Landscape. Accordingly, the Project is prescribed for the purposes of clause 34 of ISEPP and is permissible with consent.

Under Clause 101(2) of ISEPP the consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that:

(a) where practicable, vehicular access to the land is provided by a road other than the classified road, and

(b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of:

(i) the design of the vehicular access to the land, or

(ii) the emission of smoke or dust from the development, or

(iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and

(c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road.

Vehicular access to the site will be off Murray Street which is not a classified Road. Access to Murray street is via Riverina Highway and Trout Farm Road. Both Riverina Highway and Trout Farm Road are classified roads.

Chapter 13 identifies that traffic volumes would not affect the operation of the Riverina Highway and while the Scoping Report identifies that minimal dust impacts would occur off-site. The Project is not sensitive to traffic noise. As such clause 101 of the ISEPP is not considered to limit the ability of the consent authority to consent the development.

Clause 104 of the ISEPP requires that prior to determining a development identified as a traffic generating development under Schedule 3, the determining authority is to give notice to TfNSW within 7 days of the application being made and consider and submissions received within 21 days in addition to the accessibility of the site and any potential traffic safety, road congestion or parking implications. The Project would not exceed vehicle generation thresholds to be a traffic generating facility.

3.4.3 State Environmental Planning Policy No 33 – Hazardous and Offensive Development

State Environmental Planning Policy No 33 – Hazardous and Offensive Development (SEPP 33) aims to ensure that measures are employed to reduce the impact of a development that is a hazardous or offensive industry. Clause 13 of the SEPP 33 specifies that a consent authority must not consent to the carrying out of any development on land without considering:

(a) current circulars or guidelines published by DPIE relating to hazardous or offensive development, and

(b) whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply, and

(c) in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and

(d) any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and

(e) any likely future use of the land surrounding the development.

The Project involves the expansion of existing operations on a site that is appropriately zoned and isolated from sensitive receptors. The Project would introduce the storage of substances classified under the dangerous goods code. However it does not involve the use of hazardous chemicals above screening levels that would trigger consideration as potentially hazardous development. Assessment of hazardous substances is detailed in Chapter 15.

The surrounding land is owned by WaterNSW and is appropriately zoned to prevent encroachment of development that would be incompatible with the ongoing operations of Hume HPS.

3.4.4 State Environmental Planning Policy No 55 – Remediation of Land

State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55) provides a State-wide approach to the remediation of contaminated land. The aim of SEPP 55 is to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. Clause 7 of SEPP 55 provides guidelines to be considered by the consent authority when determining development applications.

Under clause 7 of SEPP 55 a consent authority must not consent to the carrying out of any development on land unless:

(f) It has considered whether the land is contaminated

(g) 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

(h) 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.

There is nothing to indicate the site is unsuitable in its current state for the Project. Unexpected finds of potential contamination would be reported in accordance with the *Contaminated Land Management Act 1997* (CLM Act).

3.4.5 State Environmental Planning Policy (Koala Habitat Protection) 2019

The State Environmental Planning Policy (Koala Habitat Protection) 2019 (Koala SEPP) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas. By supporting a permanent free-living population over their present range of habitats it is hoped that the current trend of koala population decline would be reversed.

Albury LGA is not listed in Schedule 1 of the Koala SEPP. There is no current Koala Plan of Management in Albury LGA. The Project area is identified as Site Investigation Area for Koala Plans of Management.

The biodiversity impact assessment has assessed the Project in relation to potential for impacts on koala habitat.

3.4.6 Albury Local Environmental Plan 2010

The Project area is located entirely within Albury LGA. Relevant provisions of the Albury LEP for the purpose of Section 4.15 of the EP&A Act are as follows:

- Objectives and land use for land zoned as RU2 Rural Landscape
- Part 4 Principal development standards
- Clause 5.10 - Heritage conservation
- Clause 7.1 – Earthworks
- Clause 7.2 – Water.

Zoning

The Project area is zoned as RU2 – Rural Landscape. The objectives of the RU2 zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base
- To maintain the rural landscape character of the land
- To provide for a range of compatible land uses, including extensive agriculture.

Any development type not listed as 'permitted without consent' and 'prohibited' are considered development that is permitted with consent. The Project purpose being for the development of electricity generation works is accordingly an activity that is permissible with development consent under the Albury LEP.

The Project is considered compatible with the objectives of the RU2 zone. Impacts to landscape character are considered in Chapter 11.

Principal development standards

The Project site is not mapped under the LEP as subject to maximum building heights or floor space ratios. Principal development standards are therefore not applicable to the Project.

Heritage conservation

Clause 5.10 requires development consent for works that disturb archaeological or Aboriginal places of heritage significance. The site is not mapped under the LEP in relation to heritage conservation. Detailed Aboriginal and non-Aboriginal heritage assessments have been undertaken and consultation carried out in accordance with the SEARs.

Earthworks

Clause 7.1(3) of the Albury LEP requires that before granting development consent for earthworks, the consent authority must consider the:

- Likely disruption of, or any detrimental effect on, existing drainage patterns and soil stability in the locality
- Effect of the proposed development on the likely future use or redevelopment of the land
- Quality of the fill or the soil to be excavated, or both
- The effect of the proposed development on the existing and likely amenity of adjoining properties
- Source of any fill material and the destination of any excavated material
- Likelihood of disturbing relics
- Proximity to and potential for adverse impacts on any watercourse, drinking water catchment or environmentally sensitive area.

These mandatory considerations are addressed in the impact assessment chapters of this EIS.

Water

The Project site is mapped in the LEP as land identified as 'Sensitive Area' on the Natural Resources Sensitivity – Water Map. Clause 7.2 of the LEP specifies that:

(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider any adverse impact from the proposed development on—

(a) the water quality of receiving waters, and

(b) the natural flow regime, and

(c) the natural flow paths of waterways, and

(d) the stability of the bed, shore and banks of waterways, and

(e) the flows, capacity and quality of groundwater systems.

(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—

(a) the development is designed, sited and will be managed to avoid any adverse environmental impact, or

(b) if that impact cannot be avoided—the development is designed, sited and will be managed to minimise that impact, or

(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

Considerations have been given to water impacts in Chapter 14 and the EIS has developed management and mitigation measures accordingly.

3.4.7 Murray Regional Environmental Plan No 2 – Riverine Land

The Murray Regional Environmental Plan No 2 – Riverine Land (Murray REP) aims to conserve and enhance the riverine environment of the River Murray. The Murray REP applies to the Project area and the objectives of the plan are as follows:

> *(a) to ensure that appropriate consideration is given to development with the potential to adversely affect the riverine environment of the River Murray, and*
>
> *(b) to establish a consistent and co-ordinated approach to environmental planning and assessment along the River Murray, and*
>
> *(c) to conserve and promote the better management of the natural and cultural heritage values of the riverine environment of the River Murray.*

Under Clause 8, the general and specific principles apply when a consent authority determines a development application. Table 3-3 outlines general and specific principles in Part 2 of the Murray REP and when they are to be considered as part of the EIS.

Table 3-3: Principles of the Murray REP and where they are considered in the EIS

Principles to be taken into account	Consideration
The aims, objectives and planning principles of the Murray REP	The Project area is set on a ridgeline away from the Murray River and is consistent with the principles of the Murray REP.
Any relevant River Management Plan	No River Management Plan has been released for the area.
Any likely effect of the proposed plan or development on adjacent and downstream local government areas	Water would be managed on site such that impacts to the Murray River are avoided both during construction and operation. As such no impacts on adjacent and downstream local government areas would result from the Project.
The cumulative impact of the proposed development on the River Murray.	As no impact to the River Murray are likely, no cumulative impacts would result. No other development is occurring in the vicinity of the Project.
Access The waterway and much of the foreshore of the River Murray is a public resource. Alienation or obstruction of this resource by or for private purposes should not be supported. Development along the main channel of the River Murray should be for public purposes. Moorings in the main channel should be for the purposes of short stay occupation only. Human and stock access to the River Murray should be managed to minimise the adverse impacts of	The waterway and river foreshore would not be obstructed by the Project. The Project would not involve development along the main channel along the River Murray. The Project would not involve direct access to the River Murray and no impact to the river bank and vegetation would result from the Project.

Principles to be taken into account	Consideration
uncontrolled access on the stability of the bank and vegetation growth.	
Bank disturbance Disturbance to the shape of the bank and riparian vegetation should be kept to a minimum in any development of riverfront land.	No impacts to River Murray banks would result from the Project.
Flooding Where land is subject to inundation by floodwater— ▪ the benefits to riverine ecosystems of periodic flooding, ▪ the hazard risks involved in developing that land, ▪ the redistributive effect of the proposed development on floodwater, ▪ the availability of other suitable land in the locality not liable to flooding, ▪ the availability of flood free access for essential facilities and services, ▪ the pollution threat represented by any development in the event of a flood, ▪ the cumulative effect of the proposed development on the behaviour of floodwater, and ▪ the cost of providing emergency services and replacing infrastructure in the event of a flood. Flood mitigation works constructed to protect new urban development should be designed and maintained to meet the technical specifications of the Department of Water Resources.	The BESS compound is at an elevation that would not be subject to inundation by floodwater. Access to the compound crosses a minor drainage line and the crossing would be designed to maintain overland flood conveyance. The Project does not involve flood mitigation works.
Land degradation Disturbance to the shape of the bank and riparian vegetation should be kept to a minimum in any development of riverfront land.	The Project does not involve impacts to bank and riparian vegetation.
Landscape Measures should be taken to protect and enhance the riverine landscape by maintaining native vegetation along the riverbank and adjacent land, rehabilitating degraded sites and stabilising and revegetating riverbanks with appropriate species.	The Project would limit clearing of native vegetation to the extent possible. The need for visual screening would be considered in the final design along with habitat replacement works as discussed in Chapter 7.
River related uses Only development which has a demonstrated, essential relationship with the river Murray should be located in or on land adjacent to the River Murray. Other development should be set well back from the bank of the River Murray.	The Project site has been selected based on the need to co-locate with the existing Hume Power Station but is set back to the extent possible from the River Murray bank. The Access track to the BESS compound is approximately 200 metres from the bank and while the network connection trench is approximately

Principles to be taken into account	Consideration
Development which would intensify the use of riverside land should provide public access to the foreshore.	60 metres from the bank, this is essential in order to connect into the existing Switchyard. The BESS compound is located over 300 metres from the River Murray bank and the location was selected based on constructability, existing cleared vegetation while avoiding portions of the site with higher potential to contain historical artefacts associated with Hume Dam construction.
Settlement New or expanding settlements (including rural-residential subdivision, tourism and recreational development) should be located— on flood free land, close to existing services and facilities, and on land that does not compromise the potential of prime crop and pasture land to produce food or fibre.	The Project does not involve new or expanded settlements.
Water quality All decisions affecting the use or management of riverine land should seek to reduce pollution caused by salts and nutrients entering the River Murray and otherwise improve the quality of water in the River Murray.	The Project would not impact salt or nutrient levels entering the River Murray. The potential for water quality impacts during construction would be managed through the implementation of standard construction water quality management measures. Post construction, water quality and quantity would be maintained as per the existing situation through the implementation of any necessary permanent water management features.
Wetlands Wetlands are a natural resource which have ecological, recreational, economic, flood storage and nutrient and pollutant filtering values. Land use and management decisions affecting wetlands should— ▪ provide for a hydrological regime appropriate for the maintenance or restoration of the productive capacity of the wetland, ▪ consider the potential impact of surrounding land uses and incorporate measures such as a vegetated buffer which mitigate against any adverse effects, ▪ control human and animal access, and conserve native plants and animals.	A highly modified Carex wetland has been identified adjacent to the BESS compound access track. Design process has avoided direct impacts to this area to the extent possible. The design of permanent water management features would consider interaction with the existing wetland.

3.5 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (NSW) (BC Act) introduced mandatory requirements for biodiversity assessment and report and established the Biodiversity Assessment Method (BAM) and Biodiversity Offsets Scheme (BOS), with the key principle of 'no net loss' where any impact of development is assessed and offset, while demonstrating impact avoidance, minimisation and mitigation measures prior to implementing offsets.

Part 7 Section 7.9 of the BC Act requires that an application for State significant development be accompanied by a *'biodiversity development assessment report unless the Secretary of the DPIE and the Chief Executive of the Office of Environment and Heritage determine that the proposed development is not likely to have any significant impact on biodiversity values'.*

The BC Act defines 'biodiversity values' as follows:

> *(a) vegetation integrity--being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state,*
>
> *(b) habitat suitability--being the degree to which the habitat needs of threatened species are present at a particular site,*
>
> *(c) biodiversity values, or biodiversity-related values, prescribed by the regulations.*

Additional biodiversity value prescribed in the *Biodiversity Conservation Regulation 2017* includes:

> *(a) threatened species abundance--being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site,*
>
> *(b) vegetation abundance--being the occurrence and abundance of vegetation at a particular site,*
>
> *(c) habitat connectivity--being the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range,*
>
> *(d) threatened species movement--being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle,*
>
> *(e) flight path integrity—being the degree to which the flight paths of protected animals over a particular site are free from interference,*
>
> *(f) water sustainability--being the degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site.*

The Biodiversity Development Assessment Report (BDAR) assesses the Project on all potential direct, indirect and prescribed impacts in accordance with the BC Act and BAM. The findings of the BDAR are summarised in Chapter 7.

3.6 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NSW) (NPW Act) seeks to protect natural and cultural heritage by prescribing offences and defences relating to, but not limited to, Aboriginal heritage and the preservation of native title within NSW. Under Part 6 Section 86 of NPW Act, it is an offence to harm or desecrate and Aboriginal object or Aboriginal place, outlined as follows:

(1) a person must not harm or desecrate an object that the person knows is an Aboriginal object

(2) a person must not harm an Aboriginal object

(4) a person must not harm or desecrate an Aboriginal place.

Harm is defined under Part 1 Section 5 of the NPW Act as any act or omission that:

(a) destroys, defaces or damages the object or place, or

(b) in relation to an object—moves the object from the land on which it had been situated, or

(c) is specified by the regulations, or

(d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c),

but does not include any act or omission that:

(e) desecrates the object or place, or

(f) is trivial or negligible, or

(g) is excluded from this definition by the regulations.

Section 87(1) of the NPW Act provides that it is a defence to these provisions if the harm or desecration act is authorised by an Aboriginal Heritage Impact Permit (AHIP). Under Section 4.41 of the EP&A Act, an AHIP under Section 90 of the NPW Act is not required for SSD that is authorised by a development consent.

Nevertheless, the Project is required to comply with all legislative requirements under Part 6 of the NPW Act and the Aboriginal heritage impact assessment and consultation undertaken are discussed in Chapter 8, in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (OEH, 2010).

3.7 Native Title Act 1993

The *Native Title Act 1993* (Cth) seeks to recognise and protect native title. A successful native title determination results in the recognition of the rights, interests or uses claimed by the registered party, and any actions by Government on that land must be consistent with the claim.

Searches of the register maintained by the National Native Title Tribunal indicate there are no native title claims registered with respect to the land within the project footprint.

No Crown Land will be impacted by the Project. However, there is a Travelling Stock Reserve located adjacent to the Project site (Trout Farm, Reserve Number R68040) off Trout Farm Road. The Project is not expected to encroach or impact on the Travelling Stock Reserve.

3.8 Heritage Act 1977

The *Heritage Act 1977 (NSW)* (the Heritage Act) provides for the conservation of buildings, works, relics and places that are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the State. Matters protected under the Act include items listed on the State Heritage Register, the heritage schedules of local council LEPs, and/or the conservation registers (or Section 170 Registers) of NSW state government agencies, as well as items subject to an Interim Heritage Order.

Section 139 of the Heritage Act prohibits a person from disturbing or excavating any land on which the person has discovered or exposed a relic, except in accordance with an excavation permit or a notification granting exception for the permit.

An approval under Part 4, or an excavation permit under Section 139 of the Heritage Act is not required for SSD that is authorised by a development consent (Section 4.41 EP&A Act).

Eight records associated with the Hume Dam are listed under Section 170 of the Heritage Act as present on or in the vicinity of the site. A Heritage Impact Assessment has been completed to assess the impacts of the Project, the potential for archaeology in the Project area and mitigation management measures (if appropriate) in keeping with the State Agency Heritage Guide (NSW Heritage Office, 2005).

A statement of heritage impact (SoHI) has been prepared for the Project and is attached as Appendix E and summarised in Chapter 9.

3.9 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation relating to the environment and provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places. Under Part 3 of the EPBC Act, referral for approval from the Australian Minister for the Environment is required for an action that:

- Has, will have, or is likely to have a significant impact on a matter of national environmental significance
- Is undertaken on Commonwealth land and has, will have, or is likely to have a significant impact on the environment
- Is undertaken by the Commonwealth and has, will have or is likely to have a significant impact on the environment
- Is undertaken outside Commonwealth land and has, will have or is likely to have a significant impact on the environment of Commonwealth land

After receiving a referral, if the Minister decide that significant impacts are likely, then the action (known as a 'controlled action') requires approval under the EPBC Act. A significant impact under the EPBC Act is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. Matters of national environmental significance (MNES) include:

- World heritage properties
- National heritage places
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- Nationally threatened species and ecological communities

- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining) and
- A water resource, in relation to coal seam gas development and large coal mining development.

It is generally the responsibility of the proponent (or the land owner if owned by the Commonwealth) of a proposed action to determine whether the Project, or action, has the potential to impact upon a MNES and constitute the need for a referral to the Commonwealth for formal assessment and approval under the EPBC Act. If the development is considered to be a controlled action, further assessment of MNES, particularly threatened species, ecological communities and migratory species would be required to conclude that no significant impact is likely.

An action that is referred for consideration by the Australian Government Minister for Environment cannot be undertaken until the outcome of the referral process is completed - either through the decision of the Minister for Environment that the action is not a controlled action or that the assessment and approval process has been completed.

The recent amendments to the Bilateral Agreement between NSW Government and the Australian Government (Amending Agreement No.1 March 2020) means that the Department of Agriculture, Water and the Environment (DAWE) has endorsed the NSW Biodiversity Offsets Scheme (BOS) created under the BC Act. The BOS includes the Biodiversity Assessment Method (BAM), the biodiversity credit system, and the offset rules set out in *Biodiversity Conservation Regulation 2017*. The endorsement of the BOS applies to all NSW projects that require EPBC Act approval, and it means both NSW and Commonwealth listed threatened species and communities that may be impacted by a Project can be assessed through a single set of requirements and decision made by the NSW Government.

A search of the Commonwealth Protected Matters Search Tool on 26 May 2020 has identified the following MNES listed under the EPBC Act, within 5 km of the proposed development site, listed in Table 3-4.

Table 3-4: Protected Matters Search Tool results

EPBC Act Protected Matters Search Tool - 5 km buffer	
World Heritage Properties	None
National Heritage Places	1
Wetlands of International Importance	7
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	2
Listed Threatened Species	27
Listed Migratory Species	12
Other Matters Protected by the EPBC Act - 5 km buffer	
Commonwealth Land	1
Commonwealth Heritage Places	None

Listed Marine Species	19
Whales and Other Cetaceans	None
Critical Habitats	None
Commonwealth Reserves Tribunal	None
Commonwealth Reserves Marine	None

Consideration of commonwealth listed threatened species and ecological communities is provided in the BDAR provided in Appendix C and summarised in Chapter 7. The Project has no potential to affect commonwealth land, national heritage places, listed marine species or wetlands of international importance. Impacts to MNES are unlikely to be significant and the Project has not been referred.

3.10 Protection of the Environment Operations Act 1997

The principal legislation regulating pollution and waste management in NSW is the *Protection of the Environment Operations Act 1997* (POEO Act) which specifies the requirements for licences and regulates activities that have the potential to pollute or harm the environment. All scheduled activities as listed in Schedule 1 of the POEO Act require an Environment Protection Licence (EPL). Clause 17 of Schedule 1 lists general electricity works as a scheduled activity where they exceed the capacity to generate 30 MW. Accordingly, an EPL is not required for the Project.

Waste is defined under the POEO Act to include:

- Any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment
- Any discarded, rejected, unwanted, surplus or abandoned substance
- Any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance
- Any processed, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations or
- Any substance prescribed by the regulations to be waste.

The following classes of waste are defined in clause 49 of Schedule 1 of the POEO Act:

- Special waste
- Liquid waste
- Hazardous waste
- Restricted solid waste
- General solid waste (putrescible)
- General solid waste (non-putrescible).

The construction of the Project would generate waste as identified in Chapter 17. Upgrades or future demolition of the Project would also generate waste requiring lawful management. The technology provider had committed to taking back battery cores for reprocessing when their useful life expires or if faulty. No waste would be accepted or disposed of on site.

3.11 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) aims to establish a process for investigating and, where appropriate, remediating sites where contamination presents a significant risk of harm to human health or an aspect of the environment.

The nearest listed contaminated site is an Australian Defence Wirlinga Ordnance Depot located within 5km north of the Project site. The Project has no potential to exacerbate or be affected by this site.

No reason to expect the site to be contaminated was identified. Potential remains for contamination to be identified during earth works. There is a duty to notify any significant contamination under Section 60 of the CLM Act and this would be undertaken if any previously unidentified contamination is encountered that exceeds notification thresholds.

3.12 Dams Safety Regulation 2019

The Hume Dam is currently listed as a declared dam under the *Dams Safety Regulation 2019* (Dams Regulation) by Dam Safety NSW. A dam may be listed as declared if its failure would threaten life, or cause major damage to property, the environment, or public welfare.

The owner of the Hume Dam, Murray Darling Basin Authority, is required under the Dams Regulation to assess the consequence category of the dam. Key project features would be located outside of any likely impact zone from a dam failure. The Project would not affect the consequence category of the dam.

3.13 Crown Land Management Act 2016

The *Crown Land Management Act 2016 (NSW)* provides for the ownership, use and management of Crown land in NSW. Ministerial approval is required to grant a lease, licence, permit, easement or right of way over a Crown Reserve.

No Crown Land is anticipated to be impacted by the Project. There is a Travelling Stock Reserve adjacent to the Project site with entry point on Trout Farm Road however the Project would not encroach or impact on the Reserve.

3.14 Rural Fires Act 1997

The *Rural Fires Act 1997* (NSW) (Rural Fires Act) facilitates the prevention, mitigation and suppression of bush and other fires in local government areas and parts of the State considered to be rural fire districts. The Project would be located in land mapped as Vegetation Category 2 bushfire prone land (Albury City, 2014).

Under the Rural Fires Act, the owner or occupier of land is obligated to take precautions to minimise the risk of bushfires starting or spreading within their land. Section 4.41 of the EP&A Act overrides the requirement for a bush fire safety authority to authorise the Project under Section 100B of the *Rural Fires Act*. Consideration of possible bush fire risks is however provided in Chapter 15.

3.15 Roads Act 1993

The *Roads Act 1993* (Roads Act) aims to establish the rights and procedures for using, opening and closing public roads. It also provides the classifications of roads and the declaration of TfNSW and other public authorities as roads authorities for classified and unclassified roads. A local council is the roads authority for public roads excluding classified roads and those declared by the roads authority.

Under Section 138, consent of the roads authority is required to:

- Erect a structure or carry out a work in, on or over a public road
- Dig up or disturb the surface of a public road
- Remove or interfere with a structure, work or tree on a public road
- Pump water into a public road from any land adjoining the road
- Connect a road (whether public or private) to a classified road.

No works would be required within road reserve areas for the Project.

3.16 Water Act 1912 (NSW) and Water Management Act 2000

The *Water Act 1912* (NSW) (Water Act) identifies water management authorities and governs the issue of new water licences and the trade of water licences and allocations. Surface licences are administered under Part 2 of the Water Act, whilst groundwater licences are administered under Part 5 of the Water Act. There are currently a number of areas to which an embargo on new applications under Part 2 and Part 5 of the Water Act applies.

The *Water Management Act 2000* (WM Act) was introduced to provide a comprehensive singular piece of legislation to effectively manage and regulate access and use of the State's water resources. Chapter 3, Part 3 of the WM Act requires that approval be granted for works that are classified as 'controlled activities' within waterfront land defined as 40 metres from the bank of any river, lake, estuary or coastal waters of the State (Lake includes a wetland, a lagoon, a saltmarsh and any collection of still water, whether perennial or intermittent and whether natural or artificial).

Water Sharing Plans are made under Section 50 of the WM Act and generally deals with matters set out in Sections 20 and 21 of the WM Act. The Project is located next to the River Murray and is within the Murray Water Management Area. Water Resource Plans are put in place to implement the Commonwealth Basin Plan 2012. As no groundwater or surface water would be abstracted during construction of the Project, a water access licence (WAL) would not be required. Operation of the Project would not require the modification to existing WALs.

The Project does not involve works within waterfront land and a water use approval under Section 89, a water management work approval under Section 90 or an activity approval under Section 91 of the WM Act are not required.

4. Strategic context and project need

This chapter provides a strategic justification of the development focusing on the suitability of the proposed site with respect to potential land use conflicts with existing and future surrounding land uses.

The Project's overall purpose is to improve the dispatchability of the run of river hydro power generation while enabling the HPS and the connected electricity grid to be more responsive to fluctuations in demand through the installation of a Battery Energy Storage System (BESS).

The Project works will include the following elements:

- Installation, commissioning, and operation of a 20MW/40MWh BESS
- Ancillary upgrades to the existing substation switchyard
- Underground electricity infrastructure from the existing switchyard to the BESS
- Construction of fencing around the perimeter of the BESS compound.

No changes are proposed to the existing approved operation or any other component of Hume Dam HPS as part of the Project. The Hume Dam and the HPS as a whole will continue to be operated and maintained in a manner which responds to market demand and complies with all applicable laws and existing authorisations.

4.1 Project need

The National Electricity Market (NEM) services five regions – Queensland, NSW, Victoria, South Australia, and Tasmania. It operates as a spot market to distribute electricity to homes and businesses. The role of NEM to provide electricity reliably and securely means it needs to continually meet a growing demand for a stable power source in Australian cities. At the same time, the growth in energy consumption needs to be coupled with increasing penetration of renewable sources of electricity as Australia adds to its decarbonisation and clean energy commitments. Energy storage technology has emerged as a solution that allows for greater uptake of renewable energy sources in the NEM while maintaining network stability and security (NSW Chief Scientist & Engineer, 2017). Enabling energy storage would also align with key findings from the Independent Review into the Future Security of the National Electricity Market 2017 (the Finkel Review), namely that the NEM should transition early on towards emissions reduction trajectory and that there is a need for stability solutions like battery energy systems to balance out the fluctuations of renewable energy sources.

Energy storage technology ensures a steadier supply of electricity, and are needed particularly due to the acceleration of coal plant retirements expected in the late 2020s. This includes the Hazelwood Power Station which was demolished in May 2020 and the Liddell Power Station which is due to close in 2022-2023. To ensure a smooth transition, a BESS is an important component that can provide not only storage of energy that can be dispatched to match increased demand but also provide ancillary services such as fast frequency response capability. Additionally, BESS can potentially contribute to periods of high electricity demand or mitigate power loss during more extreme natural weather events.

The Finkel Review further identifies that 'enhanced system planning will ensure that security is preserved, and costs managed, in each region as the generation mix evolves. Network planning will ensure that new renewable energy resource regions can be economically accessed'. The Council of Australian Governments (COAG) endorsed this recordation and the Australian Energy Market Operator (AEMO) subsequently prepared and released an Integrated System Plan for the NEM in July 2018 (AEMO, 2018).

The Integrated System Plan (ISP) identifies that:

> *When existing resources retire, the modelling shows that retiring coal plants can be most economically replaced with a portfolio of utility-scale renewable generation, storage, DER, flexible thermal capacity, and transmission.*
>
> *The lowest cost replacement (based on forecasted costs) for this retiring capacity and energy will be a portfolio of resources, including solar (28GW), wind (10.5 GW) and storage (17 GW), complemented by 500 MW of flexible gas plant and transmission investment. This portfolio in total can produce 90 TWh (net) of energy per annum, more than offsetting the energy lost from retiring coal fired generation.*

The Hume BESS Project would contribute to the storage requirements identified in the ISP.

4.2 Alternatives considered

Meridian has reviewed options regarding BESS technology and location. The selected technology best provides the services Meridian are looking to provide. The generation capacity matches the spare capacity available in the existing network connection for the HPS. The storage capacity is limited by both space available and the identified charge and dispatch cycle identified as being commercially viable.

Two areas within the WaterNSW landholding were considered in the Scoping Report as part of the preliminary environmental assessment. The preferred location was selected as it is a permissible land use within the zone. The other areas of the WaterNSW landholding are constrained by the presence of transmission easements, subterranean infrastructure, existing operational uses, unfavourable topography or at elevated risk of containing items of heritage significance.

4.3 Surrounding land use compatibility

There are no major existing or proposed developments neighbouring the BESS Project and the Hume Dam.

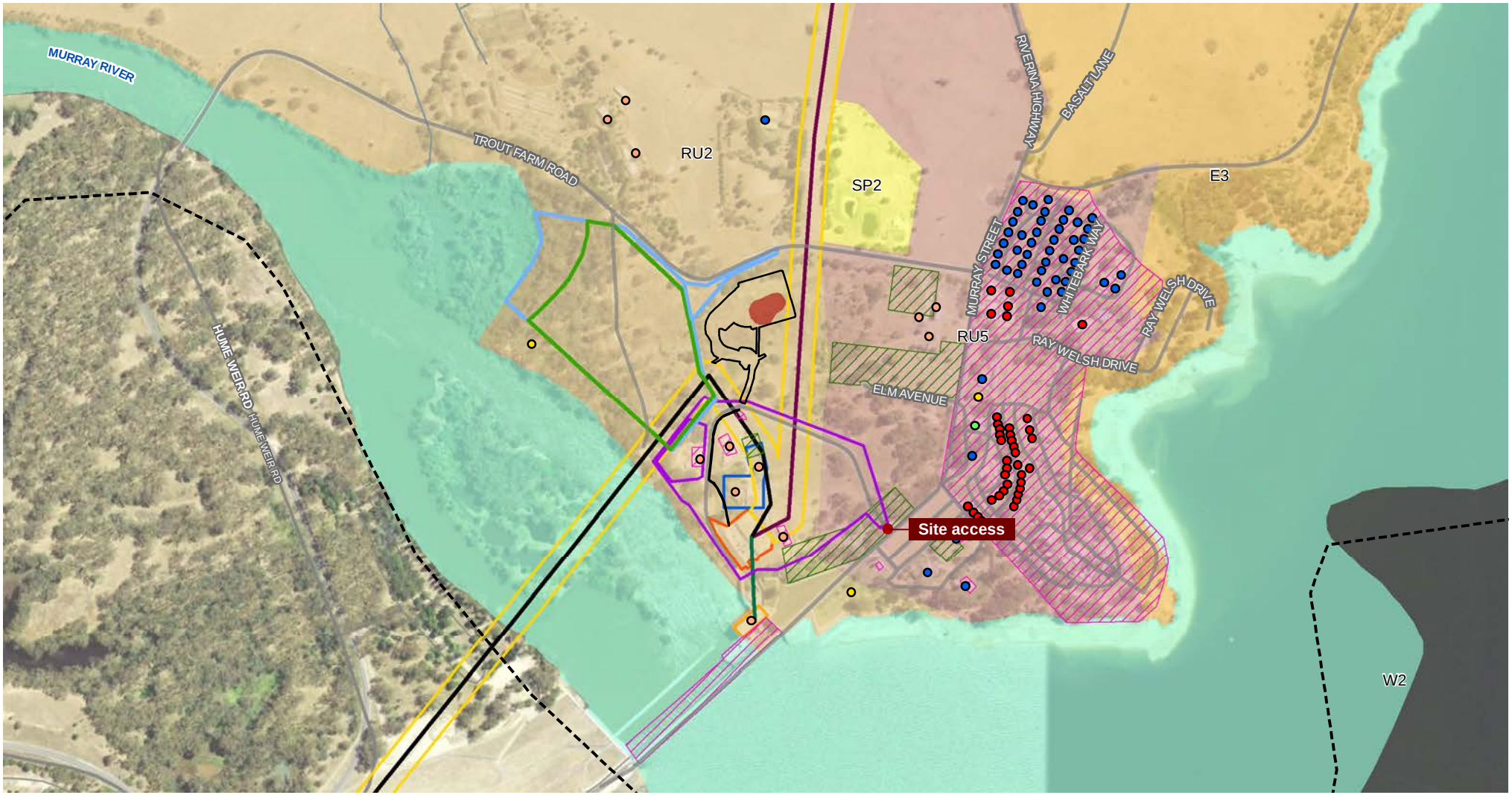
Ongoing Hume Dam Maintenance works which began in August 2019 and is scheduled to finish by the end of 2021. Available information regarding these works indicate:

- The Dam Wall crest roadway is closed to public access and gates on either side of the spillway are locked
- Public road between Hume Dam Village and the dam may also be closed at times to allow large equipment to move through
- Work is scheduled to take place on Monday to Friday from 7am to 6pm and Saturday from 7am to 5pm.

WaterNSW has confirmed that maintenance works are minor in nature and are unlikely to be affected by the Project. In addition, maintenance and Project impacts are unlikely to accumulate.

The Draft Borella Road and Riverina Highway Corridor Strategy is currently on exhibition and aims to include future upgrades at major intersections in Albury, including near the Albury Airport. The road upgrades would potentially use the same sections of Riverina Highway that would be needed to access the Project site.

The Lake Hume Village is located 300m east of the Project site, with the closest residential receiver located 200m north of the Project across Trout Farm Road. There is a WaterNSW office located 200m south of the BESS compound. The surrounding land use context is shown in Figure 4-1 with key environmental constraints illustrated in Figure 4-2.



Legend

- Maximum distrubance footprint
- State boundary
- Hume hydro power station
- WaterNSW Offices
- Switchyard
- Easement buffer for the 66kV line (22.86 m) and the 132 kV line (22.86 m)
- Hume PAD 001
- Indicative areas of high historical potential
- Heritage items
- Hume Dam works compound
- 132 kV transmission line to Albury (NSW)
- 66 kV transmission line to Wodonga (Victoria)
- Connection from power station to switchyard

Travelling stock route

- Low
- Unassessed

Receiver type

- Accommodation
- Commercial
- Industrial
- Recreational
- Residential

Land zone

- E3 Environmental Management
- RU2 Rural Landscape
- RU5 Village
- SP2 Infrastructure
- W2 Recreational Waterways

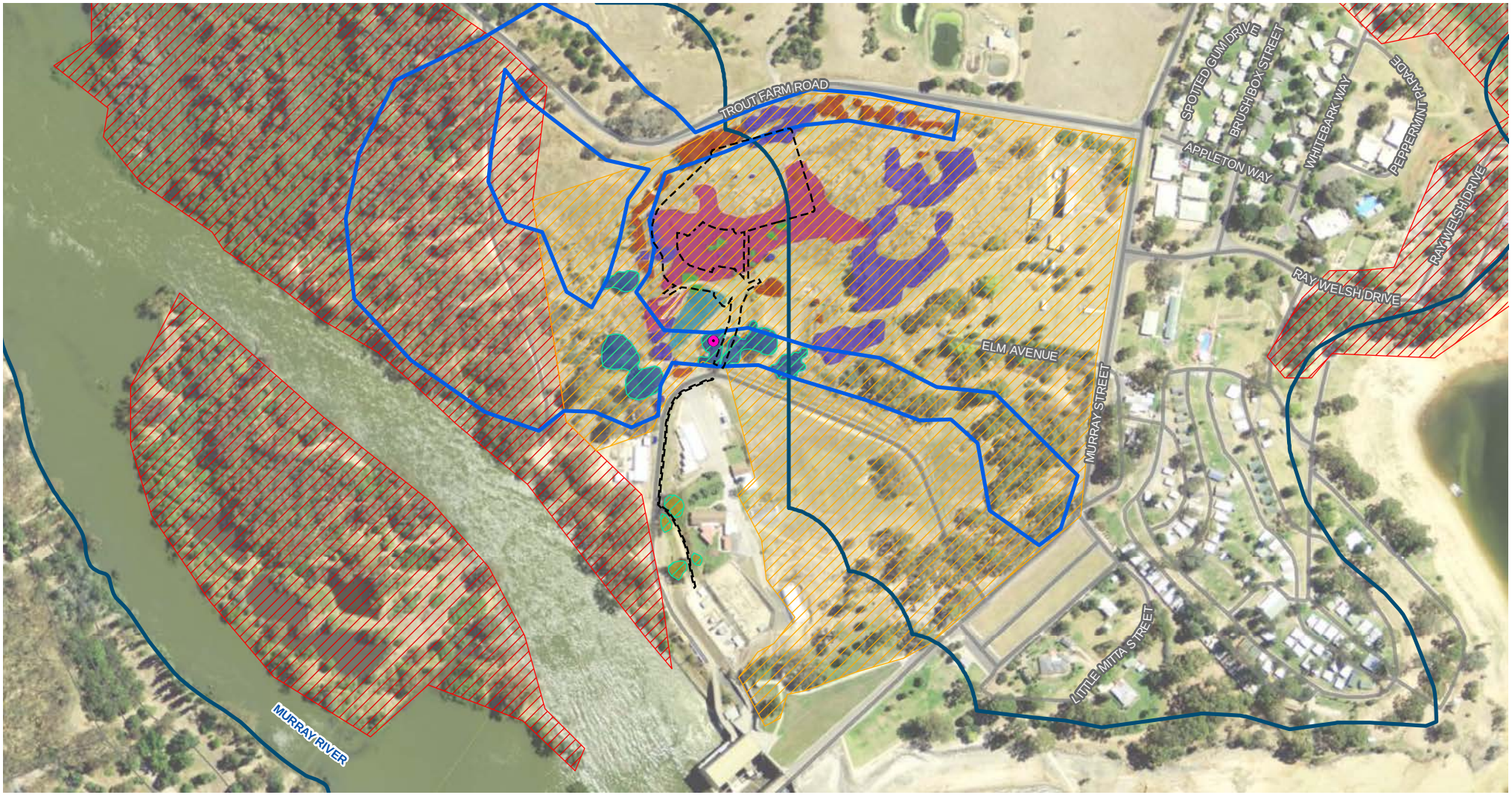
0 250 500 m

1:9,000 at A4

Data sources

Jacobs 2020
NSW Spatial Services 2019
DPE 2019
Service Layer Credits:
© Department of Customer Service 2020
GDA94 MGA55

Figure 4-1 Surrounding land use context



Legend

- Maximum distrubance footprint
- LEP - Riparian Lands Watercourse
- Squirrel Glider likely movement corridors (FLHSG)
- Squirrel Glider species polygon
- Hollow-bearing tree

NSW Rural Fire Service - Bushfire Prone Land

- Vegetation Category 1
- Vegetation Category 2

Plant community types

- Blackberry
- Exotic Trees and Shrubs
- Planted Native Trees and Shrubs
- River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) - Carex appressa wetland
- River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) - Poor
- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266) - Derived grassland
- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266) - Poor

0 100 200 m

1:5,000 at A4

Data sources

Jacobs 2020
NSW Spatial Services 2019
DPE 2019
Geoscience Australia 2019
Service Layer Credits:
© Department of Customer Service 2020

GDA94 MGA55

Figure 4-2 Key environmental constraints

The Project is located within the Upper Murray catchment next to the Hume Dam and Hume Reservoir, which is fed by rivers from extensive alpine mountain country and large river tributaries of the River Murray. While the River Murray and its catchment contain many environmentally and culturally important sites that hold national and international significance, the limited nature of the Project impacts would not affect these values.

The Project is not considered to conflict with any existing or proposed surrounding land uses. The Project is located within WaterNSW-owned lands and is not anticipated to significantly impact on the surrounding pasture, riverine and community recreation land use zones. No conflicts are anticipated between the Project and any existing or proposed future land uses. Consideration of land use conflict is provided in Chapter 10.

4.4 Strategic policy context

4.4.1 Commonwealth policy context

At the Paris Climate Conference COP21 (COP21), the Paris Agreement was entered into force on 4 November 2016. All parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed on a central goal to keep global temperature rise this century to below 2 degrees Celsius above pre-industrial levels and for all nations to strengthen the ability to deal with the impacts of climate change. Some of the key aspects of the Paris Agreement include:

- Goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees
- Aim to reach global peaking of greenhouse gas emissions (GHGs) as soon as possible
- Developed countries should continue to take the lead by undertaking absolute economy-wide reduction targets
- Enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in the context of the temperature goal.

On 10 November 2016, Australia ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol, which states Australia's intention to reduce its greenhouse gas emissions between 2013 and 2020. The Government's current climate change plan includes:

- Reducing emissions to 26-28 per cent on 2005 levels by 2030
- Doubling Australia's renewable energy capacity to be achieved in 2020
- Helping improve energy productivity by 40 per cent by 2030
- Ensuring big business and Australia's largest emitters do their part and continue to reduce emissions
- Spurring businesses, communities, households and individuals into ongoing action to reduce emissions
- Investing in innovation and clean technology to help capture the opportunities of a cleaner future
- Managing climate risks by building resilience in the community, economy and environment.

In 2017, the Government reviewed its climate change policies to ensure they remain effective in achieving Australia's 2030 target and Paris Agreement commitments. A final report was released on 19 December 2017 which generally indicated the government's policies were on course to meet Australia's international climate change commitments.

The Australian Government also has Renewable Energy Target (RET), with a 33,000 GWh target for large scale generation already being met in September 2019, a year ahead of schedule. The RET policy will continue to require renewable energy producers to meet obligations under the policy until 2030.

Hume BESS Project is consistent with the Commonwealth government's climate change initiatives and facilitates the continued expansion of renewable energy generation by providing rapidly dispatchable energy storage capacity to respond to times of high demand or low supply of renewable electricity.

Meridian is deeply committed to providing energy solutions in a sustainable manner, generating and retailing electricity from 100% renewable sources. Meridian conducts yearly carbon footprint analyses of their operations and monitor the activity of their electricity generating projects to ensure minimal environmental impact. Meridian's retail business Powershop Australia is certified as a carbon neutral retailer of electricity. The Hume BESS Project is a natural continuation of Meridian's commitment to providing reliable renewable energy solutions in Australia and New Zealand.

4.4.2 State policy context

While the Australian government currently have not established any emissions target for 2050, all State and Territories including NSW and Victoria have committed to achieving net zero emissions by 2050 (NSW Climate Change Policy Framework, 2016; Victoria's Climate Change Framework, 2016). The policies indicate a strong shift towards decarbonisation goals at a regional level, supported by a growth in renewable energy technology.

The NSW Climate Change Policy Framework (Office of Environment and Heritage, 2016) with a target of net zero emissions by 2050 represents the NSW Government position on responding to climate change and relates directly to how energy is generated and consumed in NSW. The Framework aims to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current and emerging international and national policy settings and actions to address climate change.

The Net Zero Plan Stage 1: 2020-2030 is the current strategy to enable NSW to reach net zero emissions by 2050. The Net Zero Plan, along with the NSW Electricity Strategy will provide $11.6 billion of new investment, including $75 million for emerging, on-demand electricity generation projects. As electricity generation has the highest emissions in NSW (51 $MtCO_2$-e), it is important for strategies to 'drive uptake of emissions reduction technologies that grow the economy or reduce the cost of living'. The BESS will support wider penetration of renewable energy, which is essential for reducing carbon emissions. The NSW Electricity Strategy affirms that:

> *Renewables, firmed by dispatchable technologies such as gas and storage, are the lowest cost form of new reliable electricity generation.*

As the transmission lines from the Hume Dam HPS supplies electricity to cities in both NSW and Victoria, key strategies from the Victorian Government are also considered. The Victoria Renewable Energy Roadmap 2015 (DELWP, 2015) identifies priority areas as follows:

- Transforming Victoria's generation stock towards renewable energy
- Addressing barriers to distributed generation and storage
- Encouraging household and community renewable generation
- Expanding the Government's role in facilitating the uptake of renewable energy.

The Roadmap feeds into Victoria's *Renewable Energy Action Plan* which invests $146 million to support renewable energy sector growth, empower communities and consumers, and modernise the energy system. Specific initiatives include:

- $15.8 million for smart software system, solar and battery storage microgrid initiatives across the state, and
- $25 million to deploy grid-scale battery storage facilities in the west of Victoria by Summer 2018.

Individual strategies for region-specific renewable energy roadmaps have also been developed. The Hume Region Roadmap, relevant to the Project is discussed below in Section 4.4.4.

Additionally, Victoria has legislated to bring the Victorian Renewable Energy Target to 50% by 2030, under the *Renewable Energy (Jobs and Investment) Amendment Bill 2019* (VIC). In the short term, legislated renewable energy targets are 25% by 2020 and 40% by 2025 (DELWP, 2020).

As such, Hume BESS Project is consistent with NSW Government commitment to investing in renewable energy and facilitating a stable and more secure supply of electricity.

4.4.3 National Energy Market

The strategic context for the Project aligns with ongoing operational and technological aims of the NEM, supported by the Finkel review's recommendations.

The Hume Dam HPS has 58MW capacity and 203GWh average annual output. Hydroelectricity continues to be a major renewable development industry in the Upper Murray catchment, and the Hume Dam HPS has two transmission lines that services Albury in NSW (132kV) and Wodonga in Victoria (66kV), connecting to both AusNet and TransGrid networks. Currently there is capacity for additional generation to be connected into the grid. Hume Dam HPS has enough generation output to power around 40,000 average households. For the Upper Murray catchment, the Hume Dam is particularly important for irrigation, flood mitigation and hydro-electricity.

It is widely recognised that electricity generation in Australia is undergoing a significant transition towards more distributed, intermittent generation sources.

The latest statistics for Australia's electricity generation from 2018-2019 have been published by the Department of Industry, Science, Energy and Resources (DISER). The new data shows 21% of Australia's electricity came from renewable energy in 2019, including 15,950 GWh total in hydro power.

Meridian is the largest electricity generator in New Zealand with 100% of electricity generated from renewable sources. Meridian generates wind and hydro energy in New Zealand and Australia and also sells electricity through the Powershop brand. Meridian has already published Climate Risk Disclosures and a Climate Action Plan in 2019, supporting ongoing offsetting and auditing of carbon emissions and actioning the climate policy to increase the percentage of renewable energy in both Australia and New Zealand markets (Meridian Energy, 2019). Specifically, financial year 2019 (FY19) Climate Risk Disclosures applies a 2-degree scenario modelling for both physical and transitional impacts for a 30-year time frame, in order to estimate short to long term risks based on different emissions scenarios. Under the recommendations from the Taskforce on Climate-related Financial Disclosures (TCFD), Meridian has identified extreme weather events such as storms and floods having high physical risk of damage to generation assets, while the high transitional risk driver is industry disruption in the form of electricity demand changes, and decarbonisation transitions within high-emissions sectors such as agriculture, industrial processes and mineral extraction.

For FY19, Meridian operated at net Zero Carbon for operational greenhouse gas emissions, achieved through 100% renewables generation and purchasing offsets. Meridian is also looking a expansion of electric vehicles fleet and forestry tree planting projects to support ongoing emissions reduction, setting an absolute target of halving operational greenhouse gas emission by 2030. The Meridian Climate Action Plan aligns with both Victorian and NSW State Government goals to further reduce carbon emissions through the use of technology and increasing market penetration of renewable energy.

4.4.4 Regional policy context

Riverina Murray Regional Plan 2036

The Department of Planning, Industry and Environment (DPIE) finalised a suite of Regional Plans in 2017 to set strategic planning framework for future needs in communities across the NSW state.

The Project would be located in the Riverina-Murray region and the Riverina Murray Regional Plan 2036 includes a 20-year vision and identified renewable energy as a priority growth sector. Direction 11 of the Regional Plan promotes the diversification of energy supplies through renewable generation and is guided by the NSW Renewable Energy Action Plan (2013), outlining strategic actions as follows:

- Encourage renewable energy projects by identifying locations with renewable energy potential and ready access to connect with the electricity network
- Promote best practice community engagement and maximise community benefits from all utility-scale renewable energy projects
- Promote appropriate smaller-scale renewable energy projects using bioenergy, solar, wind, small-scale hydro, geothermal or other innovative storage technologies.

The Project is located at the node between two major transmission lines that services major regions in both NSW and Victoria and expanding the storage capacity and dispatchability of the HPS would promote the innovative use of the existing power generation plant.

Albury 2030 Community Strategic Plan

The Albury 2030 adopts the directions in the Riverina Murray Regional Plan 2036 and establishes goals for the city of Albury, including to 'promote business and industry participation in opportunities in clean and renewable energy initiatives'. The Project is wholly aligned with these ambitions.

Two Cities One Community Strategic Plan 2017-2021

The Two Cities One Community Strategic Plan (2C1C) integrates the existing Albury 2030 and Wodonga 2033 Community Strategic Plans and develops a model for future growth in the region. The Action Plan for the 2C1C includes the goal to explore renewable energy opportunities for implementation across the two cities. The Project is wholly aligned with these ambitions.

Hume Region Renewable Energy Roadmap

The Hume Region Renewable Energy Roadmap (the Roadmap) echoes the *Victoria Renewable Energy Action Plan* and focuses on the Hume region communities. Specific regional opportunities include:

- Distributed energy resources and smart integration into local grid
- Pumped hydro energy storage development potential
- Large scale solar
- Bioenergy resources using biomass.

Hydroelectricity generation is identified as a major renewable industry in the Hume region, with the Hume Dam being one of four major hydro schemes. Energy storage is also identified as an important part of a renewable energy future for the region that will help shift renewable energy supply from times of low grid demand to times of high demand.

The Project would align with some of the principle strategies in the Roadmap and would further enhance regional renewable and economic development.

5. Stakeholder consultation

This Chapter provides a summary of consultation undertaken by Meridian with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.

5.1 NSW legislative requirements for consultation

SEARs for the Project were issued to Meridian on 14 May 2020.

The SEARs require that Meridian consult with the relevant local, State and Commonwealth Government authorities, infrastructure and service providers, community groups and affected landowners, exploration licence holders and mineral title holders. In particular, detailed consultation is required with affected landowners surrounding the development and Albury City Council.

The SEARs require that the EIS describe the consultation process and the issues raised and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation is required to be provided.

5.2 Community consultation

Community consultation for the project commenced in June 2020. Consultation included emails, phone calls and letters to residents and businesses in the nearby Lake Hume Village. Following phone calls, residents and business owners received emails with further information on the project and the project flyer. A 1800 number and email was provided on all collateral as a point of contact for community enquiries and a project website was established.

Overall the community and local businesses were supportive of the project. Questions and concerns raised were limited to:

- The selection of the location of the BESS and its proximity to residents
- Height of the BESS
- Potential for the battery igniting a fire
- Fumes released from the battery
- Safety protocols in the event of a fire arising from past experience with the Hume Power Station fire in 2012.

Information was provided back to the community on the safety standards of the battery technology and the likelihood of a fire from normal operation as low.

Meridian understands these concerns as the technology has not been widely used in Australia or NSW. The options consideration for the site selection is described in Section 4.2 and in general the preferred location was selected as it is a permissible land use within the zone, while other areas of the WaterNSW landholding are constrained by the presence of transmission easements, subterranean infrastructure, existing operational uses, unfavourable topography or at elevated risk of containing items of heritage significance.

Consideration of hazards including fire risks is provided in Chapter 15 and the potential for land use conflict is considered in Chapter 10. Since taking over the power station in 2018, Meridian maintains an incident response procedure for the Hume Power Station. In the event of an incident, the site's Chief Warden would activate the Emergency Siren and Emergency Response Plan (as required). The response plan may include notifying authorities such as Fire and Rescue NSW or SES Albury. Depending on the nature of the incident, authorities are

responsible for notifying members of the public and any necessary actions. The emergency response procedure would be updated to incorporate the operation of the BESS.

WaterNSW identified that a local community group 'Friends of the Lake Hume Spillway Gliders' as actively working to monitor, protect and improve habitat for squirrel gliders in the area. Meridian, via Jacobs ecologists, has consulted with a representative of this group to obtain valuable background information on the use of the site by squirrel gliders. This has informed the assessment of impacts to this species as detailed in Appendix C and summarised in Chapter 7.

5.3 Agency consultation

The following consultation was undertaken prior to requesting SEARs:

- Discussions with WaterNSW as the land owner and obtained general endorsement that the Project could be accommodated within the site. Consultation has continued to facilitate access for environmental investigations and to negotiate appropriate tenure for the construction and operation of the BESS.
- Discussions were held with TransGrid and AusNet to ascertain that capacity to connect to the network is available. Formal consultation to secure necessary connection agreements will run in conjunction with the EIS and design development process.
- Briefing of Albury Council to provide an overview of the development and seek their early views.
- Discussions with DPIE to provide a briefing on the nature of the Project and establish an appropriate assessment pathway.

The Scoping Report for the Project was made publicly available by DPIE on the Major Projects website. DPIE subsequently requested input into the development of the SEARs from relevant agencies. The following agencies provided input which was considered by DPIE in preparation of the SEARs:

- Albury Council
- Biodiversity Conservation Division of the DPIE
- Crown Lands DPIE
- Environment Protection Agency
- Fire and Rescue NSW
- Geological Survey of NSW – Mining, Exploration and Geoscience
- Transport for NSW
- TransGrid.

Since receiving the SEARs Meridian has Meridian Energy has corresponded with various stakeholders to introduce the Project. These stakeholders include:

- The Hon. Sussan Ley MP, Member for Farrer, NSW and Minister for the Environment (Note: project update sent by email 2 July 2020 – earlier correspondence by Meridian)
- Mr Justin Clancy MP, Member for Albury (Note: project update sent by email 2 July 2020 – earlier correspondence by Meridian)
- Albury City Council
- WaterNSW
- Murray Darling Basin Authority (MDBA)

- AusNet
- Department of Planning, Industry and Environment
- TransGrid
- Australian Energy Market Operator (AEMO).

A summary of issues raised and responses are provided in Table 5-1.

Table 5-1: Summary of agency consultation

Stakeholder	Date	Details	Issues raised by the stakeholder	How Addressed
WaterNSW	July 2020	Landowner and stakeholder associated with water releases	Recognition of local Squirrel Glider population in the EIS Recognition and emphasis on water quality and quantity outcomes in the EIS Potential issues on land tenure Concerns regarding access conflicts WaterNSW's consent to the lodgement of the Development Application as the landowner was received on 23 July 2020.	Impacts to squirrel glider are assessed in Appendix D and summarised in Chapter 7. Water management is described and assessed in Chapter 14. Traffic impacts are discussed in Chapter 13.
Mr Justin Clancy MP	June 2020	Local Member for Albury	Seeking an understanding of development pathway to be taken by the project	Development assessment pathway described in Section 3.1.
MDBA	June 2020	Stakeholder associated with water releases	Seeking clarification and confirmation on project disturbances to water release regimes for the Hume Dam	No disturbance to water release regime proposed. BESS maximises benefits of hydro generation through storing energy generated when not needed by the NEM.
TransGrid	Ongoing	Following formal grid connection process	No issues beyond input to SEARs	Noted
AusNet	Ongoing	Following formal grid connection process	No issues beyond input to SEARs	Noted
Albury City Council	Ongoing	Engagement to notify of project development scope and progress	No issues beyond input to SEARs Letter of Support received	Noted
AEMO	Ongoing	Provided an introductory	No barriers to connection have been identified and AEMO have	The network registration and connection process

		briefing to interested stakeholders on the Project, as part of the Project's kick off activities. Engagement in round table discussions with AEMO, TransGrid and AusNet to seek feedback on the Project's approach to registering for Grid connection, as per standard connection processes.	noted on several occasions that there is already an established and proven connection point in operation into both Vic and NSW distribution and transmission systems respectively.	are occurring in parallel to the development assessment process.

5.4 Indigenous stakeholder engagement

Aboriginal stakeholder engagement and involvement is important for the identification of Aboriginal cultural values relevant to the Project.

Aboriginal community consultation was undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), which establishes the requirements for consultation with Aboriginal stakeholders as part of the heritage assessment process to determine potential impacts of proposed activities on Aboriginal objects and places. These requirements include four stages with associated timeframes which must be adhered to. Consultation in accordance with these requirements is summarised in the subsections that follow.

5.4.1 Stage 1 - Notification of the proposed project and registration of interest

Stage 1 of the consultation process is to identify, notify and register any Aboriginal people or groups who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and / or places in the study area.

Notification was initiated on 23 August 2019 to all relevant organisations listed under Section 4.1.2 in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010). The following organisations were contacted to identify stakeholder groups or people with a potential interest in the Project:

- Albury and District Local Aboriginal Land Council
- NTS Corp
- NSW Department of Planning, Industry and Environment – Environment, Energy and Science Group – Southwest office
- Office of the Registrar, *Aboriginal Land Rights Act 1983*
- Albury City Council
- Murray Catchment Management Authority.

In addition, a notice was placed in the Border Mail on 28 August 2019, with information explaining the Project and its exact location. The notice provides additional opportunity for Aboriginal people who are interested in the Project to register. A copy of the advertisement is included in Appendix E.

Project notifications were sent to all groups and individuals identified as a result of the above consultation process on 18 September and 19 September 2019. A total of four groups and/or individuals registered their interest. A list of Registered Aboriginal Parties (RAPs) for the Project and copies of the notifications were submitted to Department of Premier and Cabinet – Heritage NSW and the Albury and District Local Aboriginal Land Council (LALC) on 17 October 2019. A copy of the notification and registration of interest process is provided in Appendix E.

5.4.2 Stage 2 – Presentation of information about the proposed project

Stage 2 of the consultation process provides Registered Aboriginal Parties (RAPs) with information about the scope of the Project and the proposed cultural heritage assessment process.

The RAP's were provided with a letter outlining the project, and a copy of the document Hume BESS Project Information and Method (Appendix E). Comments on this document were invited from RAPs and they were invited to contact Jacobs at any time throughout the assessment process to discuss the project. RAPs were provided the opportunity to nominate a Site Officer to participate in the archaeological survey.

Site Officers nominated for the archaeological survey were issued a checklist to ensure safety and preparedness for work.

5.4.3 Stage 3 – Gathering information about cultural significance

Stage 3 of the consultation process is to facilitate a process whereby RAPs can contribute to culturally appropriate information gathering and the research methodology, provide information that will enable the cultural significance of Aboriginal objects and/or places on the study area to be determined, and have input into the development of any cultural heritage management options.

RAPs were invited to submit information relevant to the cultural significance of the study area and any areas and objects within it, at all stages of the consultation process.

5.4.4 Stage 4 – Review of draft ACHAR

Stage 4 of the consultation process involves the RAPs review and feedback on the draft ACHAR (Appendix E). The ACHAR was sent in draft form to all RAPs, so that they could review the document and supply comments and feedback.

The ACHAR will be updated to incorporate the input from all RAP groups at the close of the 28 day review period. Copies of written submissions received from RAPs will be included in Appendix A of the ACHAR (see Appendix E).

Further details of consultation including meeting minutes, examples of letters sent to RAPs and knowledge holders, conversations undertaken during archaeological survey, native title search results, records of cultural heritage values interviews and a detailed consultation log are included in Appendix E.

6. Environmental impacts

A Preliminary Environmental Assessment was undertaken to support the application for the SEARs (Jacobs, 2020a) and SEARs for the Project were issued on 14 May 2020. In accordance with the SEARs, the following specialist assessments have been undertaken:

- Biodiversity Development Assessment Report (Jacobs, 2020b), presented in Appendix D and summarised in Chapter 7
- Aboriginal Cultural Heritage Assessment Report (Jacobs, 2020c), presented in Appendix E and summarised in Chapter 8
- Statement of Heritage Impact (Jacobs, 2020d) presented in Appendix F and summarised in Chapter 9
- Consideration of land use impacts provided in Chapter 10
- Visual Impact Assessment (Jacobs, 2020g) presented in Appendix G and summarised in Chapter 11
- Noise and Vibration Impact Assessment (Jacobs, 2020e) presented in Appendix H and summarised in Chapter 12
- Traffic and Transport Impact Assessment (Jacobs, 2020f) presented in Appendix I and summarised in Chapter 13
- Consideration of surface and groundwater and flooding impacts and description of water requirements and erosion and sediment controls provided in Chapter 14
- Consideration of hazards and risks including risk screening in accordance with applying SEPP 33 guidelines and consideration of potential for bushfire, spontaneous combustion and electromagnetic fields and proposed management measures provided in Chapter 15
- Consideration of socio-economic impacts provided in Chapter 16
- Identification of waste generation and proposed management in Chapter 17.

7. Biodiversity

7.1 Assessment methodology

A Biodiversity Development Assessment Report (BDAR) was prepared for the Project in accordance with the requirements of the *Biodiversity Conservation Act 2016* (BC Act) and the Biodiversity Assessment Method (BAM). The BDAR documents the results of the biodiversity assessment carried out for the Project in line with the relevant State and Commonwealth environmental and threatened species legislation and policy. It also considers relevant matters under the *Fisheries Management Act 1994*. A detailed description of the Assessment Methodology is provided in Appendix D.

7.2 Existing environment

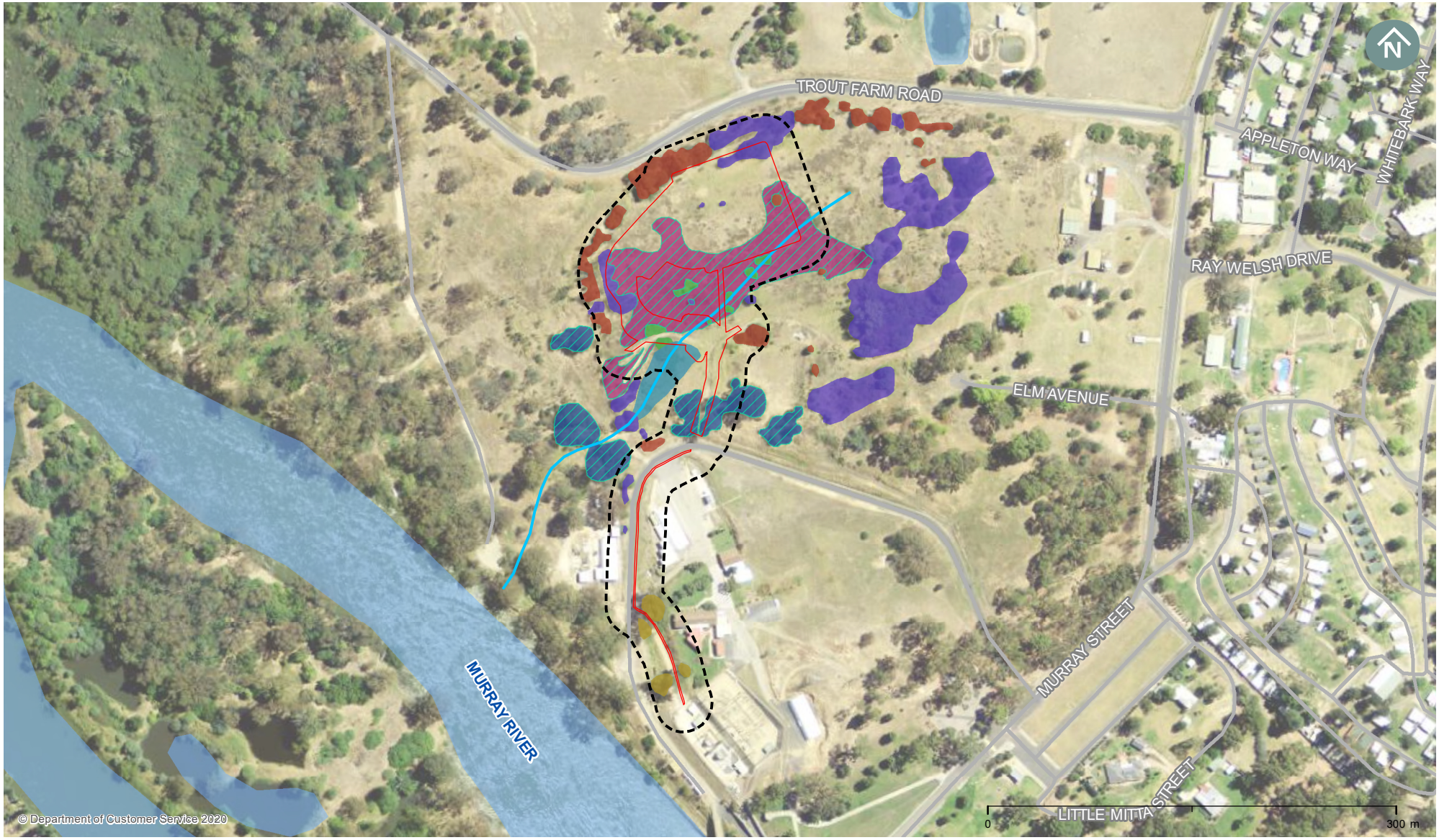
The study area is situated in a predominantly cleared rural landscape that has highly modified vegetation and habitat which is mostly dominated by exotic grassland and scattered remnant and regrowth woodland. Less modified native vegetation is situated along the edges of the Murray River to the south west. Two plant community types were identified in the development site (Refer to Figure 7.1):

- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266).
- River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5).

Seven candidate threatened plant species were identified as having potential habitat on the development site by the Biodiversity Assessment Calculator and a review of databases and were targeted during surveys. Six of the threatened plant species were targeted during surveys, though none were identified within or adjacent to the development site.

The following threatened fauna species were identified by the BAM Calculator as potential candidate species and their potential presence on the site is addressed via targeted survey and habitat assessment:

- Sloane's Froglet (*Crinia sloanei*)
- Birds:
    - Owls: Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*)
    - Nectarivores: Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*), Superb Parrot (*Polytelis swainsonii*),
    - Cockatoos: Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*),
    - Bush Stone-curlew (*Burhinus grallarius*)
    - Raptors: Little Eagle (*Hieraaetus morphnoides*), Square-tailed Kite (*Lophoictinia isura*), White-bellied Sea-Eagle (*Haliaeetus leucogaster*)



Study area
Development site
Drainage line
Waterbodies

BC Act
White Box Yellow Box Blakely's Red Gum Woodland (Endangered BC Act)

Plant community types
Blackberry
Exotic Trees and Shrubs
Planted Native Trees and Shrubs
River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) - Carex appressa wetland
River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) - Poor
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266) - Derived grassland
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266) - Poor

Figure 7-1 Map of threatened ecological communities

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Created by : AA | QA by : LC

- Mammals:
  - Squirrel Glider (*Petaurus norfolcensis*)
  - Insectivorous bats: Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Southern Myotis (*Myotis macropus*)
  - Grey-headed Flying Fox (*Pteropus poliocephalus*)
  - Brush-tailed Rock-wallaby (*Petrogale penicillate*)
  - Brush-tailed Phascogale (*Phascogale tapoatafa*)
  - Koala (*Phascolarctos cinereus*)
- Pink-tailed Legless Lizard (*Aprasia parapulchella*)
- Golden Sun Moth (*Synemon plana*)

Of these, only the Squirrel Glider and the Sloane's Froglet were considered likely to have potential breeding habitat and be potential candidate threatened species for which a biodiversity credit requirement may be generated. In the absence of breeding habitat, the remaining species are only ecosystem credit species for the purposes of this assessment.

Targeted surveys were undertaken for the Squirrel Glider and the Sloane's Froglet in June and August 2019 and June 2020.

The Squirrel Glider was not identified from targeted surveys undertaken as part of this assessment. However, this species is known to occur commonly in the locality from BioNet Atlas (Office of Environment and Heritage, 2020) records and, more specific to the development site, from survey data collected by the local conservation group *Friends of the Lake Hume Squirrel Glider*. Nest box monitoring undertaken by the group between 2013-2020 has found gliders have been observed in all about one of the 20 nest boxes installed and important movement corridors are known around the north and south of the development site. Only one tree with hollows suitable for nesting was identified within the study area, which is located along the spillway access road. A species polygon has been developed for the Squirrel Glider, which includes areas of PCT 266 with an intact canopy (excluding derived grasslands). This species is also likely to use planted native vegetation along west and northern boundary of the spillway site, however as this cannot be assigned to a PCT, is was not included in the species polygon.

The Sloane's Froglet was not identified during targeted surveys of the development site, however an ephemeral *Carex appressa* dominated wetland occurs within the study area containing native tree and shrub plantings on the edge. This wetland was dry at the time of survey but may temporarily fill with water during heavy rainfall and drains into the Murray River. An assessment of the *Carex appressa* wetland on the development site against known habitat characteristics described from the Albury population demonstrate that the habitat is marginal due to its inability to retain water. The habitat is connected to the Murray River by an unmapped drainage line, though there are no records of the Sloane's Froglet along the Murray River near the site. Therefore, the likelihood of Sloane's Froglet occurring in habitat on the development site is considered to be low.

7.3 Assessment of impacts

The potential for direct impacts to biodiversity is limited to clearing of native vegetation and habitat. The development would not impact any areas of land that the Minister for Energy and Environment has declared as an area of outstanding biodiversity value in accordance with Section 3.1 of the BC Act.

7.3.1 Plant community types

Despite avoidance and minimisation measures, the direct impacts to biodiversity values that would occur as a result of the development construction includes removal of 0.44 hectares of native vegetation, which includes the following PCTs:

- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 266) – 0.43 hectares (4,225 square metres)
  - Poor condition – 0.02 hectares (164 square metres)
  - Derived native grasslands - 0.41 hectares (4,061 square metres)
- River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) – 0.01 hectares (105 square metres).

7.3.2 Threatened Ecological Communities

One Threatened Ecological Community (TEC) listed under the BC Act will be impacted by the development:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – 0.43 hectares (4,225 square metres) comprising PCT 266 noted above.

All the areas of PCT 266 in the development site are too small and degraded to meet the condition threshold criteria for the EPBC Act listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC detailed in the listing and conservation advice.

7.3.3 Threatened species

Direct impacts on species credit threatened species habitat associated with the clearing of native vegetation is limited to 0.02 hectares (164 square metres) of habitat for Squirrel Glider, which represents foraging and connectivity habitat. The one hollow-bearing tree within this habitat would be retained, however may require some trimming for the proposed access track.

The Squirrel Glider may also be indirectly impacted by fencing and infrastructure associated with the development that is constructed within or close to known movement corridors around the development site. This includes injury and mortality caused by collision with barbed-wire fences. Measures to minimise the potential for impact have been discussed in this report.

The native vegetation is likely to provide foraging habitat for a range of mobile threatened fauna species including the Grey-headed Flying Fox, Swift Parrot and a number of insectivorous bat species. The impact to these species would be limited to foraging habitat only.

Other impacts to threatened species habitat including impacts to connectivity and species movement, impacts to non-native vegetation and disturbed areas, and impacts to water quality and hydrology are considered to be minimal and manageable through the implementation of suitable mitigation measures.

7.3.4 Prescribed biodiversity impacts

As noted, the development may affect the movement of some threatened species, specifically the Squirrel Glider. This includes injury and mortality caused by collision with barbed-wire fences. Measures to minimise the potential for impact have been discussed in this report.

Up to 0.07 hectares (682 square metres) of exotic and 0.009 hectares (91 square metres) planted native trees and shrubs would be impacted by the development. Twelve threatened species may utilise the non-native vegetation, including both native and exotic planted trees and shrubs, that are found within the development sites, including the Grey-headed Flying Fox and Swift Parrot. Due to the marginal, non-natural, structure of the vegetation present, it is unlikely to be used as breeding habitat by any threatened species. It is unlikely that the development would detrimentally affect the bioregional persistence of these species.

Considering the highly disturbed nature of the landscape within which the development sits, there are not expected to be any indirect impacts that will adversely affect areas of vegetation that will be retained. There is potential for indirect impacts to surrounding aquatic habitats (e.g. Murray River) from erosion run-off from construction and operation. The implementation of standard mitigation measures (i.e. sediment control, spill control) would be implemented to control sediment and pollutants from any significant runoff events.

7.4 Environmental management measures

Table 7-1 outlines measures for managing, avoiding or mitigating potential hazard impacts from the construction and operation of the Project.

Table 7-1: Environmental management measures - biodiversity impacts

Reference	Environmental management measures	Timing
B01	The limits of the work zone, areas for parking and turning of vehicles and plant equipment would be accurately and clearly marked out prior to commencement of works. These areas would be located so that vegetation disturbance is minimised as much as possible and the drip-line of trees avoided.	Pre-construction
B02	Exclusion zones would be established around high-quality vegetation in the west of the Project site. Periodic monitoring would be undertaken to ensure all controls are in place and no inadvertent impacts are occurring.	Pre-construction
B03	Materials, plant, equipment, work vehicles and stockpiles would be placed to avoid damage to surrounding vegetation and will be outside tree drip-lines.	Pre-construction
B04	If any damage occurs to vegetation outside of the nominated work area, the appropriate environmental representative will be notified so that appropriate remediation strategies can be developed.	Construction
B05	Erosion and sediment measures would be implemented in accordance with the principles and requirements in Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom 2004) and Volume 2D (NSW Department of Environment, Climate Change and Water 2008c), commonly referred to as the 'Blue Book'.	Pre-construction
B06	Construction personnel are to be informed of the environmentally sensitive aspects of the site, including plans for impacted and adjoining areas showing vegetation communities; important flora and fauna habitat areas; and locations where threatened species, populations or ecological communities have been recorded.	All stages
B07	A pre-clearing inspection would be undertaken 48 hours prior to any native vegetation clearing by a suitable qualified ecologist and the Contractor's Environmental Manager (or delegate). The pre-clearing inspection would include, as a minimum:	Construction

Reference	Environmental management measures	Timing
	▪ Identification of hollow bearing trees or other habitat features; ▪ Identification of any threatened flora and fauna; ▪ A check on the physical demarcation of the limit of clearing; ▪ An approved erosion and sediment control plan for the worksite; and ▪ The completion of any other pre-clearing requirements required by any project approvals, permits or licences. The completion of the pre-clearing inspection would form a HOLD POINT requiring sign-off from the Contractor's Environmental Manager (or delegate) and a qualified ecologist.	
B08	Direct impact to hollow-bearing trees is to be avoided.	Construction
B09	Construction crews would be made aware that any native fauna species encountered must be allowed to leave site without being harassed and a local wildlife rescue organisation must be called for assistance where necessary.	Construction
B10	A procedure for dealing with unexpected EEC threatened species would be identified during construction, including cessation of work and notification of the Department, determination of appropriate mitigation measures in consultation with the DPIE (including relevant relocation measures) and updating of ecological monitoring or off-set requirements.	Construction
B11	Barbed wire fencing is to be avoided wherever possible. Fencing should be lowered to a minimum required height where possible.	All stages
B12	Where barbed wire fencing cannot be avoided, it should be located away from retained vegetation and have improved visibility measures installed, such as adding visible (and often audible) objects to the fence, such as tape, plastic flags and metal tags (Booth 2007).	All stages
B13	All fencing containing barbed wire that is erected during the construction of the project is to be monitored daily in areas around known Squirrel Glider movement corridors.	Construction
B14	Permanent barbed wire fencing required by the development in identified movement corridors should implement alternative connectivity structures such as rope crossing and glide poles.	Construction
B15	Planting of native trees and shrubs through identified movement corridors would be undertaken with the agreement of WaterNSW to improve the connectivity of habitat for the Squirrel Glider and reduce the potential for impact.	Any stages
B16	Weed management is to be undertaken in areas affected by construction prior to any clearing works in accordance with the *Biosecurity Act 2015* to ensure they are not spread to the surrounding environment; including during transport disposal off-site to a licenced waste disposal facility.	Construction and Post-construction
B18	All weeds, propagules, other plant parts and/or excavated topsoil material that is likely to be infested with weed propagules that are likely to regenerate would be treated on site or bagged, removed from site and disposed of at a licensed waste disposal facility.	Construction and Post-construction

Reference	Environmental management measures	Timing
B19	All vehicles driving to and from site would follow a protocol to prevent the spread or introduction of phytophthora, namely vehicles should be clean, including the tyres and any equipment.	All stages
B20	Biodiversity offset credits would be retired in accordance with BC Act.	Prior to construction

7.5 Biodiversity offsets

An offset is required for the impacts to PCTs and threatened (species credit) species and the biodiversity credit obligation has been calculated using the Biodiversity Assessment Calculator and presented in this BDAR. Areas of the development site that do not possess PCTs have not been assessed and offset credits are not required. Offsets were identified as being required for the Squirrel Glider, however the impact area is so small that no credits were generated by the calculator.

A summary of the biodiversity credit requirements for the development are provided below in Table 7-2.

Table 7-2: Ecosystem credits required

Vegetation Zone	PCT	TEC	Credit
1	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Poor	Yes	1
3	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Poor	No	1
Total			**2**

Due to the very minor impact for Squirrel Glider, no credits were generated by the BAM Calculator.

8. Aboriginal heritage

This chapter addresses the Aboriginal heritage component of the SEARs for the Project which require the EIS to include an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including consultation with the local Aboriginal community in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010). This chapter summarises the Aboriginal Cultural Heritage Assessment Report (ACHAR) which has been prepared to assess the potential Aboriginal heritage impacts associated with the Project (Jacobs, 2020c). The ACHAR is provided in Appendix E.

8.1 Assessment methodology

The assessment of potential impacts on Aboriginal heritage has been carried out using desktop assessment, archaeological surveying and predictive modelling.

8.1.1 Database search results

A search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on 23 June 2020. No previously recorded sites are present within Lot 2 DP1165089. Thirty-six previously recorded sites are present within the wider search area. Of these, eight are modified trees; 23 are artefact scatters; and five are artefact scatters associated with areas of potential archaeological deposit (PAD). The results of the AHIMS search are provided in Appendix E.

The distribution of previously recorded sites is mapped in Figure 8-1.

8.1.2 Previous assessments

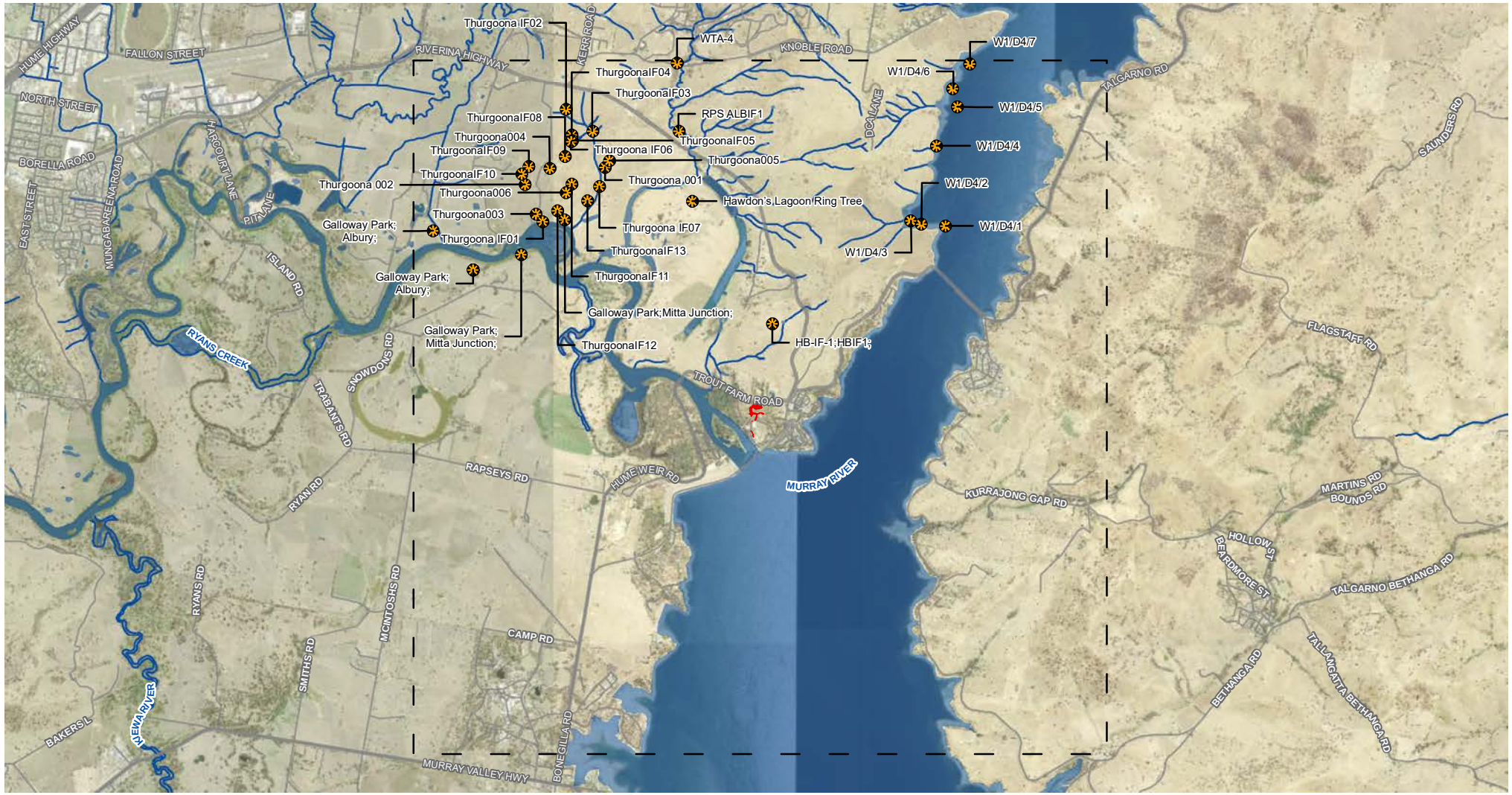
A large scale systematic archaeological survey recorded a total of 441 sites (including isolated finds) - 289 in Victoria and 152 in NSW (National Heritage Consultants, 2007). These sites comprised 358 artefact scatters, 79 isolated finds, three possible scarred trees and one Aboriginal historic place. There were approximately 1.86 sites located per kilometre of survey transect within the assessment study area.

8.1.3 Survey method

The field survey systematically investigated the areas which will potentially be subject to impact by the Project. The survey was carried out on foot. The survey investigated the Project area in full. No sub-sampling of the area was employed.

Two surveys have been carried out on 15 November 2019 and 26 June 2020, and covered a total of four survey units, as shown in Figure 8.2. The survey team consisted of one archaeologist and three Sites Officers from the Registered Aboriginal Parties.

The survey aimed to identify any Aboriginal objects and areas of potential archaeological deposit (PAD) within the Project area. The survey also recorded land disturbance, survey coverage variables (ground exposure and archaeological visibility) and landform types across the Project area. Data were captured using handheld GPS, and digital camera.



Legend

Project area

AHIMS

AHIMS search area

0 1 2 km

1:65,000 at A4

Data sources
Jacobs 2020
NSW Spatial Services 2019
Service Layer Credits:
© Department of Customer Service 2020

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Figure 8-1 Project area and previously recorded sites from AHIMS search

Legend

- Maximum distrubance footprint
- Survey unit 1
- Survey unit 2
- Survey unit 3
- Survey unit 4

0 100 200 m

1:5,000 at A4

Data sources

Jacobs 2020
NSW Spatial Services 2019
Service Layer Credits:
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Figure 8-2 Aboriginal survey units

8.1.4 Predictive model

A predictive model is used to identify areas of archaeological sensitivity. The model is based on a 'land system' or 'archaeological landscape' model of site location. This type of model predicts site location based on known patterns of site distribution in similar landscape regions.

The predictive model is based on:

- A review of previous models developed for the Project area
- A synthesis of the results of previous archaeological assessments
- The interpretation of the distribution patterns of known sites close to the Project area
- A study of previous impacts to the Project area and the potential effects of these impacts on the archaeological record.

Elevated landforms next to watercourses such as the Murray River have high archaeological potential, however depositional processes can disturb existing sites and reduce such archaeological potential. A precautionary approach has been adopted and the landform is assumed to retain archaeological potential unless there is compelling evidence for severe disturbance of the sites.

8.2 Existing environment

8.2.1 Environmental context

The Project area is located within a landscape of low rolling hills and ridges, with low gradient slopes and rounded tops, that extend back from the bank of the Murray River. In the Project area, this landscape intersects with river terraces created by the Murray River. Beyond the southern edge of the Project area, the terrain drops steeply away to form the river's northern bank.

This region has a complex geological history of deposition, deformation of strata and volcanic intrusions. This history and the weathering of these geological formations has resulted in a diverse topography that includes plateaus, mountains, dissected terrain and valleys, as well as incision features and sedimentary and volcanic fill features in the valleys (National Heritage Consultants, 2007).

The Project area itself sits on terrain that is elevated above the present riverbank and has been presumably unaffected by changes in the course of the river that might have happened in the past. Prior to European settlement of the area, there could well have been riverine features such as swamps, ponds and lakes in the immediately surrounding area which no longer exist. The surrounding region might consequently have contained a more diverse array of natural resources for Aboriginal people to use than currently exists.

Vegetation surrounding the Project has been extensively modified following European settlement, with clearing and farming occurring across the entire the landscape. The Project area has also been altered more recently by the construction of the Hume Dam weir and its associated buildings and infrastructure. The Project area currently has sparse tree cover, with isolated and unevenly distributed trees across the area. Some mature trees are present, but none of them are likely to pre-date European settlement of the area. The majority of the study area is under thick grass cover.

8.2.2 Ethnographic background

The Murray River was one of the most densely populated regions in pre-contact Australia, with Aboriginal occupation was probably heaviest around the central and lower portions of the river (Mulvaney & Kamminga,

1999, p. 303). The population along the river corridor was sustained by the abundant and diverse plant and animal resources associated with the river, swamps and billabongs. In the upper portion of the Murray, where the Project area sits, Aboriginal people would have had access to a relatively fertile hinterland, with higher rainfall than the semi-arid or arid hinterland found around the central and lower Murray.

Historical observations of Aboriginal camps in the Albury region are sparse. One observer records that camps were usually located in clear ground near water, 'as fish and birds were the principle articles of food' (Andrews, 1920, p. 35), and that these camps were usually used for long periods by large numbers of people. It is possible that large camps adjacent to water were more visible to European observers than smaller or more ephemeral camps that might have occurred away from watercourses.

There are frequent historical records of Aboriginal people annually burning off the land to restrict the growth of understorey plants and encourage grasses. This practise presumably functioned to increase the number of Kangaroos and other grazing marsupials which could be hunted (Vigilante & Bowman, 2004). It might also have been employed to encourage plants that could be exploited for food or other purposes. Aboriginal use of the daisy yam (*Microseris lanceolata* and *Microseris scapigera*), and the plant's prevalence in the landscape at the time of European settlement, is mentioned in many early historic accounts. These accounts provide strong evidence that this plant provided an important food source for Aboriginal populations in southeast Australia.

8.3 Assessment of impacts

8.3.1 Survey results

No Aboriginal objects were identified in the Project disturbance footprint.

One area of potential archaeological deposit (PAD) was identified in the Project disturbance footprint. This area has been named 'Hume PAD 001' and is located on the top of the linear ridge in survey unit 3 (Figure 8.3).

Hume PAD 001 is an area of near-level ground on the crest of a broad round-topped linear ridge. The ridge runs in a northeast to southwest direction, sloping gently downward toward the southwest. Across the area of Hume PAD 001, the gradient of the ridgetop decreases, creating a near-level platform of ground.

Hume PAD 001 has been assessed as an area of potential archaeological deposit due to its elevated and level terrain, the lack of visible prior ground disturbance in the area, and the area's low ground surface visibility.

If any Aboriginal artefacts are present within Hume PAD 001, the thick grass cover prevents their being visible on the ground surface. Any artefacts present would almost certainly be hidden under this vegetation and might also have been incorporated down into the sandy soils and sediments at the ground surface. As a consequence, the presence or absence of Aboriginal artefacts cannot be established through surface survey. For these reasons, the area is assessed as having the potential to contain Aboriginal artefacts and is consequently designated as an area of PAD.

The potential for Aboriginal objects to be present within other parts of the Project area, either on the ground surface or buried in subsurface deposits in concentrations great enough to be detectable through test excavation, is assessed as being negligible.

Legend

- Maximum distrubance footprint
- Hume PAD 001
- Contours

0 100 200 m

1:5,000 at A4

Data sources

Jacobs 2020
NSW Spatial Services 2019
Service Layer Credits:
© Department of Customer Service 2020

GDA94 MGA55

Figure 8-3 Location of potential archaeological deposit site

8.3.2 Significance assessment

A significance assessment is made up of several significance criteria that attempt to define why a site is important. The assessment of Aboriginal cultural heritage in this assessment is based upon the four values of the Australia ICOMOS Burra Charter (Australia ICOMOS, 2000):

- Social values
- Historical values
- Scientific values
- Aesthetic values.

No Aboriginal objects or places have been identified within or near the Project disturbance footprint.

Surface survey provides an understanding of the nature, and consequently the significance, of Aboriginal objects currently visible on the ground surface only. The significance of Hume PAD 001 cannot be assessed based on the data gathered during the archaeological survey. Assessing the significance of this area of PAD would require further archaeological work including subsurface test excavation. Test excavations would be carried out prior to the determination of the Project (see Section 8.4 for further details).

8.3.3 Construction

No Aboriginal objects or places have been identified within the Project disturbance footprint.

One area of archaeological potential, that has the potential to contain Aboriginal objects in subsurface deposits or hidden under vegetation cover, was identified within the study area (Hume PAD 001).

The Project would represent a direct impact to Hume PAD 001, resulting in complete destruction of the area of PAD. Hume PAD 001 lies within an area proposed to be the location of the Battery Energy Storage System (BESS) and an associated area of levelled terrain to be capped with hardstand material and used as a vehicle and laydown yard. The existing soils and sediments on and immediately underneath the present ground surface within Hume PAD 001 would be substantially disturbed or removed from the area, and any Aboriginal artefacts present within them would be removed from their archaeological context and potentially damaged or destroyed.

8.3.4 Operation

No impacts to Aboriginal heritage objects or places are expected from the operation of the Project.

8.3.5 Cumulative impacts

No known Aboriginal objects or places will be impacted by the Project.

It is not known whether any Aboriginal objects are present within Hume PAD 001. The significance of any Aboriginal objects that might be present within this area of PAD is also unknown. As a result, the cumulative impact of the Project to the potential archaeological resource of the Project area cannot be assessed until the presence or absence of Aboriginal objects within the area of PAD has been tested and confirmed.

8.4 Environmental management measures

Table 8-1 outlines measures for managing, avoiding or mitigating potential hazard impacts from the construction and operation of the Project.

Table 8-1: Environmental management measures - Aboriginal heritage impacts

Reference	Environmental management measures	Timing
AH01	A program of test excavation would be carried out on Hume PAD 001 to assess the nature and significance of any subsurface archaeological material that might be present. The test excavations would be carried out following the procedures outlined in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010), and so the test excavation program would not require an AHIP. The results of these test excavations would inform decisions around subsequent management of this area of PAD. If Aboriginal cultural heritage material is identified during the test excavation program, the location where these objects were found would be registered as an Aboriginal site. Approval to impact this Aboriginal site would need to be obtained prior to project construction works commencing.	Pre-construction
AH02	In the event that Aboriginal objects are discovered within the Project area during construction project works being carried out, all work in the area will be halted immediately, and the unexpected finds protocol (Appendix E of ACHAR) will be implemented.	Construction
AH03	A copy of the ACHAR will be submitted to the Environment, Energy and Science Group of the Department of Planning, Industry and Environment (former NSW Office of Environment and Heritage) (EESG) for review and assessment as part of the EIS.	Pre-construction
AH04	Cultural awareness induction for any personnel involved in ground breaking activities. This could include a Cultural Awareness Training Program.	Construction
AH05	A Cultural Heritage Management Plan including potential monitoring and salvage works procedures would be prepared and implemented for the Project construction.	Construction

9. Non-Aboriginal heritage

This chapter addresses the historic heritage component of the SEARs for the Project, which require the EIS to include which requires an assessment of the potential historic heritage (cultural and archaeological) impacts of the development. This chapter summarises the findings of the Statement of Heritage Impact prepared for the Project (Jacobs, 2020d) (refer to Appendix F).

9.1 Assessment methodology

Jacobs has prepared a Statement of Heritage Impact (SoHI) to support the development of the Project by assessing potential impacts on non-Aboriginal heritage (Jacobs, 2020d).

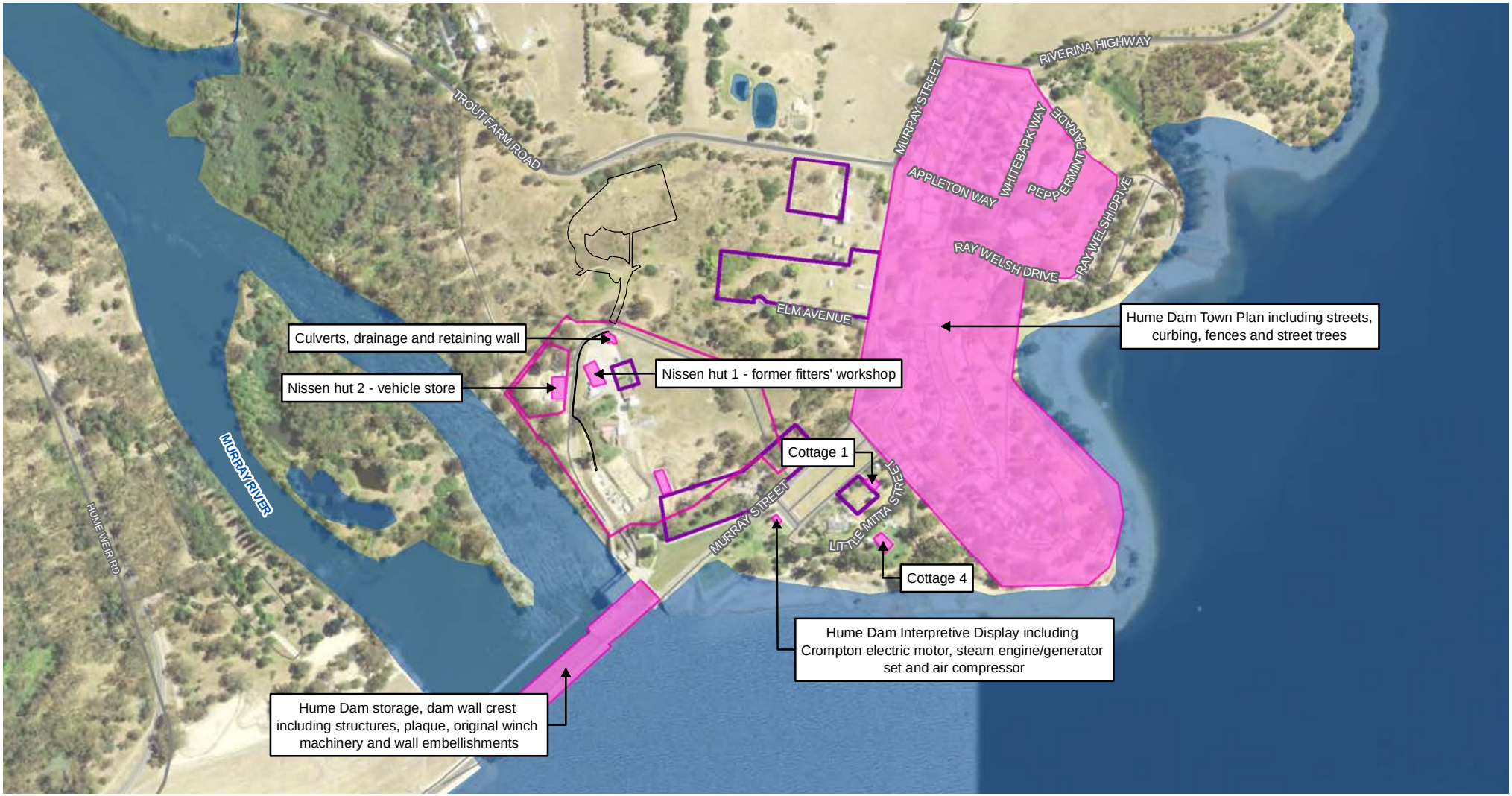
As part of this assessment, desktop assessment of known heritage values was carried out including database searches and literature review, as well as a site inspection of the WaterNSW owned land carried out by Jacobs Senior Archaeologist on 26 June 2020 to ground-truth the known heritage values. The visit comprised a pedestrian survey inspecting the areas of impact within the curtilage of the Hume Dam between the switchyard and the proposed location of the BESS, including photographs.

9.2 Existing environment

A search of the following heritage registers was undertaken on 25 March 2020

- NSW State Heritage Register (SHR)
- State Heritage Inventory including s170 State Agency Heritage and Conservation Registers
- Albury LEP 2010
- Commonwealth Heritage List
- National Heritage List
- World Heritage List and
- Register of the National Estate.

The following listed heritage items in Table 9-1 were identified within 500 metres of the Project area. The locations of these items are shown on Figure 9-1.



Legend

- Maximum disturbance footprint
- Heritage items
- Hume Dam works compound
- Indicative areas of high historical potential

0 250 500 m

1:7,500 at A4

Data sources
Jacobs 2020
NSW Spatial Services 2019
Service Layer Credits:
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Figure 9-1 Heritage values

Table 9-1: Heritage register search results

Item name	Address	Register/Agency
Hume Dam and Weir	Hume Weir, NSW	Register of the National Estate
Hume Dam	Accessed off Murray Street, on the Murray River, Albury, NSW 2640	Water NSW
Hume Dam Cottage 1	Murray River, Albury	Water NSW
Hume Dam Cottage 4	Murray River, Albury	Water NSW
Hume Dam Interpretive Display including Crompton electric motor, Steam engine/generator set and air compressor	Murray River, Albury	Water NSW
Hume Dam moveable heritage	Murray River, Albury	Water NSW
Hume Dam Nissan Huts	Murray River, Albury	Water NSW
Hume Dam Storage, dam wall crest including structures, plaque, original winch machinery and wall embellishments	Murray River, Albury	Water NSW
Hume Dam Town Plan including streets, curbing, fences and street trees	Murray River, Albury	Water NSW

The proposed location for the BESS is to the north of the Hume Dam Works Compound. It is currently a vacant field. The Hume Dam Works Compound consists of collection of buildings of various styles and vintages located on either side of a crescent road from Murray Street (see Figure 9-1).

9.3 Assessment of impacts

9.3.1 Construction

A Conservation Management Plan prepared for Hume Dam (Urbis, 2013) included a schedule of significance for heritage elements surrounding the Project area. The heritage items and features in close proximity to the Project include:

- Nissan huts
- Road layout
- Culverts, drainage and retaining walls
- Archaeology associated with upgrade works (1950-1961).

The proposed location of the BESS is in a vacant field and outside of all heritage precincts covered by the CMP. No heritage items would be impacted as a result of the construction.

The proposed location of the BESS is outside of the land known to be used during the construction and operation of the Hume Dam and the potential for significant archaeological deposits relating to the Hume Dam in this area is considered low.

The underground infrastructure is proposed to run within the road corridor in the Hume Dam Works Compound from the switchyard to the proposed BESS site. The switchyard is not considered as having any heritage value and the proposed installation of underground electricity network would not impact the road layout.

No listed heritage items or features would be impacted by the construction of the Project. However the culvert, drainage and retaining walls and the two Nissan huts are located in proximity to the Project protective fencing would be placed around the identified heritage items to prevent any risks of accidental damage (see Section 9.4).

9.3.2 Operation

There would be no impacts to known non-Aboriginal heritage or archaeology once the Project is operational.

9.3.3 Significance assessment

Staff cottages 1 and 4 contribute to the setting of the dam and are of historical, aesthetic and representative significance at a local level as surviving infrastructure from the significant construction phases associated with the dam. Cottages 1 and 4 are of significance at a local level as representative cottage dwellings of the post war and interwar periods respectively, built to a characteristic government pattern book design.

Cottage 4 represents the earliest phase of departmental development for housing at the Hume Dam and is the only site building surviving from the original inter-war construction period (circa 1921) still in State ownership.

The Nissan huts have local aesthetic and historic significance as an example of traditional military designed infrastructure that has been adapted and reused at the site and demonstrating reflecting the significant 1950s upgrade. The buildings are also of significance as surplus military structures associated with the Second World War. They have a moderate to high level of integrity.

Items of high heritage significance or moderate heritage significance within the vicinity of the Project have reproduced from the Hume Dam CMP (Urbis, 2013, pp. 117-122) in Table 9-2.

Table 9-2: Schedule of significant elements (Urbis, 2013)

Structure, Space or Element	Location or building	Grading	Level
Buildings			
Nissan hut 3 (core shed)	Hume Dam works compound	High	Local
Nissan hut 1 – former fitters' workshop – excluding attached covered area	Hume Dam works compound	High	Local
Nissan hut 2 – vehicle store (excluding the annex)	Hume Dam works compound	High	Local
Movable heritage items			
Stored moveable heritage items (stored in shipping container on site)	Hume Dam works compound	Requires assessment. High potential	-
Landscape features			
Road layout	Hume Dam works compound	Moderate	Local
Culverts, drainage and retaining walls	Hume Dam works compound	Moderate	-

Structure, Space or Element	Location or building	Grading	Level
Native plantings	River foreshore (up and downstream) and southern boundary of the Hume Dam Works Compound	Moderate	-
Archaeological resource			
Archaeology associated with the upgrade works (1950-1961) and subsequent built structures. Including former housing, barracks and mess buildings.	All precincts	Moderate	Potentially local

9.4 Environmental management measures

Table 9-3 outlines measures for managing, avoiding or mitigating potential hazard impacts from the construction and operation of the Project.

Table 9-3: Environmental management measures - non-Aboriginal heritage impacts

Reference	Environmental management measures	Timing
HH01	Protective fencing would be installed around the two Nissan huts (former fitters' workshop and vehicle store) and the culvert, drainage and retaining wall to protect them from inadvertent damage during construction of the underground electricity cable.	Construction
HH02	A heritage induction for both Aboriginal and non-Aboriginal heritage should be carried out as part of general site inductions. The aim of the induction would be to ensure that all staff, contractors and subcontractors are aware of their statutory duties under both the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*.	Pre-construction
HH03	In the event of archaeological material being uncovered during works that all works in the area should stop, the area cordoned off and a suitably qualified archaeologist be engaged to assess the significance and future management of the find(s). If deemed to be of significance, under Section 146 of the *Heritage Act 1977* (NSW), a s146 form would be submitted to notify the Heritage Council of the discovery of relics. Further investigation may be required, and appropriate management would be agreed through consultation with Heritage NSW	Construction
HH04	In the unlikely event that human remains are uncovered, all work must cease immediately in the vicinity of the remains and the area cordoned off. The local NSW Police must be notified, who would make an initial assessment as to whether the remains are part of a crime scene, or Aboriginal remains. If the remains are thought to be Aboriginal, Heritage NSW must be contacted.	Construction

10. Land

This chapter addresses the Land component of the SEARs for the Project, which requires an assessment of the potential impacts of the development on existing land uses on the site and adjacent land and the compatibility of the development with existing land uses, during construction, operation and after decommissioning.

10.1 Assessment methodology

The assessment of potential land use conflicts has involved:

- Consultation with WaterNSW to inform existing and proposed site uses
- Review of land use zoning and surrounding land uses
- Consideration of findings of heritage, visual, traffic, noise and socio-economic assessments
- Identification of potential for Project conflicts to arise in relation to the Project with reference to Land Use Conflict Risk Assessment Guide (Department of Primary Industries, 2011)
- Development of mitigation measures to manage conflicts.

10.2 Existing environment

The existing environment is generally described in Section 1.3. In relation to land use the following is identified as relevant to identification of potential conflicts:

- The site and adjacent land to the north and immediately to the south and west is zoned RU2 Rural Landscape
- Other land use zones surrounding the Project include RU5 Village to the east associated with the Lake Hume Village, SP2 Sewerage Systems to the north-east associated with Hume Weir Village sewage treatment plant and W2 Recreational Waterways to the west associated with the Murray River waterway
- The nearest residential neighbours to the project is one rural property across Trout Farm Road and Lake Hume Village tourist accommodation to the east
- The Project footprint is not currently used for economic purposes but has recently been fenced for grazing purposes to manage bushfire risks
- The remainder of the WaterNSW site is currently used for the ongoing management of Hume Dam by WaterNSW currently involving routine maintenance activities and Meridian Energy for the operation of the Hume Power Station
- Main land uses surrounding the Project are Lake Hume, village, tourist accommodation, recreational uses including water sports, heritage conservation, low intensity farming, sewage treatment and habitat protection as described below.

10.2.1 Lake Hume village

Lake Hume Village is a small tourist village located about 300 metres east from the Project site. It comprises a tourist park, a resort, and several cottages and villas. Beach and boat ramp facilities are available via Lake Hume Village, allowing access to Murray River and Lake Hume. Lake Hume Village has a small permanent population of less than 100 people and 27 private dwellings (ABS, 2016). The population of the village is expected to increase significantly during weekend and holiday periods due to an influx of tourists and visitors (refer to Section 16.2 for further details).

10.2.2 Tourist accommodation

There are two accommodation providers at Lake Hume Village that offer a range of caravan, camping and cabin accommodation options. These include:

- Lake Hume Resort, which offers 74 units, including hotel rooms and two, three and four bed cabins
- Lake Hume Tourist Park, which offers about 200 caravans, camping and cabin sites.

10.2.3 Recreational uses

Lake Hume is valued by local and regional communities for its environmental, scenic amenity, cultural heritage and recreational values. The lake is a popular recreation and tourist destination in the Albury Wodonga region and supports a range of water and land based recreational activities including fishing, boating and swimming, and camping, sightseeing and picnicking, attracting residents of surrounding communities and visitors across NSW and Victoria (Goulburn-Murray Water, 2015). Lake Hume also supports numerous sport and recreation clubs, including fishing, boating and sailing clubs and is used for regular fishing and boating competitions and events.

10.2.4 Heritage conservation

As described in Chapter 9, Hume Dam is of state historical significance for its role in the management and conservation of water within the Murray basin and as one of the great engineering projects of the inter-war period and one of the greatest water conservation projects in Australia. There are several heritage items within that curtilage of the Hume Dam that are separately listed, with the closest to the Project being the three Nissan huts in the Hume Dam Works Compound precinct and the road layout.

10.2.5 Farming

Land to the north of Trout Farm Road generally consists of grazing land. Land to the west consists of a category 3 travelling stock reserve. Category 3 travelling stock reserves are described as rarely, if ever used for travelling stock or emergency management, but are important, valued and used for other reasons such as biodiversity conservation, First Nations Peoples' heritage or recreation and are not Stock Watering Places (Local Land Services, 2019).

Land and soil capability is the physical capacity of land to sustain a range of land uses and management practices. Classification of land into classes on a scale of 1 to 8 identifies the types of land use that would be appropriate in each classification. The land capability and classifications of the Project and rural areas to the north is class 6 Low capability land (Office of Environment and Heritage, 2012). Class 6 land is identified as having very high limitations for high-impact land uses with use restricted to low-impact land uses such as grazing, forestry and nature conservation and careful management of limitations required to prevent severe land and environmental degradation. The nearest higher capability land is located over 500 metres from the Project to the west.

10.2.6 Sewage treatment

According to the Albury City website (Albury City, 2020) the Hume Weir Village system services the Hume Weir Resort, the Hume Weir Caravan Park and the Hume Dam workshop and power station. It was constructed in 1977 and has a capacity of 100 KL/day. It is an activated sludge plant utilising a Pasveer channel. Disinfection is achieved using maturation ponds and the treated effluent is discharged to the Murray River approximately 300 metres downstream of the Hume Dam wall.

10.2.7 Habitat Protection

In consultation with WaterNSW it has been identified that a local group 'Friends of the Lake Hume Spillway Gliders' have implemented a range of habitat and connectivity initiatives focused on the preservation of Sugar Gliders. This has included corridor planting running through the WaterNSW landholding and establishment of nest boxes both on and off site.

10.3 Assessment of impacts

Land use conflicts occur when one land user is perceived to infringe upon the rights, values or amenity of another (Department of Primary Industries, 2011). The process of identifying potential land use conflict is generally to identify potential risks by considering land use changes that may affect existing land uses in the area. This process was started as part of the Scoping Report for the Project and Table 10-1 identifies and quantifies potential land use conflicts based on the findings of assessment as part of the EIS process.

Table 10-1: Potential land use conflicts

Environmental matter	Impact mechanism	Summary of conflict
Noise	Noise impacts have the potential to lead to land use conflict with residential and tourist accommodation and also affect amenity for recreational uses. During construction off-site noise impacts above noise management levels would be limited to one resident in the absence of mitigation. Works may also be audible to recreational users of the area but are not expected to be at levels to cause concern. No off-site noise impacts above noise management levels are predicted during operation of the Project.	Land use conflicts associated with noise would be limited to construction phase of the Project and limited to a maximum of nine months. Reasonable and feasible mitigation measures are available and would be implemented to minimise noise impacts.
Visual	Visual impacts have potential to lead to land use conflict where they obstruct or disrupt scenic views or alter the scenic character. The Project would be visible in the distance from publicly accessible viewpoints near the Hume Dam. Views of the Project would be across existing WaterNSW operational area and Power transmission infrastructure and would not be prominent to the extent that the scenic nature would be significantly altered. Partial glimpses of the BESS may also be available to motorists on Trout Farm Road and the residential driveway north of the Project. Important views for private residents or scenic view points would not be obstructed.	Visual impacts would occur during both construction and operation but not to an extent they would unreasonably infringe on amenity of surrounding land uses (Refer to Chapter 11).
Air quality and odour	Air quality impacts are able to be readily managed during construction using standard methods and were not considered a key issue requiring further assessment for the Project. Dust would be managed during construction to avoid off-site impacts. No operational air quality emissions would	Air quality impacts would be unlikely to extend off-site and would be managed so as not to infringe on amenity of surrounding land uses.

Environmental matter	Impact mechanism	Summary of conflict
	result from the Project under normal operations. BESS technology includes extensive monitoring and safety mechanisms such that risks of emergency situations where air emissions could eventuate are extremely low. Should an emergency lead to air emissions these would be similar to those emitted from a plastic fire.	The Project would not have odorous qualities, characteristics or attributes with potential to interfere with local amenity.
Access	Traffic impacts have potential to lead to land use conflict where they unreasonably restrict access. During construction, some additional light and heavy vehicles would use the existing road network in the vicinity of the Project but not to the extent that they are assessed as causing delays to other road users. No road upgrades are proposed. Access arrangements require the use of the existing WaterNSW internal access road and WaterNSW has identified this as requiring management to avoid land use conflict with WaterNSW uses of the Site. Post construction, routine maintenance involving one vehicle attending site over a one week period each year is required. This would not lead to land use conflicts either on or off site.	Minor increase in traffic on local roads is predicted but not to the extent that it would restrict or interfere with access for the general public (Refer to Chapter 13). Traffic management within the WaterNSW lands would be subject to a traffic management plan to be agreed with WaterNSW.
Water	Water impacts have potential to lead to land use conflicts where they affect the volume or quality of water for other users. During construction, the potential exists for increased erosion leading to sediment laden run-off. This will be managed in accordance with standard mitigation measures such that off-site water quality impacts do not eventuate. Post-construction, disturbed areas would be rehabilitated and the site maintained to prevent erosion and sediment laden run-off with construction water quality controls converted to permanent controls to prevent concentrated flows and erosion. With all current and future run-off flowing to the Murray River with no intervening users, the minor changes in run-off quantities does not have potential to impact existing water use rights.	The minor increase in impervious surface within the overall catchment would lead to a minor increase in run-off but with proposed mitigation measures this would not cause land-use conflicts (Refer to Section 14.3).
Habitat	Clearing and the use of barbed wire has potential to impact habitat and connectivity through the site. During construction some clearing is required but aims to avoid native vegetation and habitat features to the extent feasible. Most clearing is limited to areas of non-native planting not identified as important habitat. Post construction, the use of barbed wire in security fencing has been identified as a risk to land use for habitat connectivity for squirrel gliders. Efforts to avoid use of	A conflict with the use of the site for habitat and connectivity for squirrel gliders has been identified. Impacts have been assessed in accordance with the Biodiversity Assessment Method and would be

Environmental matter	Impact mechanism	Summary of conflict
	barbed wire would be investigated. If not avoidable because of safety or security regulatory purposes, devices to make wire more visible to gliders would be installed. Compensatory habitat planting would also be investigated.	mitigated as described in Chapter 7.

No significant land use conflicts are identified for the Project.

10.4 Environmental management measures

Potential conflicts arising in relation to habitat and connectivity, access, visual, water and noise would be managed through the implementation of mitigation measures developed specifically for these issues as summarised in Chapter 18. On the basis that no significant land use conflicts have been identified, no additional mitigation measures are proposed.

11. Visual amenity

This chapter summarises the findings of the Visual Impact Assessment (VIA) carried out for the Project (Jacobs, 2020g) (see Appendix G) and addresses the SEARs for visual impacts including an assessment of the likely visual impacts of the development (including any night lighting) on surrounding residences, scenic or significant vistas.

11.1 Assessment methodology

The VIA is carried out using the following method:

- Description of the Project site and surrounding area
- Description of proposed works
- Description of relevant planning instruments for visual impact assessment and applying them to the Project site and surrounding area
- Computer-generated viewshed of the Project site using the visibility of a point 2 m above the existing ground level
- Assessment of the visual impact on views and visual receptors using the sensitivity and magnitude criteria from the Guideline for Landscape Character and Visual Impact Assessment (Roads and Maritime, 2018)
- Assessment of the visual impact of the Project from publicly accessible viewpoints, using both site inspection photographs and GoogleMaps photography.

11.2 Existing environment

The surrounding area is characterised by the Murray River and Hume Dam, as well as single-storey structures, grazing land and grass land in an undulating landform. The Project site is located on south-facing land rising steeply off the riverbank of the Murray River. The Hume Dam spans the width of the Murray River directly south of the Project site and is considered a local visual landmark. The dam structure features a lookout platform with 360-degree panoramic views across the local landscape.

The Project site includes a grassy field with scattered shrubs and a belt of trees on the northern boundary along Trout Farm Road visually shields the Project site to an extent. The site is not visually prominent within the landscape.

The viewshed of the Project includes the areas from which the Project site would likely be visible. The Project would be visible mostly from viewpoints south and south-west of the site and would be less visible from the north and north-east directions, as shown in Figure 11-1.

Legend

- Maximum distrubance footprint
- Proposed Battery Energy Storage System (BESS)
- Proposed hardstand laydown area and ramp
- Proposed vehicle access
- Viewpoint location
- Areas not visible from viewpoint location
- Areas visible from viewpoint location

0 100 200 m

1:7,500 at A4

Data sources

Jacobs 2020
NSW Spatial Services 2019
Service Layer Credits:
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Figure 11-1 Viewshed diagram

11.3 Assessment of impacts

The overall sensitivity of visual receptors to changes in the local visual landscape can be determined by qualifying both sensitivity and magnitude of the change in views. Sensitivity refers to the how sensitive the existing receivers and landscape is to any proposed changes, and magnitude refers to the physical scale of the changes and how much contrast it would add to the existing condition. The visual impact assessment guideline (Roads and Maritime, 2018) provides an impact assessment matrix which is reproduced in Table 11-1.

Table 11-1: Impact assessment rating matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	Moderate/High	Moderate	Negligible
	Moderate	Moderate/High	Moderate	Moderate/Low	Negligible
	Low	Moderate	Moderate/Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

From the computer-generated viewshed diagram (Figure 11-1), the Project site would not be visually prominent when viewed from residential and public accessible areas in the immediate vicinity. The site is not visible from the single residential receiver north of the Project, nor the properties in the Lake Hume Village to the east. The Project site would be visible within distant views form the west and south-west, from the River Murray and the River Murray Reserve, although the views would be filtered by landform and vegetation.

A number of representative viewpoints from publicly accessible locations have been selected from within the viewshed, as shown in Figure 11-2. These five viewpoints have been selected to show both the existing view and the potential visual impacts of the Project.

11.3.1 Viewpoint analysis

A summary of the impact of the Project as viewed from 5 different view points are outlined below (Refer to Figure 11-1). A detailed assessment is provided in Appendix G.

Figure 11-2: Viewpoint locations

VP 01 – looking north from Hume Dam

This view looks north from the middle of the dam walkway. The views are panoramic and encompass the river channel and densely vegetated river banks. From this distance, the Project site does not appear particularly prominent within the view. The impact of the Project from VP 01 has been assessed as moderate. The severity of the impact is due to the importance of the dam structure as a local attraction and the views it offers.

VP 02 – looking southwest from Trout Farm Road

This view would be experienced by motorists of Trout Farm Road. The foreground is the roadway and the background comprise a grassed embankment and a belt of mature trees that heavily filter the views beyond. The impact of the Project from VP 02 has been assessed as negligible given the Project site lacks visibility from this location.

VP 03 – looking east from Trout Farm Road

This view would be experienced by motorists of Trout Farm Road. The view is dominated by the roadway and the open glass land with shrubs and mature trees is visible in the background. The Project site would be partially visible and filtered by landform and a belt of trees. The impact of the Project from VP 03 has been assessed as negligible given the Project site lacks visibility from this location.

VP 04 – looking south across Trout Farm Road from property driveway

This view looks across Trout Farm Road from a residential property driveway north of the Project site. The view would be experienced by motorists of Trout Farm Road as well as the residents of the property. The roadway and a grassed embankment are visible in the foreground and any views beyond is filtered by mature trees. The impact of the Project from VP 04 has been assessed as negligible given the Project site lacks visibility from this location.

VP 05 – looking north from the dam viewing platform

This view looks north from the dam viewing platform and across this area a number of low-lying structures and infrastructure related to the dam and the HPS are visible. The Project site is visible in the distance and filtered by intervening mature trees. The view would be experienced by visitors accessing the viewing platform and the dam walkway. The impact on the Project from VP 05 has been assessed as moderate. The severity of the impact is due to the importance of the dam structure as a local attraction and the views it offers.

The viewshed and visibility of the Project would be relatively limited from publicly accessible and residential areas surrounding the Project site. The viewpoints from Hume Dam walkway and viewing platform would be moderately impacted by the Project however the magnitude of the changes to the view available is considered low. The impact upon other viewpoints are considered negligible and appropriate management and mitigation measures would be implemented to minimise the visual impacts of the Project.

11.4 Environmental management measures

Table 11-2 outlines measures for managing, avoiding or mitigating potential hazard impacts from the construction and operation of the Project.

Table 11-2: Environmental management measures - visual amenity impacts

Reference	Environmental management measures	Timing
V01	Retention and enhancement of existing landscape features (areas of scrub, individual trees) should be considered where feasible	Detailed design
V02	Limit the area of disturbance during construction	Construction
V03	Cutting and embankment slopes should be seeded to grass to match existing	Construction
V04	Mitigation tree and shrub planting should be considered to compensate for lost habitat and to visually integrate the Project within the surrounding landscape	Construction
V05	Colour of proposed structures and built form should be considered in a suitable muted palette to visually integrate the Project within the landscape	Detailed design
V06	Consider minimal use of reflective surfaces to avoid drawing attention to the site within views due to reflective glare.	Detailed design

12. Noise and vibration

This chapter addresses the noise component of the SEARs for the Project, which requires the EIS to include an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry (2017), cumulative noise impacts (considering other developments in the area), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria. This chapter summarises the findings of the Noise and Vibration Impact Assessment (NVIA) (Jacobs, 2020e) (see Appendix H).

12.1 Existing environment

12.1.1 Potential receivers

The nearest residential and temporary accommodation receivers are located approximately 300 metres from the Project. Additionally, there are also industrial, commercial and recreational receiver locations near the Project. Surrounding land uses and nearby receivers in relation to the Project are shown in Figure 12-1 and specific individual receiver identifiers are contained in Appendix H.

While all receivers and surrounding structures are sensitive to vibration impacts, heritage and precision industries are more typically more susceptible and are subject to more stringent criteria. A review of the Aboriginal Cultural Heritage Assessment Report (Jacobs, 2020c) and Statement of Heritage Impact (non-Aboriginal) (Jacobs, 2020d) prepared for the Project identified that the nearest heritage structure in relation to the Project are approximately 150 metres to the south of the BESS compound (State-listed Hume Dam Nissan Huts). The proposed electricity cabling infrastructure would be installed approximately 10 metres from these structures, although this would not involve the use of and vibration-generating plant and equipment.

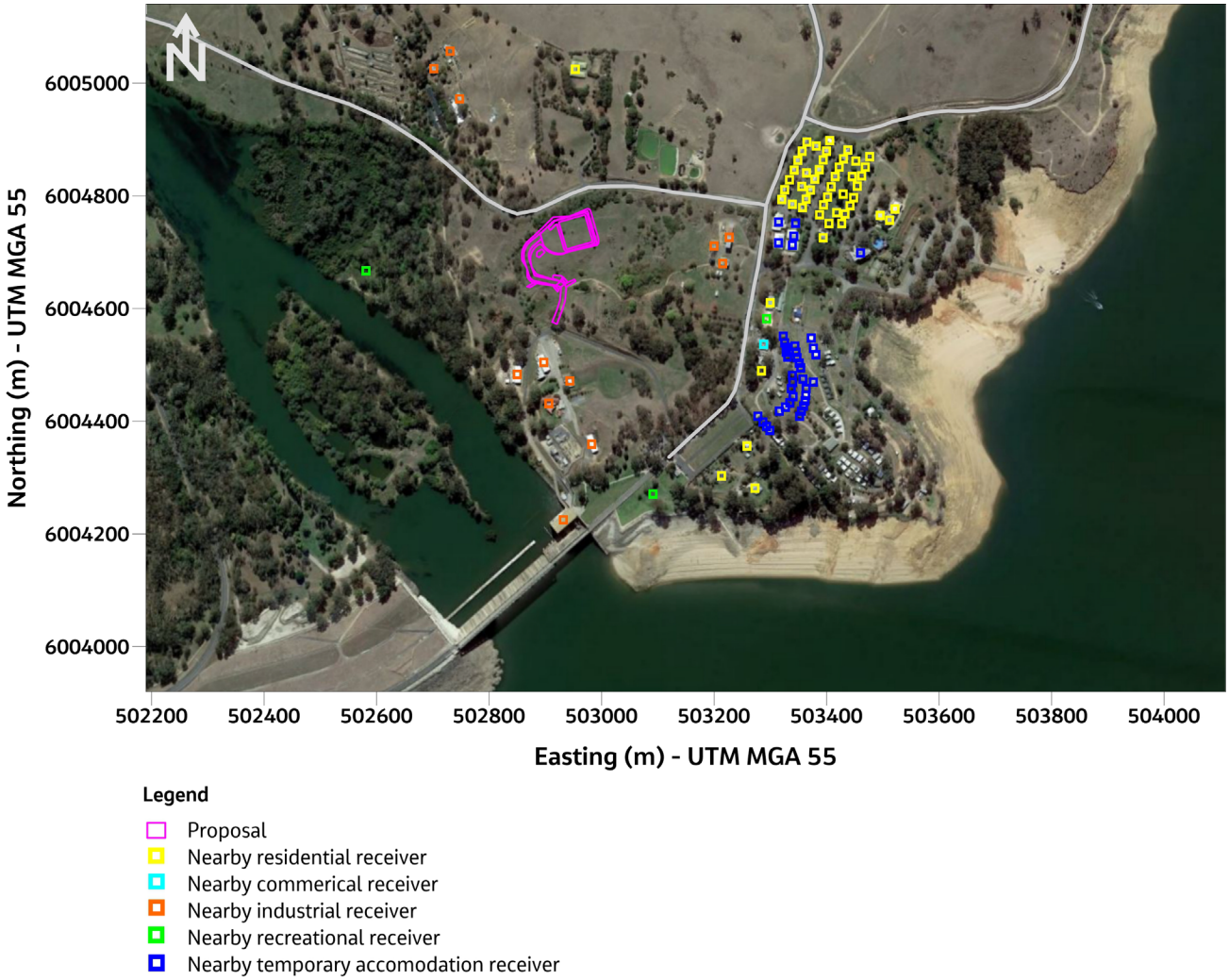


Figure 12-1: Project location and nearby receivers

12.1.2 Meteorology

Certain meteorological conditions can enhance the propagation of noise and their influence is required to be taken into consideration if they are a feature of the locality. A review of prevailing winds and temperature inversions in accordance with the methods detailed in the NPI Fact Sheet D (EPA, 2017) found that the frequency of winds blowing and frequency of temperature inversion occurrences in winter months are both 'significant'. As a result, these noise-enhancing meteorological effects require consideration as part of the Project operational noise assessment.

12.1.3 Background noise levels

In the absence of monitored background noise levels the NPI provides the following minimum rating background levels to be used for the purpose of noise assessment listed in Table 12-1.

Table 12-1: Adopted minimum rating background levels

Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
35	30	30

Estimated rating background noise levels (RBLs) are used to determine the Project's sensitivity to changes in the acoustic environment. The existing operation of the dam and HPS, as well as recreational boating are existing noise sources in the area and the adoption of minimum background levels for the Project is considered conservative.

12.2 Assessment methodology

The key activities with the potential to generate noise and vibration during the Project include:

- Civil, structural and electrical construction phases of the project including associated traffic movements
- Noise during operations.

Noise from construction and operational activities was assessed quantitatively by creating a site noise model using SoundPlan acoustic software. Levels were evaluated by comparing predictions at surrounding sensitive receivers against values developed based on guidance from the ICNG (construction) and NPI (operations).

12.2.1 Construction

The Interim Construction Noise Guideline (ICNG) (DECC, 2009) provides guidance for assessing noise from construction activities in NSW. It establishes noise management levels (NMLs) according to the hours in which construction may take place. Construction is considered to have the potential to cause a noise impact if the predicted noise exceeds the noise management levels. Table 12-2 lists ICNG guidance for establishing construction NMLs at residential receivers.

Table 12-2: ICNG guidance for establishing construction NMLs at residential receivers

Time of day	Noise management level $L_{Aeq(15min)}$
Recommended standard hours (SH): Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected Rating Background Level (RBL) + 10 dB(A)
	Highly noise affected 75 dB(A)
Outside recommended standard hours - All other times including public holidays	Noise affected RBL + 5 dB(A)

Considering the adopted RBLs in Table 12-1 and the guidance from ICNG, the following NMLs listed in Table 12-3 were established to assess potential construction noise impacts at the identified residential receiver locations surrounding the Project. Table 12-4 provides the ICNG guidance construction NMLs for non-residential land uses.

Table 12-3: ICNG NMLs for residential receivers

Receiver type	Day (during standard hours)		Day (outside standard hours)		Evening		Night	
	L_{90} (RBL) dB (A)	NML $L_{eq\ 15\ min}$ dB(A)	L_{90} (RBL) dB (A)	NML $L_{eq\ 15\ min}$ dB(A)	L_{90} (RBL) dB (A)	NML $L_{eq\ 15\ min}$ dB(A)	L_{90} (RBL) dB (A)	NML $L_{eq\ 15\ min}$ dB(A)
Residential	35	45	35	40	30	35	30	35

Table 12-4: ICNG NMLs for non-residential receivers

Non-residential receiver type	Noise management level, $L_{Aeq(15min)}$ (applies when properties are being used)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level – 65 dB(A)
Industrial premises	External noise level – 75 dB(A)
Offices, retail outlets	External noise level – 70 dB(A)
Temporary accommodation (hotels, holiday parks)	External noise level – 45 dB (A)

12.2.2 Construction traffic noise impacts

Chapter 9 of the Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime, 2016a) provides guidance for the assessment of noise associated with additional traffic generated during construction. This guidance was adopted for this assessment and has been reproduced below:

> 'For RMS projects an initial screening test should first be applied by evaluating whether noise levels will increase by more than 2dB(A) due to construction traffic or a temporary reroute due to a road closure. Where increases are 2dBA or less no further assessment is required. Where noise levels increase by more than 2.1 dB(A) further assessment is required using Roads and Maritimes Criteria Guideline.'

This guidance was considered for the purpose of reviewing potential noise associated with additional traffic generated as a result of the Project.

12.2.3 Operation

Operational noise criteria for the Project are determined in accordance with the NPI (EPA, 2017) which seeks to regulate noise impact from 'industrial activity' pertaining to noise from fixed industry and mechanical plant rather than from road, rail or construction sources. To achieve this, the NPI applies two separate noise levels: one aimed at limiting the intrusiveness of the Project's noise against the prevailing level of background noise, and the other focused on achieving suitable acoustic amenity for the surrounding land uses from industry. The more stringent of these is used to define the operational noise criteria for a Project.

Based on NPI intrusiveness noise criteria and amenity noise criteria for both residential and other receivers, the following most stringent operational noise criteria were adopted for the noise assessment of the Project in Table 12-5.

Table 12-5: Project operational noise criteria

Receiver type	Time of day	Recommended $L_{Aeq\ 15\ minute}$ Noise Level dB(A)
Residential receivers	Day (7 am to 6 pm)	40
	Evening (6 pm to 10 pm)	35
	Night (10 pm to 7 am)	35
Hotels, motels, holiday accommodation, permanent resident caravan parks	Day (7 am to 6 pm)	58
	Evening (6 pm to 10 pm)	48
	Night (10 pm to 7 am)	42
Commercial premises	When in use	63
Industrial premises	When in use	68
Active recreational area	When in use	53

12.2.4 Vibration

Vibration arising from construction activities can result in impacts on human comfort or the damage of physical structures such as dwellings. These two outcomes have different criteria levels, with the effects of vibration on human comfort having a lower threshold. Vibration arising from construction activities must comply with the criteria from Assessing Vibration: A technical guideline (DEC, 2006) and British Standard 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting (British Standards Group, 2008).

12.3 Assessment of impacts

12.3.1 Construction

Overall sound power levels (SWLs) were predicted for each phase of construction. These were determined based on sequencing and plant and equipment provided by Meridian. The overall SWLs were estimated with reference to individual plant and equipment levels presented in national and international standards and guidelines, as well as from Jacobs measurement database. Table 12-6 below summarises estimated overall noise emissions for the agreed assessment scenarios.

Table 12-6: Estimated noise emissions during construction

Construction phase	Plant/equipment	Approximate duration (weeks)	Overall sound power level (SWL) dB(A)
1. Civil works	Grader Digger x 2 Bobcat Front end loader Trucks Drilling rig Light vehicles	8 weeks	118
2. Mechanical/structural activities	Crane Forklift Franna Hand tools Light vehicles Delivery trucks	20 weeks	112
3. Electrical works	Light vehicles Franna Hand tools	20 weeks	104

Noise levels resulting from the three phases of construction (civil, mechanical/structural and electrical works as listed in Table 12-6) were predicted at the surrounding sensitive receivers identified in Figure 12-1. Table 12-7 shows the range of noise levels predicted during construction for each type of receiver.

Table 12-7: Range of predicted noise levels during construction

Receiver type	Noise management level dB(A)	Range of predicted noise level $L_{Aeq\ 15\ minute}$ dB(A) by construction phase		
		1. Civil works	2. Mechanical / structural activities	3. Electrical works
Residential	45	32.0 to **57.2**	26 to **51.2**	<20 to 43.2
Accommodation	45	37.1 to **53.4**	31.1 to **47.4**	23.1 to 39.4
Commercial	70	53.0	47.0	39.0
Industrial	75	55.8 to 61.0	49.8 to 54.8	41.8 to 46.8
Recreational	65	46.2 to 53.6	40.1 to 46.5	32.1 to 38.5

During the completion of phase 1 (civil works), levels above the day time NML of 45 dB(A) were predicted at some residential receivers. This was also the case at some temporary accommodation receivers. Levels at surrounding commercial, industrial and recreational receivers were predicted to remain below applicable NMLs. During phase 2 (mechanical/structural works) levels above the day time NML of 45 dB(A) were also predicted at some residential receivers. During this phase, no exceedances were predicted at surrounding commercial,

industrial and recreational receivers. Finally, no exceedances were predicted during the completion of phase 3 (electrical works). Specific predictions for each receiver are outlined in Appendix H.

Levels above standard day time NMLs were predicted at 17 residential and 2 temporary accommodation receivers during phase 1 (civil works), and at 8 residential receivers and 2 temporary accommodation recievers during phase 2 (mechanical /structural activities). Of the exceedances predicted, all but one were instances where the predicted level was less than 10 dB(A) above the NML. Exceedances less than 10 dB(A) during standard hours are considered to be at a level that is 'clearly audible', but not at a magnitude requiring additional measures beyond standard best-practice controls. At the receiver located 200 metres to the north of the Project along Trout Farm Road (RR01) during phase 1 civil works, a 12 dB(A) exceedance during standard hours is 'moderately intrusive' under the CNVG and additional mitigation measures outlined in Section 12.4 would be required.

12.3.2 Construction traffic noise impacts

The project would also result in additional traffic movements during construction which could result in additional vehicle-related noise emissions. The additional flows forecast are summarised below:

- During construction:
  - Up to around 24 additional light vehicle movements per day
  - Approximately four additional heavy vehicle movements per day
- During operations:
  - Negligible. Estimated that the project would generate only one vehicle per day over a one week period each year.

Existing traffic flow data were used to estimate existing traffic flows for the purpose of assessing whether traffic generated during construction could result in increases of 2.1 dB(A) or more at nearby receivers (see Section 12.2.2). Considering worst-case estimate of 24 additional light and four additional heavy vehicle movements generated as a result of construction, using the Construction Noise Estimator it was determined that noise from road traffic would increase by around 0.1 dB(A) at the most-affected receiver along Murray Street. Considering this, it was determined that the 2.1 dB(A) criteria under the CNVG would not be exceeded.

12.3.3 Operation

During operations the only source of noise emissions would be from the BESS and periodic maintenance activities. For the purpose of the assessment, a maximum sound pressure level of 79 dB(A) at 1 metre from the facility was advised.

Worst-case (i.e. with noise-enhancing meteorology) operational noise levels have been predicted for nearby receivers. The highest predicted noise contribution at a nearby residential receiver was less than 20 dB(A). This is well below the lowest allowable operational criterion of 35 dB(A). Levels up to approximately 25 dB(A) were predicted at the industrial receivers to the south; well below the operational criterion of 68 dB(A). Considering this it was determined that noise from operations at the facility would be at an acceptable level at surrounding receivers that would not result in sleep disturbance impacts and that no control measures would be required.

12.3.4 Cumulative noise impacts

Cumulative noise impacts can occur when noise from more than one development affects the same sensitive receiver(s). This can cause cumulative noise levels up to around 3 dB(A) higher than the noise level from the highest individual contribution. Contributions from surrounding local noise sources are considered as already

being accounted for in the adopted background noise levels. During construction and operation, cumulative impacts would be negligible at surrounding residential and industrial receivers.

12.3.5 Vibration

Of the plant and equipment expected to be used during construction listed above in Table 12-6 the drilling rig to be used during site civil works has the potential to generate vibration impacts. Relevant guidance from the CNVG for the drilling rig is shown in Table 12-8.

Table 12-8: Recommended safe working distances for use of drilling rig near residential receivers

Plant	**Rating / description**	**Safe working distance (meters)**	
		Cosmetic damage **(British Standards Group, 1993)** (BS7385-2: 1993)	Human response **(DEC, 2006)**
Pile boring (drilling rig)	≤800 mm	2 metres (nominal)	4 metres

Considering the location of the nearest sensitive receivers (including the nearest heritage structures) being further than the recommended safe setback distances in Table 12-8 it is concluded that vibration impacts from pile boring would be unlikely during the Project.

Small compaction equipment (e.g. plate compactor) may also be used during the installation of the 11 kV electricity cabling infrastructure from the existing switchyard to the BESS. Depending on intervening ground conditions, peak particle velocities reduce to around 3 mm/s at distances of 15 to 20 metres from plate compactor operations. If the nearby heritage structures are sound, the 3 mm/s criterion from DIN 4150-3: 2016 would be conservative and a higher level of 7.5 mm/s PPV limit representing 50% of the 15 mm/s PPV limit for 'unreinforced or light framed structures' from British Standard 'BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites'. Levels decrease to around 7.5 mm/s at around 10 metres. Care will need to be taken if compaction activities are required within the setback distance appropriate to the integrity of these structures.

12.4 Environmental management measures

Consistent with the requirements of the SEARs, this Chapter presents measures to be included in the Project noise management plan. Standard techniques for controlling noise impacts during construction are presented in the ICNG. Table 12-9 outlines measures for managing, avoiding or mitigating potential hazard impacts from the construction and operation and forms a draft noise management plan for the Project.

Table 12-9: Environmental management measures - noise and vibration impacts

Reference	**Environmental management measures**	**Timing**
NV01	▪ Works would be limited to standard hours of construction accept where safety requirements dictate an alternative approach.	During construction
NV02	▪ Select low-noise plant and equipment ▪ Ensure equipment mufflers operate in a proper and efficient manner.	Prior to and during construction
NV03	▪ Where possible, use quieter and less vibration emitting construction methods.	During construction

NV04	▪ Only have necessary equipment on-site and turn off when not in use.	During construction
NV05	▪ Where possible, concentrate noisy activities at one location and move to another as quickly as possible.	During construction
NV06	▪ Vehicle movements, including deliveries outside standard hours should be minimised and avoided where possible.	During construction
NV07	▪ Ensure all plant and equipment is well maintained and where possible, fitted with silencing devices.	Prior to and during construction
NV08	▪ Use only the necessary size and powered equipment for tasks.	During construction
NV09	▪ Implement training to induct staff on noise sensitivities	Prior to and during construction
NV10	▪ Where possible, consider the application of less intrusive alternatives to reverse beepers such as 'squawker' or 'broadband' alarms.	During construction
NV11	▪ Consider the installation of temporary construction noise barriers for concentrated, noise-intensive activities.	During construction
NV12	▪ Where practicable, install enclosures around noisy mobile and stationary equipment as necessary.	During construction
NV13	▪ Where possible, avoid simultaneous operation of two or more noisy plant close to receivers. ▪ The offset distance between noisy plant and sensitive receivers should be maximised.	During construction
NV14	▪ Plan traffic flow, parking and loading/unloading areas to minimise reversing movements.	Prior to and during construction
NV15	▪ Delivery and loading / unloading of materials should occur as far as possible from sensitive receivers. ▪ Select site access points and roads as far as possible from sensitive receivers.	During construction
NV16	▪ Complete routine monitoring to evaluate construction noise levels and evaluate whether the mitigation measures in place are adequate or require revision.	During construction
NV17	Care should be taken during compaction activities within the vicinity of nearby heritage structures during the installation of the 11 kV electricity cabling infrastructure from the existing switchyard to the BESS. These structures should first be inspected to determine whether a 10 or 20 metre safe setback distance should be applied. Following this, these setbacks should be adhered to or where this isn't possible an attendee should be present during the works to suspend activities in the instance of any issues.	Cable trenching

In addition to these standard measures, the assessment indicated that additional actions are required at residential receiver 'RR01' (located 200 metres to the north of the Project along Trout Farm Road). Prior to commencement of civil works, this residence would be notified of the potential for noise impacts during the construction phase of the project. Noise monitoring would also be completed to verify the resulting noise levels at this location to confirm that other measures would not be required.

13. Traffic and Transport

This chapter addresses the Transport component of the SEARs for the Project, which requires the EIS to include:

- An assessment of the peak and average traffic generation, including over-dimensional vehicles, construction worker transportation and transport of materials by rail
- An assessment of the likely transport impacts to the site access route (including Murray Street and Hume Weir Road), site access point, any Crown land, particularly in relation to the capacity and condition of the roads
- A cumulative impact assessment of traffic from nearby developments
- A description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required)
- A description of the measures that would be implemented to mitigate any transport impacts during construction

This chapter summarises the findings of the Traffic and Transport Impact Assessment Report (Jacobs, 2020f) (see Appendix I).

13.1 Assessment methodology

The Traffic and transport assessment involved the following:

- A review of the existing transport network, including a description of transport infrastructure in the study area, public transport service provision, pedestrian and cycle networks, and traffic volumes
- Assessment of the potential transport and traffic impacts during construction and operation of the Project
- Development of suite of measures to mitigate and manage the identified transport and traffic impacts during construction and operation of the Project.

13.2 Existing environment

The Project site is bordered by Trout Farm Road and Murray Street, and existing access to the site is via Murray Street in Lake Hume Village. Other roads in the vicinity of the site are Riverina Highway and Bonegilla Road. Figure 13-1 shows the roads within the study area.

13.2.1 Road network

Key roads in the study area include:

- The Riverina Highway is a state road that extends between the NSW / Victoria border and Deniliquin via Albury. The road is a two-lane single carriageway with a posted speed limit of 80 kilometres per hour. The upgrade of the Riverina Highway east of Albury was completed in December 2017
- Murray Street is a local road providing access to Lake Hume Village from the Riverina Highway. The road is a two-lane single carriageway with a posted speed limit of 50 kilometres per hour
- Trout Farm Road and Bonegilla Road are regional roads that provide a connection between Lake Hume Village and the Murray Valley Highway. The roads are two-lane single carriageway with a posted speed limit of 80 kilometres per hour.

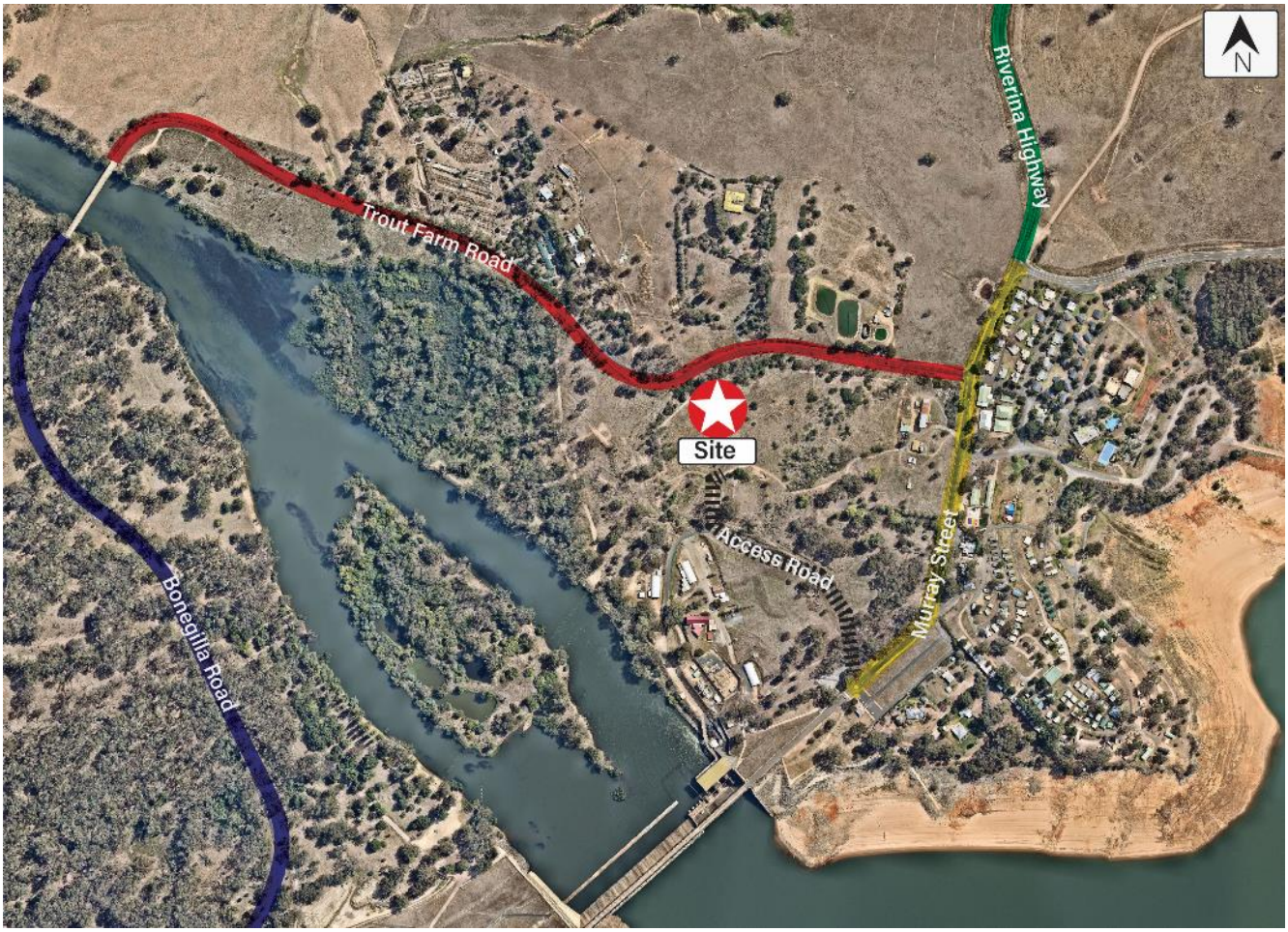


Figure 13-1: Key roads

13.2.2 Road safety

Two crashes were recorded in the study area in the five-year period between 2014 and 2018, including:

- One head-on crash on the Riverina Highway about 900 metres east of Murray Street in 2014, resulting in a serious injury
- One off-carriageway crash on the Riverina Highway about one kilometre north of Murray Street in 2015, resulting in a moderate injury.

No crashes resulting in a casualty were recorded on Murray Street or Trout Farm Road.

The average number of vehicles (bi-directional) over a seven-day period in 2016 on the approaches to Lake Hume Village are as follows (Roads and Maritime, 2016b)

- 2,476 vehicles per day from the northern approach (Riverina Highway)
- 1,761 vehicles from the eastern approach (Riverina Highway)
- 1,893 vehicles from the southern approach (Trout Farm Road / Bonegilla Road).

On average, 18 per cent of vehicles on the surrounding road network are heavy vehicles, and the traffic growth rate is 2 per cent per year.

Daily traffic volumes were collected along Murray Street in 2006 at station 95469. One-way flows of 1,142 vehicles per day were measured with average flows one-way flows of 897 vehicles during standard daytime hours.

13.2.3 Road network performance

The performance measure for midblock road links is based on the volume to capacity (V/C) ratio and is based on Level of Service (LoS) criteria defined in the Austroads *Guide to Traffic Management: Traffic Studies and Analysis (Part 3)* (Austroads, 2009).

LoS is defined as a quantitative measure for ranking operating conditions, based on factors such as speed, travel time, freedom to manoeuvre, interruptions, comfort and convenience. There are six LoS, from A to F, with LoS A representing the best operating condition and LoS F the worst. A LoS of A implies that vehicles travelling along a particular road section are experiencing free flow conditions. LoS E represents a midblock section at capacity. LoS F describes a breakdown in vehicle flow.

A summary of existing midblock performance is shown in Table 13-1. All roads currently operate satisfactorily with ample spare capacity.

Table 13-1: Existing midblock performance (bi-directional)

Road	Daily traffic volume (2020)*	Peak hour volume**	Capacity (vehicle / hr)***	V/C ratio	LoS
Riverina Highway (northern approach to Lake Hume Village)	2,680	268	3,400	0.08	A
Riverina Highway (eastern approach to Lake Hume Village)	1,906	191	3,400	0.06	A
Trout Farm Road / Bonegilla Road (southern approach to Lake Hume Village)	2,049	205	3,400	0.06	A

**2020 volumes calculated by applying 2% per annum growth rate to 2016 volumes (compounded)*

***Peak hour volume assumed to be 10% of the total daily volume*

****Capacity of a two-lane two-way highway: 1,700 vehicles per lane per hour (based on Austroads)*

13.2.4 Public transport

There are no existing public transport services in the study area.

13.2.5 Active transport

There are no existing pedestrian or cycle facilities in the study area.

13.3 Assessment of impacts

13.3.1 Construction

Project construction has been scheduled for completion at the end of September 2021. Construction of the project is scheduled to begin in January 2021 with peak traffic expected to occur between May and June 2021.

The main drivers of construction traffic generation are the delivery of construction materials, equipment, plant components, as well as the construction workforce travelling to and from the site. Table 13-2 shows anticipated light and heavy vehicle volumes during construction.

Table 13-2: Traffic generated during construction period

Activity	Period	Construction traffic generation		Total
		Light vehicles	Heavy vehicles	
Civil	January 2021 to May 2021	12	4	16
Mechanical / structural	March 2021 to April 2021	12	4	16
Electrical	May to June 2021	12	2	14
Testing and commissioning	July 2021 to Sep 2021	10	0	10
Total		46	10	56

Project site access

The access and egress route for light and heavy vehicles would be via Murray Street and Riverina Highway (to and from Albury) as shown in Figure 13-2.

The number of trips generated during the construction phase includes the following assumptions:

- Inbound light vehicle traffic movements are assumed to occur within one hour of construction personnel travelling to work and parking at the compound at the start of their shift, and similarly for outbound light vehicle movements occurring within one hour of workers travelling from the compound at the end of their shift
- Inbound and outbound heavy vehicle traffic movements are assumed to be spread evenly throughout the day during the standard construction work hours (Monday to Friday 7 am to 4 pm, Saturday 8 am to 1 pm and no work on Sunday or public holidays)
- Traffic impact of oversized vehicles on the existing network would be minimal.

Figure 13-2: Vehicle access and exit route to and from the Project site would be via Murray Street

13.3.2 Impact on road network

Road safety

There is unlikely to be an impact on road safety during construction due to the low volume of additional traffic movements associated with construction activity.

Road network performance

Midblock performance results under the '2021 without construction' (without construction vehicles associated with the project) and '2021 with construction' (with construction vehicles associated with the project) scenarios are summarised in Table 13-3. The performance results show the Riverina Highway would operate at the same LoS with construction traffic compared to the scenario without construction traffic.

In addition, construction of the project would have minimal impact on local roads within Lake Hume Village including Murray Street and Hume Weir Road given the low volume of additional traffic movements associated with construction activity.

Therefore, the impact of construction vehicles on road network performance would be minimal.

Table 13-3: Midblock performance with and without Project construction (bi-directional)

Road and scenario	Daily traffic volume (2021)*	Peak hour volume (without construction traffic)**	Peak hour construction traffic volume	Total peak hour volume	Capacity (vehicle / hr)***	V/C ratio	LoS
Riverina Highway (northern approach to Lake Hume Village)							
2021 without construction	2,734	273	-	273	3,400	0.08	A
2021 with construction	2,734	273	47 (46 light vehicles + 1 heavy vehicle)	320	3,400	0.09	A

**2021 volumes calculated by applying 2% per annum growth rate to 2016 volumes (compounded)*

***Peak hour volume assumed to be 10% of the total daily volume*

****Capacity of a two-lane two-way highway: 1,700 vehicles per lane per hour (based on Austroads)*

Public transport

Construction activities would not have an impact on the public transport network.

Active transport

Construction activities would not have an impact on the active transport network.

13.3.3 Cumulative impacts

A cumulative construction traffic impact assessment has not been undertaken as there are no major projects occurring near the Project site that coincide with the proposed construction period or proposed construction vehicle access and egress route, based on information that is currently available to the public.

13.3.4 Operation

During the operational phase of the Project, there would be maintenance undertaken twice a year by field staff using a light vehicle to access the site. As such, no formal or dedicated parking facilities would be provided within the BESS. As the operation of the project is expected to generate less traffic than during construction, the operational impacts of the Project on the surrounding road network, public transport network, active transport network and to be road safety is likely to be minimal.

13.4 Environmental management measures

Table 13-4 outlines measures for managing, avoiding or mitigating potential hazard impacts from the construction and operation of the Project.

There would be minimal impact on the performance of the road network during construction works. However, an appropriate site-specific Construction Traffic Management Plan (CTMP) would be prepared as part of the Construction Environmental Management Plan (CEMP) for the Project. The requirements of the CTMP are detailed within Table 13-4.

Operational mitigation measures are not proposed as there would be negligible impacts arising from the operation of the Project.

Table 13-4: Environmental management measures - traffic and transport impacts

Reference	Environmental management measures	Timing
Construction		
TT1	A CTMP will be prepared and implemented as part of the CEMP. The CTMP will include: ▪ Measures to maintain access to local roads and properties, and maintain the capacity of existing roads where possible ▪ Site specific traffic control measures (including signage) to manage and regulate traffic movement ▪ Requirements and methods to consult and inform the local community of impacts on the local road network due to the development-related activities ▪ Consultation with Transport for NSW, Albury City Council and the construction contractor, if needed ▪ Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads ▪ A response plan for any construction related traffic incident ▪ Monitoring, review and amendment mechanisms ▪ Individual traffic management requirements at each phase of construction ▪ Measures to minimise the number of workers using private vehicles travelling to and from the work site ▪ Employment of standard traffic management measures to minimise short-term traffic impacts expected during construction ▪ Relevant traffic safety measures, including appropriate signage, driver conduct and safety protocols ▪ Identify requirements for, and placement of, traffic barriers ▪ Any work that has potential to significantly disrupt traffic on the Riverina Highway must be scheduled to be carried out outside peak holiday periods.	Detailed design and Construction
TT2	Where works will affect the free flow of traffic, a Traffic Control Plan will be prepared and a Road Occupancy Licence will be obtained from Transport for NSW if necessary.	Prior to construction
TT3	Road maintenance will be managed through the following measures: ▪ A Road Dilapidation Report will be prepared and approved prior to and following the construction of the project. Any impacts identified as caused by the Project will be rectified as specified with any road maintenance agreements ▪ Routine defect identification and rectification of the access roads and tracks will be managed as part of the project maintenance procedure ▪ Access roads and tracks will be designed in accordance with the relevant vehicle loading requirements.	Prior to construction
TT4	Affected communities, visitors and emergency services will be notified in advance of any disruptions to traffic and restriction of access impacted by Project activities.	Construction

14. Surface water and hydrology

This chapter addresses the water component of the SEARs for the Project, which requires an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including the Murray River and Hume Dam) and measures proposed to monitor, reduce and mitigate these impacts as well as details of water requirements and supply arrangements for construction and operation and a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom, 2004).

14.1 Assessment methodology

The desktop assessment involved a review of the existing surface water conditions across the study area to assess the likely potential impacts of the Project on surface water quality during construction and operation. The assessment has included:

- Review and summary of available literature, water quality data and background information on catchment history and land use to aid interpreting the existing conditions. Literature sources included:
  - Commonwealth Australia Bureau of Meteorology (BoM) National Groundwater Information System: Groundwater Explorer; and Groundwater Dependent Ecosystem Atlas; Climate database
  - New South Wales Department of Planning, Industry and Environment (DPIE): Drainage basin overview and gauging station index; NSW Water Quality and River Flow Objectives; Key fish habitat mapping; Soil and Land Information System (SALIS)
  - WaterNSW: Realtime data and daily river reports; dam levels; Pollution Source Assessment Tool (PSAT); protected and special Areas; drinking water catchments
  - Spatial Services (New South Wales Department of Customer Service): Mapped watercourses and waterbodies in NSW
  - Geoscience Australia: Publicly available mapping on geology, topography and soils.
- Assessment of the impact of construction and operation activities on water quality and hydrology with reference to Australian and New Zealand water quality guidelines (ANZG, 2018) (ANZECC & ARMCANZ, 2000) with respect to the relevant environmental values of aquatic ecosystems, visual amenity, primary and secondary contact recreation, and irrigation supplies
- Preliminary identification of water quality and hydrology treatment measures to mitigate the impact of construction on water quality, following the principles of Managing Urban Stormwater–Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater–Soils and Construction Volume 2D (DECC, 2008), collectively referred to as the Blue Book
- Review of LEP flood mapping and topography to confirm Project is at an elevation unlikely to be affected or affect flooding
- An assessment of potential Project related groundwater impacts completed by undertaking a review of surface geology, aquifers, groundwater bores, and groundwater dependent ecosystems through the Bureau of Meteorology (BoM) National Groundwater Information System (NGIS) and WaterNSW.

14.2 Existing environment

14.2.1 Groundwater conditions

The review of potential groundwater impacts identified the following conditions with respect to groundwater within the Project Site and surrounding 500 metres collectively comprising the Study Area:

- The Project site and Study Area is located within the Thurgoona Hydrogeological Landscape (HGL). Key features of the Thurgoona HGL include:
  - A moderately to highly weathered landscape of rolling hills, gently inclined slopes and fans, broad crests and ridges and widely spaced drainage lines
  - Metamorophosed consolidated rocks from the Ordovician and Silurian Period that have been intruded by granitic rocks (Hawksview Granite) from the Silurian period, and Quaternary alluvium occurring along river valleys and colluvium occurring on upper slopes
  - Deep and poorly drained soils on crests and slopes, with moderately deep and poorly drained soils on lower slopes
  - A thick ferromanganiferous hardpan that commonly occurs on crests and upper slopes
  - Moderate to severe gully erosion risk along drainage lines and lower slopes
  - Minor sheet and rill erosion (localised on upper slopes)
  - Moderate seasonal salinity and waterlogging issues in depressions and slope breaks
  - Unconfined to semi-confined flow conditions with groundwater flow occurring primarily through fractures in bedrock and saprolite, and some flow through colluvial and alluvial sediments on lower slopes and along drainage lines
  - Moderate hydraulic conductivity (10^{-2} to 10 m/day), moderate transmissivity (2-50 m^2/day), moderate to steep hydraulic gradient (>10%), fresh to marginal groundwater salinity (<1,600 µs/cm), shallow to intermediate depth to water table (<8m), and moderate recharge rates.
  - The landscape provides freshwater runoff as an important water source, and dilution flow source. The landscape also generates salt loads which enter streams and contains important land assets on which salinity processes impact.
  - Appropriate management strategies for this landscape include: Maintaining and maximising runoff, discharge rehabilitation and management of waterlogged and saline sites, and buffering salt stores by keeping salt stores dry and immobile.
- The Project site and Study Area are located within the NSW Murray-Darling Basin Fractured Rock (Lachlan Fold Belt) Groundwater Management Area (GMA) and adjacent to the Murray Unregulated and Alluvial GMA, within the Murray groundwater province
- There are no boreholes within the Project site or Study Area
- There is one existing structure (sewer tank) approximately 70 metres south of the site that may be defined as a contamination source under Schedule 2 of the Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011
- One (1) aquatic groundwater dependent ecosystem, comprising The Murray River, is located within 500 metres of the Project. This is classed as a high potential Groundwater Dependent Ecosystem (GDE) (connector type) under the national assessment framework.

14.2.2 Hydrology and water quality

An assessment of potential Project related surface water impacts was completed by undertaking a review of local hydrology and water quality through the Bureau of Meteorology (BoM), WaterNSW, Soil and Land Information System (SALIS), and the Murray-Darling Basin Authority (MDBA).

The review process identified the following conditions with respect to surface water:

- The Project site and Study Area is located south of a local ridgeline approximately 300 metres to 400 metres north of the Murray River, and approximately 550 metres north-west of the Hume Dam which forms the Lake Hume reservoir
- There are no mapped watercourses within the Project site or Study Area, however a number of topographic drainage depressions are observed through which ephemeral (stormwater) flows are likely to concentrate
- The site and the Lake Hume Reservoir are located within the Upper Murray Catchment Area as defined under the NSW Murray and Lower Darling Surface Water Resource Plan 2012 (Department of Planning, Industry and Environment, 2019)
- The Project is downstream of the Hume Dam and no mechanisms of the Project would affect the operation of the dam or the hydrology and water quality within the dam
- Flows through the section of the Murray River adjacent to the site are towards the west and are regulated by controlled discharge from Hume Lake Reservoir
- The nearest river monitoring station comprises the WaterNSW monitoring station 409016 (Murray @ Heywoods), which is located approximately 900 metres due west of the project and monitors flow, level, discharge and salinity within the Murray River downstream of the site (Figure 14-1). Additional monitoring stations with comprehensive water quality data are located approximately 25 kilometres downstream (409017) and 27 kilometres downstream (409001). These are monitored as part of the Murray Lower Darling surface water resource plan area (WRPA).

14.2.3 Soils

The Project site and Study Area are located within the Wagra Soil Landscape. Key development issues of this landscape relevant to water quality include:

- Moderate to high erosion hazard
- Localised sodicity
- Low fertility
- Hardsetting conditions
- Localised aluminium toxicity.

Soils within and around the Project site and Study Area are classified as Hydrological Soil Group B. Group B soils have moderate infiltration rates when thoroughly wetted and consist primarily of deep coarse textures. These soils have a moderate rate of water transmission.

Review of borehole logs from recent site investigation indicates the presence of sandy silts / sandy clays forming the soil profile, directly overlying a weathered granite at approximately 0.7m to 1.7m depth (Aitken Rowe Geotechnical Engineering, 2020).

Information available through the NSW Soil and Land Information System (SALIS) indicates the following modelled soil properties with respect to modelled soil erosion potential under the revised universal soil loss equation (RUSLE), which are relevant to design of erosion-sediment control measures:

- K-Factor (measure of susceptibility of soil particles to detachment and transport by rainfall-runoff): Approximately 0.05-0.06 (high)
- C Factor (ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil): 0.01-0.02 (low). C-Factor for disturbed sites is default as 1.0 (high),
- LS Factor (combined effect of slope length and slope gradient on soil loss. It is the ratio of soil loss per unit area): 5-10 (low)
- Covered soil erosion: 2-5 t/ha/yr
- Bare soil erosion: 200-500 t/ha/yr (calculated value 572 t/ha/yr).

Review of the Blue Book (Landcom, 2004) indicates the following RUSLE properties for the study area:

- R-Factor (measure of the ability of rainfall to cause erosion): Approximately 1100 (low)
- Calculated Soil Loss Class: 5 (requires special control measures for period of December-February).

Water quality in the Murray River has been classified as good for the water quality monitoring site at Union Bridge (Department of Planning, Industry and Environment, 2019) also known as WaterNSW monitoring station 409001, which is located approximately 27 kilometres upstream of the site.

Figure 14-1: WaterNSW Monitoring Station 409016 (Murray @ Heywoods)

Table 14-1 summarises key statistics for water level, discharge, electrical conductivity and temperature recorded in the Murray River at WaterNSW monitoring station 409016 (located approximately 900 metres downstream of the site) over the period between 1969 and 2020. Table 14-1, Table 14-2, Figure 14-2 and Figure 14-3 present monthly averages for level, discharge, salinity and temperature.

Table 14-1: Summary statistics for level, discharge, electrical conductivity and temperature at WaterNSW monitoring station 409016 (Murray @ Heywoods)

Reference	5 %ile	20 %ile	Median	Average	80 %ile	95 %ile
Level (m)	1.2	1.6	2.8	2.6	3.4	3.9
Discharge (ML/d)	464.4	1978.4	12274.5	12416.2	19801.5	26423.2
Conductivity (µs/cm)	36.4	40.9	59.0	49.5	58.0	62.2
Temperature (°C)	9.8	11.1	15.7	16.0	20.8	22.8

Table 14-2: Monthly averages for level, discharge, electrical conductivity, and temperature at WaterNSW Monitoring station 409016 (Murray @ Heywoods)

Reference	Level (m)	Discharge (ML/d)	Conductivity (µs/cm)	Temperature (°C)
January	3.3	17834.2	52.4	20.6
February	3.2	17419.7	54.1	22.1
March	3.3	18312.5	54.0	21.7
April	2.7	11131.6	49.9	18.8
May	1.8	3450.3	49.0	14.7
June	1.5	1956.8	16.8	11.6
July	1.8	4361.8	45.1	9.9
August	2.3	10076.7	44.4	10.0
September	2.7	14314.2	45.7	11.7
October	3.2	18994.2	58.9	13.7
November	3.0	15259.5	50.5	15.6
December	3.1	15569.2	50.4	17.8

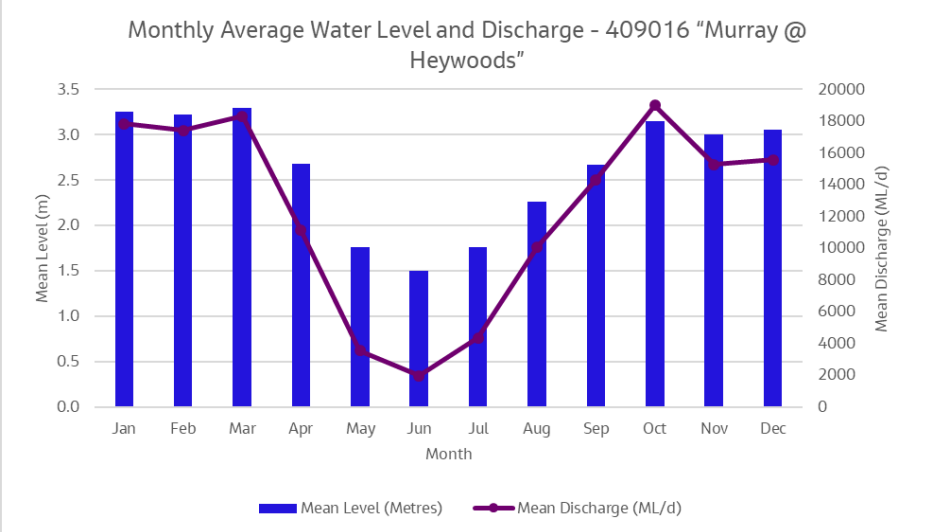


Figure 14-2: Monthly average water level and discharge - 409016 (Murray @ Heywoods)

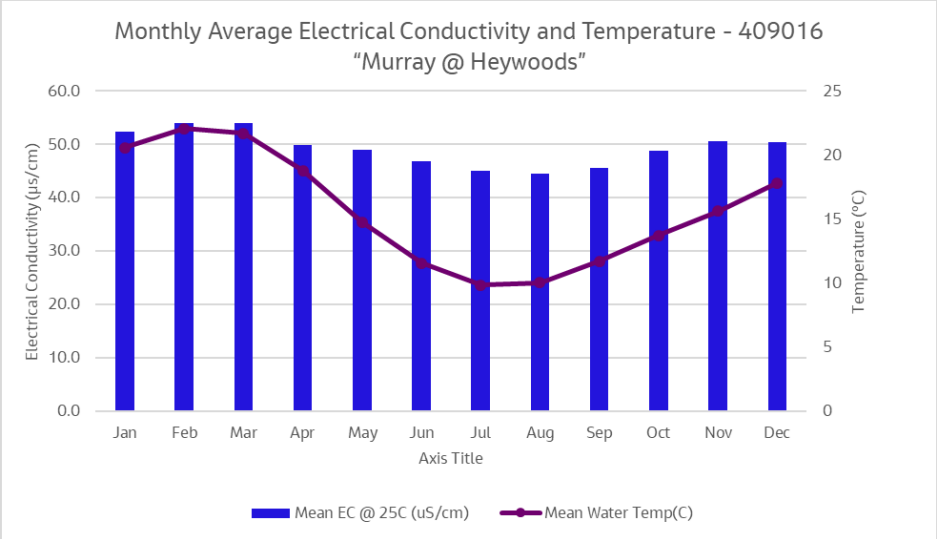


Figure 14-3: Monthly average electrical conductivity and temperature - 409016 (Murray @ Heywoods)

The data presented in Table 14-1, Table 14-2, Figure 14-2 and Figure 14-3 show the overall, monthly and seasonal variations in water level, discharge, electrical conductivity and temperature in the Murray River approximately 900 metres downstream of the Project site.

Low flow conditions (including level and discharge) typically occur during autumn / winter months, rising into spring and summer highs. Temperature also drops during autumn / winter period and rising during spring / summer with a noted lag due to latent heat effect. Electrical conductivity is relatively stable, however shows a similar trend to seasonal temperature variations.

Water levels typically vary between 1.6 and 3.4 metres, while discharge rates typically vary between 1978.4 ML/d and 19801.5 ML/d. Electrical conductivity is relatively stable and fresh, typically varying between 40.9 and 58.0 µs/cm, while temperature typically varies between 11.1 and 20.8 °C. Flows are highly regulated by controlled discharge from the Hume Lake reservoir.

Summary water quality monitoring data from the nearest routine WRPA monitoring site (409017 @ Union Bridge) is presented in Table 14-3 alongside relevant water quality objectives under the NSW WRPA water quality targets. The data shows that parameter concentrations / values are typically within the WRPA objectives, except for dissolved oxygen which falls below lower limits at and below 25 percentile values, and nitrogen / phosphorous which exceeds objectives at the 90 percentile values.

Table 14-3: Summary water quality monitoring data - (409017 @ Union Bridge)

Reference	10 %ile	25 %ile	Median	Average	75 %ile	90 %ile	WRPA Objective
Total Nitrogen (mg/L)	0.25	0.28	0.35	0.36	0.43	0.52	0.50
Total Phosphorous (mg/L)	0.018	0.021	0.025	0.028	0.031	0.043	0.04
Turbidity (NTU)	5.00	6.00	8.00	9.10	10.00	14.00	15.00

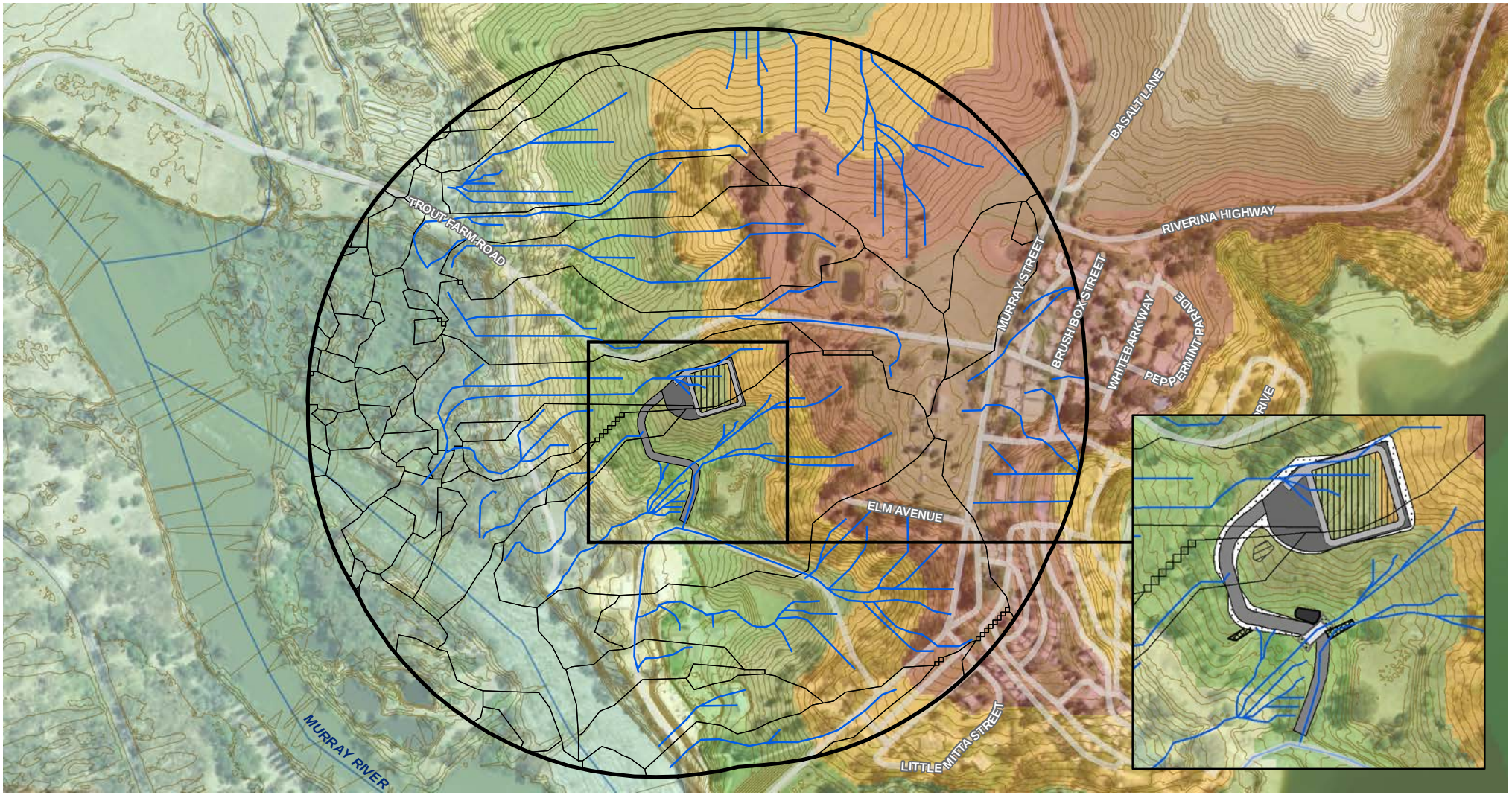
Reference	10 %ile	25 %ile	Median	Average	75 %ile	90 %ile	WRPA Objective
Total Suspended Solids (mg/L)	5.00	5.00	7.40	8.90	11.00	14.00	-
Dissolved Oxygen (% Saturation)	74.00	83.00	93.00	89.00	96.00	100.00	90.00-110.00
pH	6.60	6.90	7.10	7.11	7.40	7.50	6.50-7.50
Electrical Conductivity (µs/cm)	41.00	45.00	52.00	50.00	57.00	61.00	412.00
Temperature	ND	ND	ND	ND	ND	ND	20%-80% Natural
Toxicants	ND	ND	ND	ND	ND	ND	ANZG 95%

The quality of the water at this site is impacted by the quality and quantity of the water in Hume Dam. When stratified, the bottom waters of large storages can become anoxic, resulting in the release of nutrients and metals from the reservoir sediments. Low dissolved oxygen levels resulting from low flows and releases of anoxic waters from the Hume reservoir represents a medium risk factor, whilst risk factors for other parameters are classified as low.

Figure 14-4 presents site topography, local drainage sub-catchments, drainage lines and mapped watercourses within and around the Project site and study area. An assessment of drainage across the site and study area has identified the following conditions affecting the site:

- The Project site is located along a topographic ridgeline and local north-east to south-west aligned spur
- The Project site and associated construction / operational features cross cut approximately five (5) mapped drainage sub-catchments, through which drainage is directed (via overland and concentrated flows) to the Murray River in a westerly / south-westerly direction
- The headwaters of several topographic drainage features cross cut the northern and southern portions of the Project site
- A number of topographic drainage features intersect construction access tracks and the operational access road at various locations
- Several drainage lines intersecting the project site discharge to the Murray River via a mapped terrestrial wetland, which is located within the Study Area and approximately 200 metres south-west of the site at its nearest point.

Table 14-4 presents monthly rainfall-runoff percentage values for varying ranked percentile events within the project catchment derived from the Australian Landscape Water Balance Model (ALWBM) hosted by the Bureau of Meteorology (BoM), where surface runoff is calculated as a combination of infiltration excess runoff and saturation excess runoff.



Legend

- Project area 500m buffer
- Proposed Battery Energy Storage System (BESS)
- Proposed hardstand laydown area
- Proposed ramp
- Proposed vehicle access
- Embankment
- Re-grade ex-track
- Culvert
- Rip Rap
- Sediment pond
- Topsoil stockpile
- Drainage sub-catchments
- Drainage
- Contours
- Watercourse

Topography (m)

- 155.71 - 165.66
- 165.67 - 175.61
- 175.62 - 185.57
- 185.58 - 195.52
- 195.53 - 205.47
- 205.48 - 215.42
- 215.43 - 225.38
- 225.39 - 235.33
- 235.34 - 245.28
- 245.29 - 255.24

0 200 400 m

1:6,800 at A4

Data sources
Jacobs 2020
NSW Spatial Services 2019
© Department of Customer Service 2020

GDA94 MGA55

Figure 14-1 Project area drainage features

Table 14-4: monthly rainfall-runoff percentage values for varying ranked percentile events within the Project catchment

Reference	1%ile Percentage Runoff (%)	10%ile Percentage Runoff (%)	30%ile Percentage Runoff (%)	70%ile Percentage Runoff (%)	90%ile Percentage Runoff (%)	99%ile Percentage Runoff (%)
January	0.00	0.32	0.79	0.83	1.49	19.32
February	0.00	0.55	0.34	0.59	0.82	4.71
March	0.00	0.09	0.23	0.48	0.67	15.67
April	0.00	0.14	0.28	0.44	1.38	9.62
May	0.86	0.31	0.43	0.71	1.26	16.63
June	0.26	0.50	0.73	1.56	5.36	35.49
July	0.44	0.73	1.55	4.65	23.87	54.28
August	0.97	1.69	2.67	16.73	26.44	43.23
September	1.08	2.60	3.09	12.72	23.36	31.46
October	1.64	1.62	3.76	13.13	21.56	32.28
November	0.72	1.81	2.07	4.45	11.54	17.94
December	0.00	0.76	1.36	2.10	8.27	16.99

1-10% = very much below average conditions, 10%-30% = below average conditions, 30%-70% average conditions, 70%-90% = above average conditions, 90%-99% = very much above average conditions, 99%-100% = highest 1%.

Results show that percentage runoff values vary significantly depending on weather conditions. Increasing magnitudes of runoff may be expected with increasing storm intensity which can be correlated with decreasing frequency of occurrence. Under average conditions monthly runoff percentages are expected to be below 4%, where runoff generating storm events occur. The highest percentage values for average conditions are between August and November.

No further hydrological or water quality data is available for the Project site and features associated with the surrounding study area.

14.3 Assessment of impacts

14.3.1 Description of erosion and sediment controls

During construction water from the BESS compound, construction laydown area and access track would be directed to the existing natural drainage line which flows south-west, discharging into the River Murray.

All drainage from the site during construction will be established to achieve the management requirements of Managing Urban Stormwater: Soils & Construction (Landcom, 2004) prior to release to natural drainage lines or receiving waterways. Construction drainage would include diversion bunds to direct water away from the BESS compound. Diversion bunds and drains along the upslope side of the access track would also be provided with energy dissipaters and scour protection directing runoff to an approximately 100 cubic metre sediment basin. A schematic of the proposed construction stage erosion-sediment control plan has been prepared for the Project and is included in Appendix C.

Following construction, it is proposed that the construction stage management would be converted into a permanent operation stage features, capable of matching pre-development water quality and quantity calculations. All disturbance areas not housing permanent infrastructure would be rehabilitated with native vegetation, drainage features would be retained and maintained to prevent erosion and the sediment basin converted to a bioretention basin (or similar) and sized to achieve pre-development flow characteristics.

14.3.2 Water requirements for construction and operation

Up to 60,000 litres of water is expected to be required predominantly for compaction and dust suppression activities. Water would be sourced from standpipes and carted to site with a tanker under agreement with water supply authority. A 45,000 litre fire water tank would also be filled during construction.

No water is required for the operation of the Project. The fire water tank would be filled by tanker and toped up on an as needed basis.

14.3.3 Construction Stage Impacts

Construction of the Project would involve a range of activities including vegetation clearing and subsequent mulching, cut and fill earthworks, and establishment of Project facilities. Potential construction phase impacts to surface water quality associated with construction of the Project are presented in Table 14-5.

Table 14-5: Construction stage impact identification

Construction activity	Environmental issue(s)	Potential impact	Relative magnitude of impact with mitigation
Earthworks, cut and fill, stockpiling	Erosion and exposure of sediments and contaminated soils from exposed areas, open cuts and stockpiles due to wind and stormwater runoff leading to sedimentation and contamination of downstream waterways. Soil erosion and mobilisation of sediments into receiving waterway as a result of the construction of earth and land forming associated with the Project. Contaminants associated with previous land uses could be exposed and transported downstream.	Increased sedimentation can alter the geomorphology of waterways and smother and reduce biological productivity of aquatic systems through reduced light penetration (increased turbidity) decreasing available plant material for fish to feed on. Increased sediments could result in increased nutrients in waterways which can lead to harmful algal blooms and aquatic weeds. Increased metal and toxicant concentrations which can impact the health of aquatic organisms and result in fish kills. Reduced visual amenity.	Low
Pollution – leakage or spills	Leakage or spills of petroleum, oils and other toxicants from machinery, plant equipment, refuelling and vehicles traveling to and from site. Spills and leakages could potentially be	If pollution is mobilised to waterways, oily films can accumulate on the surface of the water, reducing the visual amenity. Pollution can decrease biodiversity, cause habitat loss, and result in fish	Low

	transported to downstream waterways.	kills from increased concentrations of toxicants.	
Concreting	Concrete dust, concrete slurries or washout water discharged to downstream waterways.	If by-products of concrete are mobilised to waterways, they could result in increased pH of the downstream water quality and can be harmful to aquatic life. Water contaminated with chromium can accumulate in the gills of fish affecting the health of aquatic animals. Solids that are improperly disposed of can clog stormwater pipes and cause flooding.	Low

With the implementation of proposed mitigation measures, construction activities are unlikely to result in any significant adverse effects water quality within the Murray River. Further, changes in hydrology resulting from the Project would be insignificant in comparison to the fluctuation resulting from the ongoing operation of the Hume Dam.

Management measures to mitigate potential environmental impacts during construction are discussed in Section 14.4.1.

14.3.4 Operation Stage Impacts

The Project would involve the establishment of new permanent impervious surfaces. As such (without appropriate on-site management of drainage), there may be an ongoing potential risk of soil erosion and subsequent transportation of sediment into nearby receiving waterways, as a result of concentrated flows, discharging from and adjacent to impervious areas. An overall increase in surface water runoff would also result from the Project.

In summary, potential surface water impacts may include:

- An increase in suspended sediment and potential pollutant concentrations due to erosion and mobilisation of exposed soils adjacent to impervious areas from potential areas of concentrated flows
- Stormwater runoff being discharged to nearby watercourses which contains sediments from dry deposition on hard surfaces
- Changes to current hydrological regimes including increased surface water runoff and peak discharges from decrease in local perviousness.

Potential impacts to surface water quality associated with operation of the Project are presented in Table 14-6.

Table 14-6: Operation stage impact identification

Operational element	Environmental issue(s)	Potential impact	Relative magnitude of impact with mitigation
Stormwater quality	Untreated stormwater which is not conveyed to treatment systems. Gross pollutants and litter, sediments, total suspended solids, nutrients, heavy metals.	Increased sediment loads and nutrients reduce light penetration through the water column or can smother aquatic flora and fauna. Increased nutrients from sediments can result in excessive plant growth, resulting in harmful algal blooms.	Low
Peak Flows	Decreased perviousness within catchment resulting in Increased stormwater runoff, peak discharges, and flow velocities.	Scouring of drainage channels resulting in environmental degradation and increased sediment loads receiving environments.	Low

Altered hydrology and reductions in perviousness within the local catchment as a result of operation of the site has the potential to cause increased stormwater runoff, higher peak discharge rates, and increased flow velocities through the catchment. Without appropriate mitigation, these factors have the potential to result in increased risk of erosion within local drainage channels, and subsequent sedimentation of / water quality impacts to downstream receiving environments.

As the relative area of the site is relatively small compared to the total catchment size (approximately 6%), the relative increase in perviousness is considered unlikely to result in significant changes to local hydrology and water quality. Initial modelling using the modified rational method indicates a potential increase of approximately 12% in peak flow rates through the local catchment (without mitigation measures) from operation of the site.

Water quality and hydrological impacts during operation are unlikely with the implementation of mitigation measures (including conversion of construction retention basin to a permanent retention basin / bio-retention basin). Proposed management measures to attenuate potential environmental impacts during operation are discussed in Section 14.4.2.

14.4 Environmental management measures

14.4.1 Construction Stage Management Measures

Table 14-7 outlines measures for managing, avoiding or mitigating potential hazard impacts during construction of the Project.

Table 14-7: Construction stage environmental management measures - surface water and hydrology impacts

Reference	Environmental management measures	Timing
W01	A Surface Water Management Plan (SWMP) would be developed as part of the Environmental Management Plan for the Project and include: ▪ Erosion sediment control sub-plan ▪ Designated parking and laydown areas ▪ Dedicated fuel and chemical storage areas ▪ Storage and handling of all chemicals, wastewater, and fuels in accordance with Australian Standards at suitable distance from drainage channels ▪ On-site storage of spill kits ▪ Inspections and maintenance of construction plant and machinery ▪ Management of acid sulfate soils ▪ Maintenance and restricted use of access tracks ▪ Recycling and re-use of stormwater (where practical).	Detailed design
W02	The Erosion Sediment Control Plan (ESCP) would include details on the following requirements: ▪ Avoidance of unnecessary clearing ▪ Management and maintenance of on-site stockpiles ▪ Grading of land to mitigate uncontrolled discharge / wasting ▪ Stabilisation and management of surfaces and construction roads ▪ Construction and maintenance of Sediment basin including temporary gravel construction access, temporary block and gravel drop inlet protection, outlet stabilisation structure ▪ Construction and maintenance of temporary diversion drains, lined channels, level spreader, temporary sediment trap and fences ▪ Dust control ▪ Required monitoring and management of water quality parameters within sediment basins and treatment to achieve requirements for discharge.	Detailed design

With the implementation of proposed mitigation measures discussed in Table 14-7, construction activities are unlikely to result in any significant adverse effects water quality or hydrology within the Murray River. Specific measures to protect water quality hydrological conditions during construction of the site should be established as part of detailed design. The construction surface water management plan and erosion-sediment control sub-plan should be treated as a live document during construction with regular review and amendments where necessary to reflect site conditions.

14.4.2 Operation Stage Management Measures

Table 14-8 outlines measures for managing, avoiding or mitigating potential hazard impacts during operation of the Project site.

Table 14-8: Operation stage environmental management measures - surface water and hydrology impacts

Reference	Environmental management measures	Timing
W03	The Surface Water Management Plan would be updated prior to operation to provide details of how stormwater management and peak flows would be managed to achieve pre-development levels including: ▪ Conversion of construction phase water quality basin to permanent operational retention basin / bio-retention basin ▪ Proposed monitoring to demonstrate effectiveness ▪ Flow control / attenuation structures at outlet of operational stormwater retention basin ▪ Additional drainage protection / stream stabilisation measures to mitigate potential scouring effects both upstream and downstream of operational stormwater detention basin.	Detailed Design

With the implementation of proposed mitigation measures discussed in Table 14-8 , operational activities are unlikely to result in any significant adverse effects water quality or hydrology within the Murray River. Specific measures to protect water quality hydrological conditions during operation of the site should be established as part of detailed design.

15. Hazards and risks

This chapter considers the Hazards components of the SEARs, which include dangerous goods and hazardous materials associated with the development, and all potential risks including bushfires, spontaneous ignition, electromagnetic fields.

15.1 Assessment Methodology

The assessment of hazards and risks associated with the project has involved review of information provided by Meridian's battery technology provider and consideration of site and surrounding land-uses. In particular the review has focused on risk topics raised by the SEARs and concerns raised by a neighbour which are:

- Dangerous goods and hazardous substances
- Bushfire and spontaneous ignition
- Electromagnetic fields (EMF).

The Project does not alter the operation of the Hume Dam and is well removed from operational infrastructure and as such risks associated with Dam Safety are not considered further.

The methodology used to address dangerous goods and hazardous substances has responded to the SEPP 33 Guidelines and included screening of hazardous chemicals to confirmation that hazardous chemicals proposed to be used in association with the Project are not potentially hazardous in their own right.

The methodology used to address bushfire and spontaneous combustion has involved review of technology provider's fire detection and suppression information and bushfire prone land and general design information.

Consideration of EMF has relied on information provided by Meridian's technology provider to confirm that design parameters of the equipment do not introduce EMF risks. The assessment of exposure to electric and magnetic fields (EMF) was undertaken with reference to the Energy Networks Australia (ENA) EMF Management Handbook (ENA, 2016) (EMF handbook) and the exposure levels identified by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields (ICNIRP, 2010).

15.2 Existing environment

The existing environment as it relates to hazards and risks is generally described in Chapter 10. In addition, the BESS compound would be located:

- On small ridgeline mapped as Category 2 vegetation in relation to bushfire risks but over 150 metres from category 1 vegetation located downslope to the west
- Approximately 200 metres from the nearest industrial building (WaterNSW warehouse)
- Over 200 metres from residential development
- At an elevation above where flooding could impact the BESS.

The access track, underground electricity cabling infrastructure and transformer bay works are in closer proximity to existing infrastructure and operational areas but do not involve new activities that would alter the current level of hazards or risk.

Vegetation surrounding the BESS is generally described as follows:

- North: A narrow, less than 20 metres, strip of vegetation between the BESS compound and Trout Farm Road beyond which land is not mapped as bushfire prone land.
- East: grassland associated with the transmission line easement through WaterNSW landholding for approximately 80 metres beyond which is approximately 60 metres of sparse vegetation and then cleared land associated with the Lake Hume Village.
- South: downward sloping grass land interspersed with sparse vegetation extending to WaterNSW offices and operations area.
- West: Downward sloping grass land interspersed with vegetation extending beyond the WaterNSW property boundary and across the neighbouring travelling stock reserve for approximately 150 metres to Category 1 vegetation consisting of an approximate 14 ha area extending along the River Murray bank.

As stated in the EMF handbook (ENA, 2016), EMF are part of the natural environment and electric fields are present in the atmosphere and static magnetic fields are created by the earth's core. EMF is also produced wherever electricity or electrical equipment is in use. Powerlines, electrical wiring, household appliances and electrical equipment all produce EMF. The Project area is in close proximity to energy generation and distribution infrastructure associated with the HPS and network connections to NSW and Victoria.

All new electrical components including the 11kV underground electricity cabling infrastructure from the existing switchyard to the BESS are contained within non-publicly accessible areas.

15.3 Dangerous goods and hazardous substances

The Hazardous and Offensive Development Application Guidelines - Applying SEPP 33 (SEPP 33 Guidelines) identify that certain activities may involve handling, storing or processing a range of substances which in the absence of locational, technical or operational controls may create an off-site risk or offence to people, property or the environment. Such activities would be defined as potentially hazardous or potentially offensive. The SEPP 33 Guidelines aim to assist determining authorities and proponents to establish whether a development Project would fit into such definitions and hence, come under the provisions of SEPP 33.

15.3.1 SEPP 33 screening

The SEPP 33 Guideline screening procedure is based on the quantity of dangerous goods involved in the Project and, in some cases, the distance of these materials from the site boundary. Key inputs to the screening exercise provided by Meridian include confirmation that the Project does not seek approval for storage of hazardous substances above screening levels and only minor quantities of such substances would be handled in a manner typical of earthworks projects, as shown in Table 15-1.

Table 15-1: Screening procedure and Project details

Screening information	Project detail
All dangerous goods and otherwise hazardous materials involved in the proposed development - include raw materials, intermediates, and products	Lithium-Ion batteries are assigned to class 9 as an article under the Australian Dangerous Goods Code and as per the guidelines are excluded from risk screening. The HVAC system would use FORANE ® 410A, a class 2.2 non-flammable, non-toxic gas which is also excluded from risk screening under the guidelines.

Screening information	Project detail
	The fire suppression system would use substances not classified as dangerous or otherwise hazardous.
Dangerous Goods classifications (including all subsidiary classes) for all Dangerous Goods held on site	No dangerous goods would be held on site beyond those described above.
Quantities of dangerous goods and otherwise hazardous materials involved in the proposed development	The Project does not involve dangerous goods or otherwise hazardous substances included in SEPP 33 screening process. Minor quantities of diesel and other plant maintenance substances would be appropriately stored on site.
If developing an existing site, all existing dangerous goods and otherwise hazardous materials and their quantities	Types and quantities of dangerous goods and otherwise hazardous materials used on site by WaterNSW or Meridian has not been obtained. While the Project is located on WaterNSW land it does not involve interaction with existing site uses. The nearest location where dangerous goods could be currently stored is over 200 metres from the BESS.
Distance from the boundary for each hazardous substance	The BESS components are located approximately 20 metres from the site boundary at their nearest point.
Weekly and annual number of deliveries (and the quantities) of dangerous goods and otherwise hazardous materials to and from the facility	The Project does not involve the delivery of dangerous goods or otherwise hazardous substances following the completion of construction.
Site layout plan showing proposed development and any existing development on site	Refer to Figure 2-1
local layout plan showing immediate neighbours and their activities	Refer to Figure 4-1
A locality plan showing the nearest residential property.	Refer to Figure 4-1
Any incompatible materials (hazardous and non hazardous materials)	Not applicable
Any wastes that could be hazardous	Not applicable
The possible existence of dusts within confined areas;	Not applicable
Types of activities the dangerous goods and otherwise hazardous materials are associated with (storage, processing, reaction, etc.)	Not applicable
Incompatible, reactive or unstable materials and process conditions that could lead to uncontrolled reaction or decomposition.	Not applicable

Screening information	Project detail
Storage or processing operations involving high (or extremely low) temperatures and/or pressures	Not applicable
Details of known past incidents (and near misses) involving hazardous materials and processes in similar industries.	Not applicable
A listing of any materials or processes that could produce air, noise, water or other emissions with a potential for pollution	Not applicable
Details of known requirements for pollution control licenses, permits or agreements.	The Project is not a scheduled activity under the POEO Act and does not require an Environmental Protection Licence.

As the Project does not involve the use of dangerous goods or otherwise hazardous substances covered by the SEPP 33 guidelines and the Project does not alter how these chemicals are stored or handled associated with existing site operations, there is no potential for cumulative hazards or for land-use safety risk profile to be significantly increased. The existing separation between the Project and other existing storage locations for hazardous chemicals means there is a low and manageable risk that the Project could interact with existing storage. Therefore, it can be concluded that the Project would not have any hazardous impact on the existing operations or contribute to the escalation of any event in a manner that could impact the site or off-site receptors. As such, the Project does not intensify the existing risk profile of the site and is not considered potentially hazardous or offensive development.

15.4 Bushfire prone land

Bush fire prone land (BFPL) is land that has been identified by local council which can support a bush fire or is subject to bush fire attack. Bush fire prone land maps are prepared by local council and certified by the Commissioner of the NSW RFS. A review of the NSW Rural Fire Service mapping was conducted to confirm that the Project would be located within and near bushfire prone land.

The location of bushfire prone land in relation to the Project is shown in Figure 4-2, with the site being mapped as vegetation category 2 identified as having lower combustibility and/or limited potential fire size due to the vegetation area shape and size, land geography and management practices.

The BESS would include an automatic fire detection and suppression system. Further, the design of each BESS stack is such that should one battery cell within a stack suffer thermal runaway, the operation of the stack would be stopped automatically before being likely to spread to other cells. Should a fire eventuate within the stack, the automatic fire detection system would trigger the suppression system. The fire detection and suppression system would as such operate to remove the risk of spontaneous combustion within the BESS spreading either within the BESS compound or to surrounding vegetation.

With operational spontaneous combustion managed through the above fire detection and suppression system, the following bushfire risks are identified for the Project:

- Construction of the Project could introduce additional fire ignition risks
- Construction and operation of BESS not adequately considered in bushfire emergency response management
- Protection of additional on-site infrastructure from existing bushfire threats.

Bushfire risks during construction are limited to clearing and hot works such as welding having the potential to ignite surrounding vegetation and causing a bushfire. Should a fire ignite and spread this could affect both the health and safety of construction workers, impacts to construction materials and assets and wider property damage. With appropriate standard controls around hot works and smoking, the risk of construction causing a fire are considered low. Standard mitigation measures are provided in Section 15.6.

Post construction bushfire risks would remain consistent with the existing situation. The only change would be that the BESS infrastructure would require protection and consideration in any bushfire emergency response. The key bushfire risk to the Project based on review of surrounding land-use and vegetation is identified as a fire approaching from downslope from the west of the BESS compound.

The BESS compound as the only new component requiring protection. Infrastructure within the BESS compound would be constructed with steel lined structures which are non-combustible and air tight. Each BESS stack would be surrounded with a granular topping with a minimum four metre buffer inside the proposed internal perimeter access track and cleared but grassed embankments to the perimeter fence. As such, BESS components would generally be provided with a 20 metre cleared buffer to surrounding land with permanent access to provide a defendable space.

The western end of the BESS compound is the proposed location of the construction compound which would be completely cleared associated with the Project. Opportunity to increase asset protection from this side is available and would be considered in the detailed design if necessary. A 45,000 litre water tank dedicated for fire fighting purposes would also be positioned outside the BESS compound and directly situated adjoining the main gate entry for easy access.

WaterNSW is understood to implement bushfire management on site to meet the requirements of the *Rural Fires Act 1997* and amendments and the Rural Fires Regulation 2013. Bushfire risks would be considered in the detailed design and the bushfire management plan either developed or updated to address identified risks in consultation with WaterNSW and Local Land Services as the manager of the neighbouring travelling stock reserve.

Overall, the hazards and risks associated with construction, operation and decommissioning of the Project are considered low and do not introduce new bushfire risks to the site.

15.5 Electromagnetic fields

Risks associated with EMF have been considered by Meridian's nominated technology provider and is summarised as follows:

- EMF is considered in the safety in design process for any BESS site
- BESS voltage levels for the Project are 11kV and current within each cable would be less than 1000A
- When there is no current flowing, there is no magnetic field generated. This means that for the BESS operations, it will only generate magnetic fields during the charging or discharging cycle

- Underground Networks typically have no electric fields as these are effectively screened by ground cover while magnetic fields at the centreline are higher, but disperses much more rapidly, than for overhead Networks
- The configuration of the cable can also significantly reduce magnetic fields and for the Project would involve a tre-foil arrangement.

As the electrical cable would be installed underground, no electric field would eventuate and no further consideration of electric fields is necessary. Consideration of magnetic field risks for the project is provided as follows.

Energy Networks Australia EMF Management Handbook (ENA, 2016) states that:

> *'In general, electric and magnetic fields from electricity assets will be well below the Reference Levels in these guidelines* (includes ICNIRP guidelines) *and specific compliance assessments will not be required. Exceptions could include specific occupational activities in close proximity to assets such as very highly loaded conductors, air cored reactors or air cored transformers'*.

As such, the EMF handbook focuses on occupational exposure. A compliance assessment can be used to demonstrate compliance with relevant Australian and international guidelines and, in particular, the Reference Levels or Basic Restrictions. The EMF handbook suggests that where an assessment is required, it could be undertaken in the form of a review of work practices against minimum compliance distances, measurements or simple calculations or modelling to demonstrate compliance against the Reference Levels, or modelling to demonstrate compliance against the Basic Restrictions. For the purposes of this assessment, a desktop assessment was made in accordance with the EMF handbook (ENA, 2016) with exposure limits identified by ICNIRP Guidelines (ICNIRP, 2010) used as reference.

The exposure 'limits' commonly referred to with regard to exposure to electric and magnetic fields are formally known as Reference Levels. These Reference Levels have been determined so as to provide a practical tool of assessment whilst maintaining adequate safety margins to potential health effects. The following extract from the EMF handbook describes the relationship between the Reference Levels and the Basic Restriction levels determined based on biological effects:

> *'Basic restrictions are the fundamental limits on exposure and are based on the internal electric currents or fields that cause established biological effects. The basic restrictions are given in terms of the electric fields and currents induced in the body by the external fields. If Basic Restrictions are not exceeded, there will be protection against the established biological effects.*
>
> *The Basic Restrictions include safety factors to ensure that, even in extreme circumstances, the thresholds for these health effects are not reached. These safety factors also allow for uncertainties as to where these thresholds actually lie. The physical quantity used to specify the Basic Restrictions is the tissue induced electric field.*
>
> *The Basic Restrictions in the ICNIRP Guidelines are specified through quantities that are often difficult and, in many cases, impractical to measure. Therefore, Reference Levels of exposure to the external fields, which are simpler to measure, are provided as an alternative means of showing compliance with the Basic Restrictions.*
>
> *The Reference Levels have been conservatively formulated such that compliance with the Reference Levels will ensure compliance with the Basic Restrictions. If measured exposures are higher than Reference Levels then a more detailed analysis would be necessary to demonstrate compliance with the Basic Restrictions'*.

ICNIRP identifies two Reference Levels for EMF fields based on whether the exposure is in regard to general public or occupational as identified in Table 15-2.

Considering the proposed underground cable it is appropriate to adopt the occupational Reference Levels on the basis that there would be limited public activity in the vicinity.

Table 15-2: ICNIRP Reference Levels

EMF field	ICNIRP 2010
Electric field	10 kV/m (occupational) 5 kV/m (public)
Magnetic field	1,000 µT * (occupational) 200 µT (public)
* ICNIRP advises that this level may be exceeded under certain conditions.	

The assessment methodology described in the EMF handbook (ENA, 2016) is based on the British Standard BS EN 50499 – Procedures for the assessment of workers due to electromagnetic fields. This methodology derives a minimum compliance distance for people at which the exposure is equal to the ICNIRP reference level, i.e. if people are further away their exposure is below the Reference Levels as illustrated in Figure 15-1. The methodology is based on the current flowing in a single conductor.

As per EMF handbook, the source of a magnetic field is the current flowing through a conductor (the underground cable). The magnetic field decreases with the distance from the conductor. Meridian has confirmed that current within each cable would not exceed 1000A.

According to ENA (2016) Compliance with ICNIRP Reference Levels can be demonstrated by showing that people are at a distance larger than the minimum compliance distance .The minimum distance is calculated by a standard equation provided in the EMF handbook with the outcomes illustrated in Figure 15-1.

The above approach can be conservatively applied to three phase circuits, bundled circuits and multiple circuits. Where there are multiple circuits and the separation of conductors is small, an assessment of the net current can be used.

The net current within the underground electrical cable installation would not exceed 2000A. Based on the EMF handbook the resulting compliance distance will be less than 0.4 metres for occupational exposure and less than two metres. As the cables would be buried approximately one metre deep the exposure to any people at ground level will thus be below the ICNIRP occupational reference limit for magnetic fields.

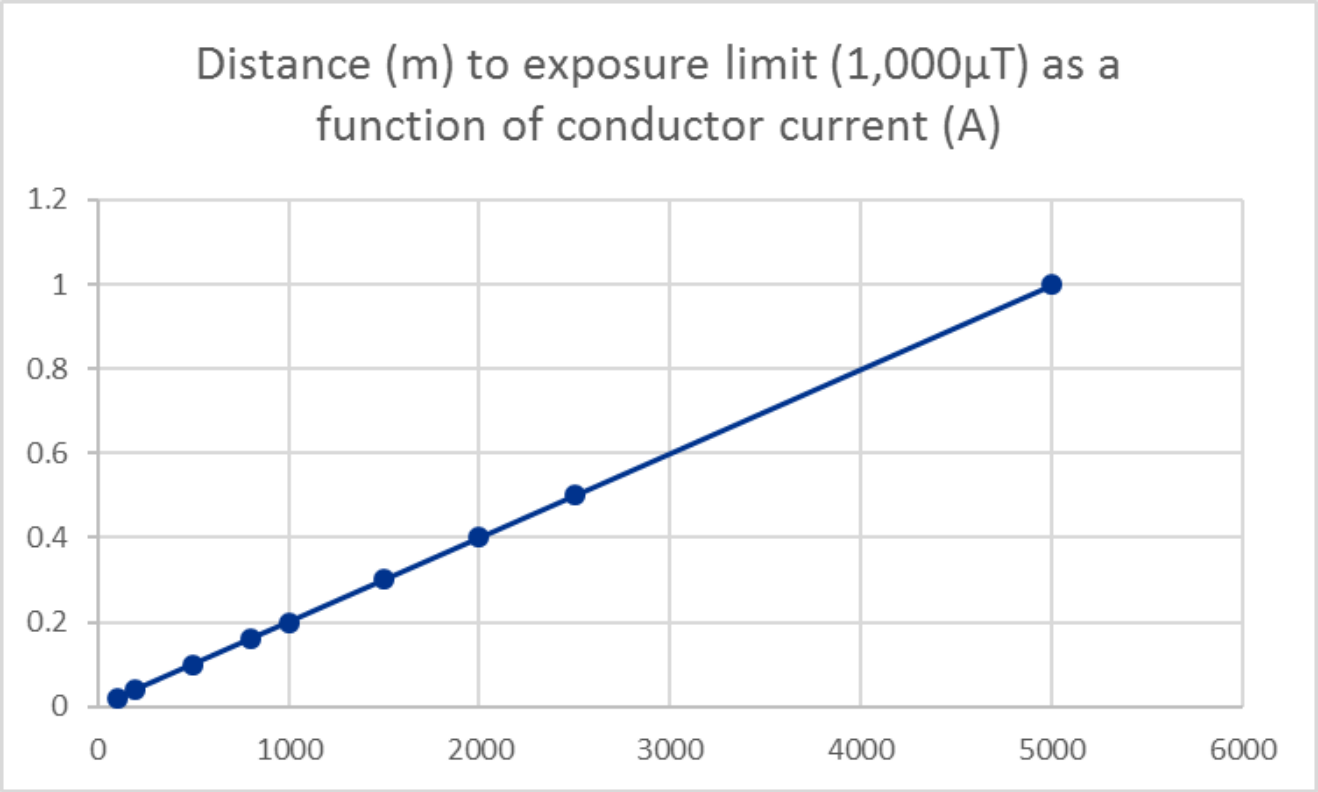


Figure 15-1: Magnetic Field Minimum Compliance Distances for occupational Reference Levels

15.6 Environmental management measures

Table 15-3 outlines measures for managing, avoiding or mitigating potential hazard impacts from the construction and operation of the Project.

Table 15-3: Environmental management measures - hazards and risks impacts

Reference	Environmental management measures	Timing
DG01	Storage and management of dangerous goods and hazardous materials (if required) would occur in a safe, secure location consistent with the requirements of applicable Australian Standards.	All
DG02	The need to store or handle additional dangerous goods or hazardous substances would be subject to additional risk consideration prior to being undertaken.	All
DG03	Refuelling will take place in a designated area within the works area, away from ignition sources and trees or vegetation and with appropriate controls to prevent any spills coming into contact with the ground.	Construction
DG04	Minimal volumes of fuel, chemical and liquid will be handled and stored on site.	All

Reference	Environmental management measures	Timing
DG05	Appropriately stocked emergency spill kit will be at all works areas at all times while works are in progress. All staff will be made aware of the location of the spill kit and trained in its use.	Construction
BF01	Temporary construction compounds would be maintained in a tidy and orderly manner to minimise potential fuel loads in the event that any construction compounds are affected by fire.	Construction
BF02	Construction activities involving flammable materials and ignition sources (for example, welding) would be proactively managed to ensure that the potential for fire is effectively minimised. High risk construction activities, such as welding and metal work, would be subject to a risk assessment on total fire ban days and restricted or ceased as appropriate. Construction personnel would be inducted into the requirement to safely dispose of cigarette butts.	Construction
BF03	An emergency response plan would be prepared for the Project and provided to the Local Emergency Management Committee.	Prior to commissioning
EMF01	Design and selection of all electrical equipment is to minimise EMF levels and comply with ICNIRP reference levels	Detailed design

16. Socio-economic assessment

This chapter considers the socio-economic components of the SEARs, which include an assessment of the likely impacts on the local community, demands on Council infrastructure and a consideration of the construction workforce accommodation.

16.1 Assessment methodology

The methodology for this assessment has been informed by the requirements of the *Social impact assessment guideline for State significant mining, petroleum production, and extractive industry development* (DPE, 2017) (DPE social impact guideline). It involved:

- Scoping of the potential socio-economic issues relevant to the Hume Battery Energy Storage System and of communities likely to be most affected by the Project and identification of the study area
- Describing the existing socio-economic environment of the study area to provide a baseline from which impacts of the Project were assessed
- Identifying and assessing the potential socio-economic impacts of the project's construction and operation, including both negative and positive impacts. This included consideration of potential impacts on local amenity, access and connectivity, business and communities. The significance of identified socio-economic impacts was also assessed using the approach outlined in Section 16.1.1
- Identifying measures to manage or mitigate potential impacts on the socio-economic environment and maximise potential benefits.

16.1.1 Evaluation of significance

A matrix was used to evaluate the significance of potential socio-economic risks for the identified impacts as outlined in the DPE social impact guideline (refer to Figure 16-1). This was based on consideration of the expected consequences of a potential impact and likelihood of the impact occurring as defined in Table 16-1.

			Consequence Level				
			1	2	3	4	5
			Minimal	Minor	Moderate	Major	Catastrophic
Likelihood Level	A	Almost certain	A1	A2	A3	A4	A5
	B	Likely	B1	B2	B3	B4	B5
	C	Possible	C1	C2	C3	C4	C5
	D	Unlikely	D1	D2	D3	D4	D5
	E	Rare	E1	E2	E3	E4	E5
Social Risk Rating							
	Low		Moderate		High		Extreme

Source: Department of Planning and Environment (2017)

Figure 16-1: Evaluation matrix

Table 16-1: Consequence and likelihood definitions

Category		Description
Likelihood criteria		
A	Almost certain	Is expected to occur as a result of the Project under most circumstances.
B	Likely	Will probably occur as a result of the Project in most circumstances.
C	Possible	Could occur and has occurred in similar circumstances.
D	Unlikely	Could occur as a result of the Project but is not expected.
E	Rare	Could occur only in exceptional circumstances.
Consequence level		
1	Minimal	Small scale, reversible impacts. Minor or short-term impacts (less than one month) to stakeholder(s) and customers.
2	Minor	Mostly local impacts that are relatively short-term (between one and three months). Positive impacts provide some value to society. Negative impacts may require minor remedial actions but can be easily adapted to by society.
3	Moderate	Medium-term impacts (between three and six months). Impacts may require considerable remediation. Positive impacts can be enhanced to provide substantial value to society. Society has capacity to adapt and cope with the negative impacts.
4	Major	Long-term (between six and 12 months) and potentially far-reaching impacts that result in severe disruptions for stakeholder(s) and customers. Extensive remediation is required. Positive impacts will provide substantial value to society. Society has limited capacity to adapt and cope with the negative impacts.
5	Catastrophic	Long-term (greater than 12 months), high-magnitude, irreversible and far-reaching impacts that result in extended substantial disruptions and impacts on stakeholder(s) and customers. Positive impacts will provide enormous value both locally and regionally. Society has no capacity to cope with significant negative impacts.

16.1.2 Study area

The Project is located at Lake Hume Village within the Albury City local government area (LGA) in southern NSW. The Albury LGA forms part of the wider Albury-Wodonga region, which also includes the City of Wodonga located in Victoria south of the Murray River.

The study area for this assessment includes the Australian Bureau of Statistics (ABS) Statistical Area Level 1 (SA1) of 1117228, which includes the ABS defined state suburbs of Lake Hume Village, Wirlinga and part of Thurgoona. It is likely that potential benefits and impacts of the Project's construction and operation would also be experienced by communities in the wider region and have also been considered in this assessment.

16.1.3 Data sources

Data presented in this assessment is primarily from the ABS 2016 Census of Population and Housing. Additional socio-economic data and information was also sourced from:

- Australian and NSW government agencies, including the ABS (non-Census data) and NSW Department of Planning, Industry and Environment
- Albury City Council publications, reports and websites
- Website and literature reviews
- Outcomes of other technical assessments undertaken for the EIS, including traffic and transport, noise, air quality, and landscape and visual amenity.

16.2 Existing socio-economic environment

This Section describes the existing social and economic characteristics and features of the study area. It includes information on the study area's population and demography, employment and industry, social infrastructure and community values.

16.2.1 Regional context

The Albury LGA is located near the border of NSW and Victoria and is part of the wider Albury Wodonga region. The LGA had an estimated resident population of 54,353 people in June 2019 (ABS, 2016), with this projected to increase to 60,383 people by 2041. Over the past 10 years, the LGA the population of the LGA has grown at a rate above regional NSW.

The Albury LGA includes the main urban centre of Albury as well as industrial, commercial, recreational and parkland areas, and surrounding rural uses. The Murray River and Lake Hume are major features of the LGA with these contributing a range of economic, social and environmental values for local and regional communities.

Building of The Hume Dam was completed in 1936. Lake Hume is the main operating storage of the River Murray system. The primary role Lake Hume is to regulate and conserve water for both human consumption and the environment, with secondary roles including hydroelectric power generation and flood mitigation (Murray Darling Basin Authority, 2018).

16.2.2 Local context

Lake Hume Village is a small tourist village located about 300 metres east from the project site. It comprises a tourist park, a resort, and several cottages and villas. Beach and boat ramp facilities are available via Lake Hume Village, allowing access to Murray River and Lake Hume. One rural residential dwelling is also located 200 metres north of the project site across Trout Farm Road.

At the 2016 Census, Lake Hume Village had a population of about 56 people and 27 private dwellings (ABS, 2016). The population of the village is expected to significantly during weekend and holiday periods due to an influx of tourists and visitors.

16.2.3 Community profile

Key population and demographic data from the study area is presented in Table 16-2, along with data for the Albury LGA and regional NSW. The study area had a total population of 1013 people at the 2016 Census. Compared to the regional NSW, communities in the study area generally had:

- Similar proportions of children aged 14 years or under, lower proportions of working aged people and higher proportions of people aged 65 years or over
- Level levels of cultural diversity, with relatively low proportions of people who are Aboriginal and/or Torres Strait Islander, higher proportions of people born in Australia, and lower proportions of households were a non-English language is spoken
- Higher proportions of couple only families and lower proportions of families with children, which is likely due to the higher proportions of older people
- Relatively low levels of houses that were occupied on Census night, which is likely to reflect the study area as a destination for holidaymakers and presence of short-term visitor and tourist accommodation
- Higher proportions of dwellings that were owned outright or with a mortgage and lower proportions of dwellings that were being rented, lower median rent and higher levels of rental housing affordability, and lower levels of housing affordability in relation to owner occupiers.

Table 16-2: Population and demographic characteristics

Characteristic	Study area (1117228 SA1)	Albury LGA	Regional NSW
Population and growth			
Population (2016)	1013	51,076	2,643,536
Estimated resident population (ERP) (2019)*	n/a	54,353	2,777,654
ERP growth (average annual change 2009-2019)*	n/a	1.1%	0.8%
Projected population (2041)**	n/a	60,383	3,469,605
Projected population growth (average annual change 2016-2041)**	n/a	0.6%	0.5%
Age profile			
Median age	40 years	39 years	43 years
0-14 years	18.4%	18.8%	18.4%
15-64 years	54.8%	63.3%	60.6%
65+ years	26.9%	17.9%	19.0%
Cultural diversity			
Aboriginal and/or Torres Strait Islander people	1.6%	2.8%	5.5%
Australian born	86.2%	81.4%	80.9%
Speaks language other than English at home	5.4%	8.0%	7.4%
Families and households			
Couple family without children	53.7%	40.8%	42.3%
Families with children (couple families and one parent families)	46.4%	57.9%	56.3%
Total families	272	12,829	693,185

Characteristic	Study area (1117228 SA1)	Albury LGA	Regional NSW
Housing			
Total occupied private dwellings	362	19,492	980,437
Occupancy rate	83.6%	88.7%	86.8%
Separate houses	96.4%	80.2%	82.2%
Semi-detached, row or terrace house, townhouse, flat, apartment, etc	0.0%	18.9%	15.6%
Other dwelling***	3.6%	0.5%	1.5%
Owned outright or owned with a mortgage	71.0%	62.5%	68.0%
Rented	18.1%	33.7%	27.9%
Median weekly rental costs	$250	$231	$270
Households with rent payments greater than or equal to 30% of household income	5.5%	12.5%	10.8%
Households with mortgage payments greater than or equal to 30% of household income	7.8%	4.9%	5.8%

*Note: *** Other dwelling includes caravan, cabin, houseboat, improvised home, tent, sleepers out, house or flat attached to a shop, office, etc*
*Source: ABS 2016 Census QuickStats for SA1 1117228, Albury City LGA (LGA100050), and Rest of NSW (1RSW GSSCA), available from https://www.abs.gov.au/websitedbs/D3310114.nsf/Home/2016%20QuickStats, * ABS, 2020, ERP by SA2 and above (ASGS 2016), 2001 onwards and ERP by LGA (ASGS 2019), 2001 to 2019, **NSW 2019, NSW 2019 Population projections (LGA and Greater Sydney Region and Regional NSW projections)*

16.2.4 Economic profile

Table 16-3 provides an overview of income and employment data for the study area, along with data for the Albury LGA and regional NSW.

At the 2016 Census (ABS, 2016), compared to regional NSW the study area had higher median weekly personal and household incomes, lower proportions of low-income households and higher proportions of high-income households. The study area also had levels of unemployment well below regional NSW, with about 2.4% of the labour force unemployed at the 2016 Census, compared to 6.6% in regional NSW.

The importance of tourism to the study area is reflected in accommodation and takeaway food services being two of the five highest industries of employment for people aged 15 years or over. Social services such as hospitals and primary education were also key industries of employment, with the study area having higher proportions of people working in these two industries. Farming is also important to communities in the study area with beef cattle farming being one of the top five industries of employment in the study area.

Table 16-3: Employment and income

Characteristic	Study area (1117228 SA1)	Albury LGA	Regional NSW
Income			
Median weekly personal income	$709	$642	$584
Median weekly household income	$1,482	$1,185	$1,168
Households with income <$650/ week	14.1%	24.5%	24.7%

Characteristic	Study area (1117228 SA1)	Albury LGA	Regional NSW
Households with income >$3,000/ week	14.7%	9.5%	10.5%
Employment			
Total labour force	464	24,591	1,182,573
Unemployment (%)	2.4%	6.8%	6.6%
Main industries of employment	▪ Hospitals (except Psychiatric hospitals) (4.5%) ▪ Primary education (4.0%) ▪ Accommodation (3.0%) ▪ Takeaway food services (3.0%) ▪ Beef cattle farming (specialised) (2.8%)	▪ Hospitals (except Psychiatric hospitals) (4.5%) ▪ Supermarket and grocery stores (2.6%) ▪ Cafes and restaurants (2.3%) ▪ Takeaway food services (2.3%) ▪ Primary education (2.3%)	▪ Hospitals (except Psychiatric hospitals) (3.9%) ▪ Aged care residential services (2.7% ▪ Supermarket and grocery stores (2.6%) ▪ Primary education (2.4%) ▪ Other social assistance services (2.2%)

Source: ABS 2016 Census QuickStats forSA1 1117228, Albury City LGA (LGA100050), and Rest of NSW (1RSW GSSCA), available from https://www.abs.gov.au/websitedbs/D3310114.nsf/Home/2016%20QuickStats

Tourism

Tourism data for the study area is available at an LGA level and wider tourism region level, with the study area located within 'The Murray' tourism region.

In 2018, the Albury LGA attracted 1.17 million visitors international and domestic visitors, of which about 60.3% were domestic day trippers and 38.4% were domestic overnight visitors. International and domestic overnight visitors stayed for a total of 1.249 million nights. The average stay for visitors was three nights, although international visitors generally stayed longer (11 nights), with domestic visitors staying for an average of two nights. Visitors to the LGA spent a total of $343 million in 2018, of which about 59.5% related to domestic overnight travel and 37.3% to domestic day trippers. The average spend per night on commercial accommodation was $172, with international tourists spending an average of $86 and domestic tourists spending an average of $185 (Tourism Research Australia, 2019).

Holidaying was the main reasons for visiting the Albury LGA, with this group representing 421,000 visitors. More than two-thirds of this group comprised domestic day trippers. Visiting friends of relatives was the other main reason for visiting the LGA, with this group representing 290,000 visitors in 2018, of which slightly more than half were domestic overnight visitors. Business travellers accounted for about 107,000 visitors. About 46.7% of visitor nights involved a stay in the home of a friend or relative, with 34.4% of visitor nights involving a stay in a hotel or similar. About 58,000 visitor nights (4.6%) involved commercial camping/caravan park (Tourism Research Australia, 2019).

In 2018, there were 568 tourism businesses in the Albury LGA, of which 36.3% were non-employing (e.g. sole traders or partnerships with no employees in addition to the business owners). About 34% of businesses employed one to four people, while about 7.6% of businesses employed 20 or more employees (Tourism Research Australia, 2019).

Visitor accommodation

A range of other short-term visitor and tourist accommodation options are available in Albury and Wodonga, including caravan parks, hotel/ motels, serviced apartments, cottages and bed and breakfasts.

In 2016, there were 33 hotels, motels and serviced apartments with 15 rooms or more in the Albury LGA offering about 1,223 rooms. The average room occupancy rate for the year ending June 2016 was 56.6%. Occupancy rates varied across the year with the peak occupancy in the March 2016 quarter (61.9%) and the lowest occupancy rate in the September 2015 quarter (50.8%) (Destination NSW, 2016).

There are two accommodation providers at Lake Hume Village that offer a range of caravan, camping and cabin accommodation options. These include:

- Lake Hume Resort, which offers 74 units, including hotel rooms and two, three and four bed cabins
- Lake Hume Tourist Park, which offers about 200 caravan, camping and cabin sites.

16.2.5 Social infrastructure

Social infrastructure within the study area mainly includes recreation and leisure facilities, including:

- Lake Hume Tourist Park Beach located on the Lake Hume foreshore, which includes open grass area, picnic tables, barbeque facilities, shelter, public toilets and shade areas and is a popular swimming area
- Apex Park (The Pines) located on Lake Hume, which includes a boat ramp, barbeque facilities, picnic facilities, shelter and public toilets, and is well used by fishers, water skiers and jet skiers
- Boat ramps, including at Hume Weir Resort and Apex Park Lake Hume
- Hume Dam Wall Reserve, which includes a viewing platform
- Walking tracks, including across the dam wall.

Lake Hume is a popular location for water sports and water-based recreation such as boating, kayaking, canoeing, sailing, fishing, water skiing, jet skiing, swimming.

A wide range of social infrastructure is in Albury and Wodonga that serves the needs of communities in the study area, the Albury LGA and wider Albury Wodonga region. This includes:

- Hospitals, health and medical services, including Albury Base Hospital and Albury Wodonga Private Hospital, child and family health centres, and community health support services
- Education facilities, including public and private preschools, primary schools and high schools, and tertiary education facilities such as Charles Sturt University – Albury-Wodonga Campus, TAFE NSW
- Emergency services, including Ambulance NSW, three Fire and Rescue NSW stations and Hume Zone NSW Rural Fire Service, Albury Police Station, and State Emergency Services
- Employment and business services, including chambers of commerce and Regional Development Australia (Murray NSW)
- Recreation, leisure and sporting facilities
- Cultural facilities such as churches, museums and art galleries, performance venues
- Community and family support services, including supported accommodation and housing services, community centres, disability services, and family and children's services.

16.2.6 Transport and access

Road access to the study area from Albury is provided via Riverina Highway. Riverina Highway is an important local access route, which caters for local communities accessing Albury, and tourists and visitors of Lake Hume Village. Road access is also provided to Wodonga in the south via Trout Farm Road, Heywood Bridge and Bonegilla Road. The Hume Highway connects Albury and Wodonga to Sydney and Melbourne. The highway forms part of the national road network and is an important freight connection.

Public transport bus services are provided in Albury servicing the Albury city centre and surrounding suburbs.

Albury Airport is located off of the Riverina Highway and caters for general aviation and charter flights. Commercial airlines operating from the airport include Qantas, Virgin Australia and Rex airlines with flights between Albury and Sydney and Melbourne.

16.2.7 Community values

Lake Hume supports a large and diverse range of values and uses including water for irrigation, urban use (towns and cities), domestic and stock use, recreation and tourism opportunities.

Lake Hume is valued by local and regional communities for its environmental, scenic amenity, cultural heritage and recreational values. The lake is a popular recreation and tourist destination in the Albury Wodonga region and supports a range of water and land based recreational activities including fishing, boating and swimming, and camping, sightseeing and picnicking, attracting residents of surrounding communities and visitors across NSW and Victoria (Goulburn-Murray Water, 2015).

Lake Hume also supports numerous sport and recreation clubs, including fishing, boating and sailing clubs and is used for regular fishing and boating competitions and events. For example, the Leigh Martin Marine Mercury Classic Lake Hume is an annual two-day fishing competition held in October/ November at Lake Hume Resort. The event attracts competitors from across the state.

Hume Dam is of state historic significance for its role historic, associative, aesthetic, social and research values. Lake Hume Village is valued by residents and visitors for its relaxed lifestyle, scenic location, and access to Lake Hume for fishing, boating and sightseeing. Lake Hume Village also provides access to the dam wall to allow people to view Lake Hume, the River Murray and surrounding countryside.

16.3 Impact assessment

This Section assesses potential socio-economic impacts of the construction and operation of the Hume BESS.

16.3.1 Construction

Employment

The Project would impact positively on employment through the creation of direct employment opportunities through the construction phase. The project would generate employment for up to 40 people over the nine-month project construction phase, with most construction workers expected to be sourced from surrounding communities where possible. As indicated in Section 16.2.4, the Albury LGA reported levels of unemployment above the NSW average at the 2016 Census (ABS, 2016). The creation of employment opportunities would benefit local and regional workers and have potential to support improved incomes for individuals.

The Project is also likely to generate indirect jobs in local, regional and national businesses and industries from increased economic activity and spending at businesses providing goods and services to support construction activities.

Local businesses

During construction, potential benefits for businesses would mainly be associated with provision of goods and services to support construction activities (e.g. equipment hire, fuel supplies, transportation, administrated services). Increased spending by workers on such things as accommodation, food and services is also likely to impact positively on local businesses.

It is expected that construction workers from outside local and regional communities would be accommodated in short-term visitor accommodation in Lake Hume Village or Albury. As indicated in Section 16.2.4, the peak occupancy rate for visitor accommodation in the Albury LGA was 56.6%. The use of some of the available, under-utilised tourist accommodation for temporary workforce accommodation would provide economic benefits for the owners of tourist accommodation by providing a base load demand. The use of visitor accommodation by construction workers for the project has potential to impact on the availability of some visitor accommodation at Lake Hume Village and Albury, particularly during peak visitor periods and events. This may cause some visitors to travel to other nearby towns and locations, which may possibly have some flow on effects for other tourism related businesses such as visitor attractions and restaurants/cafes.

During construction, potential disruption to the amenity of the Lake Hume Resort and Lake Hume Tourist Park associated with noise and minor increase in traffic could eventuate in the absence of mitigation. This may impact on the use and enjoyment of these facilities for some visitors. Engagement with the managers of these businesses about the timing of particularly noisy works would help to minimise any potential impacts for visitors. Construction works would be limited to standard day-time construction hours and would not cause sleep disturbance for visitors.

Transport and access

Construction of the project would generate construction traffic associated with the haulage and delivery of construction materials and equipment, transport of construction workforce, and general site activities. Peak daily traffic movements are expected to be about 24 light vehicles (i.e. 12 vehicles one way) and eight heavy vehicles (i.e. four vehicles one way).

Access to the site would be via the Riverina Highway and Murray Street. As indicated in Chapter 13, the Riverina Highway caters for local communities accessing Albury, and tourists and visitors of Lake Hume Village. While the daily traffic volumes are generally minimal, an increase in construction traffic using local roads may increase road safety risks for motorists, pedestrians and cyclists, particularly within Lake Hume Village, and influence perceptions of road safety for some people. With the implementation of traffic management measures potential transport impacts for communities, workers and visitors to the study area would be minimal.

Housing and accommodation

During construction, the Project would generate employment for up to 38 people over the nine-month construction period.

As previously indicated, it is expected that construction workers from outside local and regional communities would be accommodated in short-term visitor accommodation in Lake Hume Village or Albury. This would increase demand for temporary accommodation options, such as cabin and motel accommodation.

As indicated in Section 16.2.4, there are two accommodation providers at Lake Hume Village that combined offer nearly 200 rooms (in two, three and four bed cabins and hotel rooms) and about 90 caravan and camping sites. Within the Albury LGA more generally, there are about 33 hotels, motels and serviced apartments with 15 rooms or more offering about 1,223 rooms. In 2016, the peak occupancy rate for visitor accommodation in the Albury LGA was 56.6% suggesting that there would generally be capacity in existing tourist accommodation to accommodate construction workers. If most workers choose to stay in Lake Hume Village, there are likely to be periods (e.g. during holidays and events) that use of accommodation by construction workers may reduce the availability of accommodation for tourists and visitors. Ongoing consultation with operators of tourist accommodate at Lake Hume Village would assist in managing any impacts on visitor accommodation during peak visitor times.

Social infrastructure

The Project does not directly impact on existing community services or social infrastructure in the study area.

The Albury LGA is provided with a high level of community services and facilities, including health and medical services, emergency services, cultural facilities and recreation, leisure and sporting facilities. Given the number of construction workers required for the Project, potential impacts on existing services and facilities due to increased demand are unlikely.

Community values

During construction, potential impacts on community values may be associated with:

- Increased noise and construction traffic, resulting in temporary disruptions to amenity for residents and visitors in Lake Hume Village
- Increase in construction traffic using local roads, resulting in possible road safety risks for motorists, pedestrians and cyclists, particularly within Lake Hume Village, and influencing perceptions of road safety for some people.

Any impacts are likely to be minor and are expected to be appropriately managed with the implementation of environmental and traffic management measures and consultation and communication with local communities.

Construction of the Project would not impact on access to Lake Hume for fishing, boating or other water based activities.

16.3.2 Operation

Once operational, the Project would benefit communities, businesses and industry by increasing the reliability in the National Energy Market.

The Project would result in more efficient use of hydro electricity generated by the existing Hume hydro power station, allowing the storage of energy during periods of low energy demand for use in periods of high energy demand. This would provide an overall downward pressure on energy prices, supporting reduced electricity costs for households, businesses and industry over the medium to long term.

The Project would contribute to the NSW and Australian governments commitments for increasing the use of clean energy by facilitating an increase in the use of renewable energy.

During operation, the Project would generate employment for two people. It is expected that these workers would live in local region.

16.4 Evaluation of significance

Table 16-4 presents a summary of the socio-economic impacts of the Project's construction and operation, along with the outcomes of the evaluation of significance. The evaluation of significance is based on the social risk matrix presented in Section 16.1.1.

Table 16-4: Summary of socio-economic impacts and evaluation of significance

Impact	Nature	Without mitigation			Mitigation	With mitigation		
		Likelihood	Consequence/ benefit	Ranking		Likelihood	Consequence/ benefit	Ranking
Construction								
Creation of direct local employment opportunities	Positive	Almost certain	Mod	Extreme	No mitigation required	Almost certain	Mod	Extreme
Improved income for individuals	Positive	Possible	Minor	Mod	No mitigation required	Possible	Minor	Mod
Creation of indirect local employment opportunities	Positive	Possible	Minor	Mod	Identify opportunities to maximise use of local suppliers	Likely	Minor	High
Opportunities for/ increased spending at local businesses	Positive	Likely	Mod	High	Identify opportunities to maximise use of local suppliers	Almost certain	Mod	Extreme
Disruption to local business amenity	Negative	Possible	Minor	Mod	Implementation of environmental and traffic management measures	Unlikely	Minor	Low
Change in road safety risks	Negative	Unlikely	Mod	Mod	Implementation of traffic management measures	Rare	Mod	Mod
Change in perceptions of road safety	Negative	Possible	Minor	Mod	Implementation of traffic management measures	Unlikely	Minor	Low
Reduced availability of tourist accommodation	Negative	Possible	Minor	Mod	Consultation with local tourist accommodation operators	Unlikely	Minor	Low
Demand for social infrastructure	Negative	Unlikely	Minimal	Low	No mitigation required	Unlikely	Minimal	Low
Temporary disruptions to local amenity	Negative	Possible	Minor	Mod	Implementation of environmental and traffic management measures	Unlikely	Minor	Low
Operation								
Reduced electricity costs	Positive	Possible	Major	Extreme	No mitigation required	Possible	Major	Extreme
Contribution to clean energy commitments	Positive	Almost certain	Major	Extreme	No mitigation required	Almost certain	Major	Extreme

Creation of local employment opportunities	Positive	Almost certain	Minimal	High	No mitigation required	Almost certain	Minimal	High

16.5 Impact management

Table 16-5 outlines measures for managing, avoiding or mitigating potential socio-economic impacts and maximising benefits from the construction and operation of the Project. Additional measures relating to such things as traffic and transport are also described in other chapters of the EIS.

Table 16-5: Management measures – socio-economic impacts

Impact	Proposed mitigation measure
Opportunities for/ increased spending at local businesses/ creation of indirect local employment opportunities/	▪ Identify opportunities to maximise the use of local suppliers and businesses in the provision of goods and services for construction.
Disruption to local business amenity	▪ Implementation of environmental and traffic management measures
Change in road safety risks/ change in perceptions of road safety	▪ Implementation of traffic management measures
Reduced availability of tourist accommodation due to increased demand by construction workers	▪ Consultation with local tourist accommodation operators ▪ Consider timing of key tourist activities and events in the planning of peak construction works. ▪ Maximise the use local labour, where possible, to reduce the number of people requiring accommodation.
Temporary disruptions to local amenity	▪ Implementation of environmental and traffic management measures

17. Waste

This chapter addresses the waste related elements of the SEARs, which requires that the EIS identify, quantify and classify the likely waste stream to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.

17.1 Likely waste streams

The identification of likely waste streams has involved consultation with Project development team including battery supplier to understand the construction methodology. In general, waste generation has been minimised to standard construction wastes due to the pre-assembled nature of the batteries. Limited information is available regarding likely quantities, but no problematic waste streams or volumes are anticipated. Waste was then attributed to a likely classification based on the EPA Waste Classification Guidelines (NSW Environment Protection Authority, 2014) which separate waste into the following:

- Special waste
- Liquid waste
- Hazardous waste
- Restricted solid waste
- General solid waste (putrescible)
- General solid waste (non-putrescible).

During construction, waste would be generated associated with the following activities:

- Clearing of vegetation for access track and BESS compound and works area
- Earthworks to create BESS compound and access track
- Trenching for cable installation
- Demolition of redundant shed at Switchyard
- Installation of foundations for BESS and switch room building
- Installation of above ground civil, mechanical and electrical plant and equipment
- Worker facilities including office, lunchroom and ablutions.

The operation of the Project is not anticipated to generate waste. Battery cores would be taken back by the technology provider for re-purposing while steel components would be recycled.

Table 17-1 identifies likely waste streams, their classification and estimated quantity where possible.

Table 17-1: Likely waste streams

Waste identification	Waste description	Likely Classification	Estimated quantity	Proposed management
Sewage	Portable ablutions facilities pump-out	Liquid	>1000 litres per week	Pump-out for off-site disposal
Fuels, lubricants, and chemicals	Containers that previously contained Class 1, 3, 4, 5 or 8 substances used for construction plant. Used oil from construction plant.	Hazardous	Unknown volume, waste associated with minor maintenance of vehicles only.	Fuels and oils drained from plant for maintenance would be decanted for re-use. Where unsuitable they would be taken off-site for recycling.
Hydrocarbon contaminated soils	Spills from construction plant and refuelling	Hazardous	Minimal	Spill clean-up material would be placed in dedicated covered skip bin for collection for off-site disposal.
Excavated natural materials	Earthworks spoil	General	8000 m^3 of material will be cut and filled to establish permanent BESS compound and access track.	Maintaining soils on site. Any chance finds of unsuitable or contaminated material would be tested to confirm waste classification prior to off-site disposal.
Green waste	Clearing of vegetation	general	Minor clearing volumes only.	Disposal off site at Council green waste facility unless otherwise suitable for habitat features while managing bushfire risks.
Construction waste	Timber, packaging, metal, asphalt, concrete, glass, plastic, rubber, plasterboard, ceramics, bricks from the installation of foundations and underground services and above ground civil, mechanical and electrical plant and equipment.	General	Unknown but generally >3m^3 per week.	Off-site disposal.

Waste identification	Waste description	Likely Classification	Estimated quantity	Proposed management
Grit, sediment in erosion controls	Collected in, and removed from, stormwater treatment devices and/or stormwater management systems.	General	As generated	Clean sediment would be incorporated into rehabilitation.
Site office waste	Paper/cardboard	General	Negligible	Off-site disposal
Food waste	Generated from worker's lunches.	Putrescible	>0.5 kg per person per day	Off-site disposal
Battery cores	End of life or defective lithium-ion batteries	Hazardous	Quantity unknown	End of life or defective lithium-ion batteries will be taken back by supplier for re-purposing or appropriate disposal.
Packaging waste	Cardboard, plastic, pallets etc	General	Pre-ass	Pre-assembled components will avoid significant volumes of packaging waste and waste generated would be segregated for off-site disposal.

17.2 Environmental management measures

Waste management for the Project would be based on the waste management hierarchy established by the objectives of the *Waste Avoidance and Resource Recovery Act 2001* as follows:

- **Avoidance** including action to reduce the amount of waste generated by households, industry and all levels of government
- **Resource recovery** including re-use, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources
- **Disposal** including management of all disposal options in the most environmentally responsible manner.

Waste avoidance would be achieved as follows in relation to the design and construction of the Project:

- Selection of battery technology being delivered in an assembled state avoids significant volume of packaging waste
- Use of pre-assembled battery technology minimises construction duration reducing the generation of putrescible waste and liquid waste associated with worker
- Project layout has been refined to minimise excavation by the introduction of a benched BESS platform reducing the volume of cut material requiring management.

Resource recovery would be achieved as follows in relation to the Project:

- Battery cores would be returned to the technology provider for reprocessing
- The Project design would seek to achieve balanced cut and fill with only material unsuitable for re-use requiring off-site disposal
- Cleared vegetation would be distributed to surrounding vegetation, mulched for use in rehabilitation or taken to the local green waste processing facility
- The use of recycled products would be explored as part of detailed design but use would be limited based on local availability and suitability
- Packaging materials would be segregated for recycling where possible

Any necessary waste disposal would be undertaken using licenced waste transporters and facilities. Local disposal options are available for all anticipated waste streams.

Table 17-2 outlines measures for managing, avoiding or mitigating potential waste impacts from the construction and operation of the Project.

Table 17-2 Environmental management measures - waste impacts

Reference	Environmental management measures	Timing
WR01	A Waste Management Plan would be developed for the Project with the following criteria: ▪ A hierarchical waste management approach would be used, from the most preferable (reduce, reuse or recycle wastes) to the lease preferable (disposal) to prioritise waste management strategies to avoid waste generation ▪ The plans would promote the use of materials with minimal packaging requirements, removal of packaging offsite by suppliers and fabrication of parts offsite ▪ Where waste cannot be avoided, waste materials would be segregated by type for collection and removal (for processing or disposal) by licensed contractors ▪ All waste types would be separated at source for recycling ▪ A licensed service provider would be appointed to collect waste during construction and operation ▪ Each waste type would be classified for transport to ensure correct handling. ▪ Any waste that cannot be recovered or recycled would need to go to a licensed treatment or disposal facility where it would be treated and disposed of according to its classification.	Detailed design
WR02	Cleared vegetation would be either mulched for onsite reuse or used to created habitat piles, noting that any weeds and pathogens would be managed according to requirements under the *NSW Biosecurity Act 2015*.	Construction

18. Management and monitoring measures

This Chapter addresses the SEARs requirement that the EIS include a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS.

18.1 Project environmental commitments

18.1.1 Ongoing design strategy

While the Project design has been substantially progressed, final detailed design is yet to be completed. The EIS is based on a current design status which may be amended through the detailed design process. Construction methods may also vary subject to design refinements and the selection of the construction contractor.

The assessment of the project within the EIS is based on consideration of reasonable worse case environmental impacts to allow flexibility in design and construction methodology. The ongoing design of Project components would adopt the performance outcomes for the Project as identified in the EIS.

As part of the engagement of a technology provider and construction contractor, a risk assessment would be completed on the battery solution selected and construction methods to be implemented and an environmental management plan prepared that incorporates the Project commitments and conditions of approval. Further consultation with relevant agencies would be undertaken and necessary approvals of final designs and methods sought.

Meridian will comply with any pre-construction compliance obligations prior to the commencement of the Project. The risk assessments, final design plans and management plans would be used to confirm that no greater impact than that assessed in this EIS would eventuate. Where additional impacts are identified, any necessary modifications would be sought.

18.1.2 Environmental management plan

An environmental management plan would be developed for the Project and updated as it progresses through construction, operations and finally decommissioning. The environmental management plan would provide principles and plans of implementation related to environmental performance objectives of the Project aimed at achieving and demonstrating compliance with the commitments of the EIS and approval conditions and minimising environmental impact.

The environmental management plan, and conditions of approval would be implemented through contractual arrangements such that resources necessary to achieve compliance and to minimise impacts will be provided. The Environmental Management Plan would be reviewed and updated in response to design changes, compliance reporting, independent audit findings and prior to progressing into each stage of the development.

18.1.3 Summary of proposed monitoring

Table 18-1 provides a summary of monitoring committed to in the EIS or otherwise proposed.

Table 18-1: Summary of proposed monitoring

Environmental matter	Monitoring	Frequency
General	Weekly inspections of all active works areas would be undertaken to confirm: ▪ Clearing and ground disturbance is limited to approved impact footprint ▪ Exclusion zone marking is in place to protect heritage items in proximity to works ▪ Erosion controls are in place and retain capacity to manage run-off events in accordance with guidelines ▪ Storage and handling arrangements for oils, grease and fuel for construction plant are appropriately bunded and managed to prevent spills and that no evidence of spills exists ▪ Spill kits are fully stocked and appropriate for the works being undertaken ▪ Waste is appropriately segregated and being collected at a frequency to maintain site in a neat and tidy manner ▪ Stockpiled materials are appropriately managed to prevent wind-blown dust or erosion. Should weekly observations identify areas of concern, the frequency of inspection would be increased.	Weekly during construction
Biodiversity	Any trenches left over night will be inspected each morning such that trapped fauna can be released Perimeter fencing will be inspected observed for signs of trapped or injured squirrel glider.	As needed
Heritage	Ground excavations will be observed for signs of items of heritage value and works stopped and chance finds reported immediately.	ongoing
Noise	Construction noise monitoring to confirm predicted noise levels are not exceeded and to confirm need and effectiveness of noise mitigation measures. Operational noise monitoring to confirm predicted noise levels would not exceed NML at any off site receiver location.	On commencement of Civil works. On commencement of operations.
Waste	Records of all waste sent off-site will be retained on site.	As needed

Water	Post rainfall inspections to confirm sediment control functioning and need for active management of water levels or quality in sediment basin prior to discharge. Real-time water quality sampling of any discharge to confirm general compliance with guideline levels of suspended sediments (turbidity), pH or visible signs of oils and grease.	Prior to and during any discharge events.
Auditing	Independent audits of construction, operation and closure.	In accordance with Independent Audit Post Approval Requirements unless not required by conditions of approval.

18.1.4 Consolidated summary of mitigation measures

A summary of the proposed environmental mitigation measures is provided in Table 18-2. These measures have been adapted from, and reflect the intent of, the recommended measures of the specialist assessments provided in Appendix D to I whilst adopting the overarching environmental management approach for the Project by Meridian.

Table 18-2: Proposed mitigation measures

Reference	Environmental management measures	Timing
Biodiversity		
B01	The limits of the work zone, areas for parking and turning of vehicles and plant equipment would be accurately and clearly marked out prior to commencement of works. These areas would be located so that vegetation disturbance is minimised as much as possible and the drip-line of trees avoided.	Pre-construction
B02	Exclusion zones would be established around high-quality vegetation in the west of the Project site. Periodic monitoring would be undertaken to ensure all controls are in place and no inadvertent impacts are occurring.	Pre-construction
B03	Materials, plant, equipment, work vehicles and stockpiles would be placed to avoid damage to surrounding vegetation and will be outside tree drip-lines.	Pre-construction
B04	If any damage occurs to vegetation outside of the nominated work area, the appropriate environmental representative will be notified so that appropriate remediation strategies can be developed.	Construction
B05	Erosion and sediment measures would be implemented in accordance with the principles and requirements in Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom 2004) and Volume 2D (NSW Department of Environment, Climate Change and Water 2008c), commonly referred to as the 'Blue Book'.	Pre-construction
B06	Construction personnel are to be informed of the environmentally sensitive aspects of the site, including plans for impacted and adjoining areas showing vegetation communities; important flora and fauna habitat areas; and locations where threatened species, populations or ecological communities have been recorded.	All stages
B07	A pre-clearing inspection would be undertaken 48 hours prior to any native vegetation clearing by a suitable qualified ecologist and the Contractor's	Construction

Reference	Environmental management measures	Timing
	Environmental Manager (or delegate). The pre-clearing inspection would include, as a minimum: ▪ Identification of hollow bearing trees or other habitat features; ▪ Identification of any threatened flora and fauna; ▪ A check on the physical demarcation of the limit of clearing; ▪ An approved erosion and sediment control plan for the worksite; and ▪ The completion of any other pre-clearing requirements required by any project approvals, permits or licences. The completion of the pre-clearing inspection would form a HOLD POINT requiring sign-off from the Contractor's Environmental Manager (or delegate) and a qualified ecologist.	
B08	Clearing hollow-bearing trees is to be avoided.	Construction
B09	Construction crews would be made aware that any native fauna species encountered must be allowed to leave site without being harassed and a local wildlife rescue organisation must be called for assistance where necessary.	Construction
B10	A procedure for dealing with unexpected EEC threatened species would be identified during construction, including cessation of work and notification of the Department, determination of appropriate mitigation measures in consultation with the DPIE (including relevant relocation measures) and updating of ecological monitoring or off-set requirements.	Construction
B11	Barbed wire fencing is to be avoided wherever possible. Fencing should be lowered to a minimum required height where possible.	All stages
B12	Where barbed wire fencing cannot be avoided, it should be located away from retained vegetation and have improved visibility measures installed, such as adding visible (and often audible) objects to the fence, such as tape, plastic flags and metal tags (Booth 2007).	All stages
B13	All fencing containing barbed wire that is erected during the construction of the project is to be monitored daily in areas around known Squirrel Glider movement corridors.	Construction
B14	Permanent barbed wire fencing required by the development in identified movement corridors should implement alternative connectivity structures such as rope crossing and glide poles.	Construction
B15	Planting of native trees and shrubs through identified movement corridors would be undertaken with the agreement of WaterNSW to improve the connectivity of habitat for the Squirrel Glider and reduce the potential for impact.	Any stages
B16	Weed management is to be undertaken in areas affected by construction prior to any clearing works in accordance with the *Biosecurity Act 2015* to ensure they are not spread to the surrounding environment; including during transport disposal off-site to a licenced waste disposal facility.	Construction and Post-construction
B18	All weeds, propagules, other plant parts and/or excavated topsoil material that is likely to be infested with weed propagules that are likely to regenerate would	Construction and Post-construction

Reference	Environmental management measures	Timing
	be treated on site or bagged, removed from site and disposed of at a licensed waste disposal facility.	
B19	All vehicles driving to and from site would follow a protocol to prevent the spread or introduction of phytophthora, namely vehicles should be clean, including the tyres and any equipment.	All stages
B20	Biodiversity offset credits would be retired in accordance with BC Act.	Prior to construction
Aboriginal heritage		
AH01	A program of test excavation would be carried out on Hume PAD 001 to assess the nature and significance of any subsurface archaeological material that might be present. The test excavations would be carried out following the procedures outlined in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010), and so the test excavation program would not require an AHIP. The results of these test excavations would inform decisions around subsequent management of this area of PAD. If Aboriginal cultural heritage material is identified during the test excavation program, the location where these objects were found would be registered as an Aboriginal site. Approval to impact this Aboriginal site would need to be obtained prior to project construction works commencing.	Pre-construction
AH02	In the event that Aboriginal objects are discovered within the Project area during construction project works being carried out, all work in the area will be halted immediately, and the unexpected finds protocol (Appendix E of ACHAR) will be implemented.	Construction
AH03	A copy of the ACHAR will be submitted to the Environment, Energy and Science Group of the Department of Planning, Industry and Environment (former NSW Office of Environment and Heritage) (EESG) for review and assessment as part of the EIS.	Pre-construction
AH04	Cultural awareness induction for any personnel involved in ground breaking activities. This could include a Cultural Awareness Training Program.	Construction
AH05	A Cultural Heritage Management Plan including potential monitoring and salvage works procedures would be prepared and implemented for the Project construction.	Construction
Non-Aboriginal heritage		
HH01	Protective fencing would be installed around the two Nissan huts (former fitters' workshop and vehicle store) and the culvert, drainage and retaining wall to protect them from inadvertent damage during construction of the underground electricity cable.	Construction
HH02	A heritage induction for both Aboriginal and non-Aboriginal heritage should be carried out as part of general site inductions. The aim of the induction would be to ensure that all staff, contractors and subcontractors are aware of their statutory duties under both the National Parks and Wildlife Act 1974 and the Heritage Act 1977.	Pre-construction

Reference	Environmental management measures	Timing
HH03	In the event of archaeological material being uncovered during works that all works in the area should stop, the area cordoned off and a suitably qualified archaeologist be engaged to assess the significance and future management of the find(s). If deemed to be of significance, under Section 146 of the *Heritage Act 1977* (NSW), a s146 form would be submitted to notify the Heritage Council of the discovery of relics. Further investigation may be required, and appropriate management would be agreed through consultation with Heritage NSW	Construction
HH04	In the unlikely event that human remains are uncovered, all work must cease immediately in the vicinity of the remains and the area cordoned off. The local NSW Police must be notified, who would make an initial assessment as to whether the remains are part of a crime scene, or Aboriginal remains. If the remains are thought to be Aboriginal, Heritage NSW must be contacted.	Construction
Visual amenity		
V01	Retention and enhancement of existing landscape features (areas of scrub, individual trees) should be considered where feasible	Detailed design
V02	Limit the area of disturbance during construction	Construction
V03	Cutting and embankment slopes should be seeded to grass to match existing	Construction
V04	Mitigation tree and shrub planting should be considered to compensate for lost habitat and to visually integrate the Project within the surrounding landscape	Construction
V05	Colour of proposed structures and built form should be considered in a suitable muted palette to visually integrate the Project within the landscape	Detailed design
V06	Consider minimal use of reflective surfaces to avoid drawing attention to the site within views due to reflective glare.	Detailed design
Noise and vibration		
NV01	Works would be limited to standard hours of construction accept where safety requirements dictate an alternative approach.	During construction
NV02	▪ Select low-noise plant and equipment Ensure equipment mufflers operate in a proper and efficient manner.	Prior to and during construction
NV03	▪ Where possible, use quieter and less vibration emitting construction methods.	During construction
NV04	▪ Only have necessary equipment on-site and turn off when not in use.	During construction
NV05	▪ Where possible, concentrate noisy activities at one location and move to another as quickly as possible.	During construction
NV06	▪ Vehicle movements, including deliveries outside standard hours should be minimised and avoided where possible.	During construction

Reference	Environmental management measures	Timing
NV07	▪ Ensure all plant and equipment is well maintained and where possible, fitted with silencing devices.	Prior to and during construction
NV08	▪ Use only the necessary size and powered equipment for tasks.	During construction
NV09	▪ Implement training to induct staff on noise sensitivities	Prior to and during construction
NV10	▪ Where possible, consider the application of less intrusive alternatives to reverse beepers such as 'squawker' or 'broadband' alarms.	During construction
NV11	▪ Consider the installation of temporary construction noise barriers for concentrated, noise-intensive activities.	During construction
NV12	▪ Where practicable, install enclosures around noisy mobile and stationary equipment as necessary.	During construction
NV13	▪ Where possible, avoid simultaneous operation of two or more noisy plant close to receivers. ▪ The offset distance between noisy plant and sensitive receivers should be maximised.	During construction
NV14	▪ Plan traffic flow, parking and loading/unloading areas to minimise reversing movements.	Prior to and during construction
NV15	▪ Delivery and loading / unloading of materials should occur as far as possible from sensitive receivers. ▪ Select site access points and roads as far as possible from sensitive receivers.	During construction
NV16	▪ Complete routine monitoring to evaluate construction noise levels and evaluate whether the mitigation measures in place are adequate or require revision.	During construction
NV17	▪ Care should be taken during compaction activities within the vicinity of nearby heritage structures during the installation of the 11 kV electricity cabling infrastructure from the existing switchyard to the BESS. These structures should first be inspected to determine whether a 10 or 20 metre safe setback distance should be applied. Following this, these setbacks should be adhered to or where this isn't possible an attendee should be present during the works to suspend activities in the instance of any issues.	Cable trenching

Traffic and transport		
TT1	A CTMP will be prepared and implemented as part of the CEMP. The CTMP will include: ▪ Measures to maintain access to local roads and properties, and maintain the capacity of existing roads where possible ▪ Site specific traffic control measures (including signage) to manage and regulate traffic movement ▪ Requirements and methods to consult and inform the local community of impacts on the local road network due to the development-related activities ▪ Consultation with Transport for NSW, Albury City Council and the construction contractor, if needed ▪ Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads ▪ A response plan for any construction related traffic incident ▪ Monitoring, review and amendment mechanisms ▪ Individual traffic management requirements at each phase of construction ▪ Measures to minimise the number of workers using private vehicles travelling to and from the work site ▪ Employment of standard traffic management measures to minimise short-term traffic impacts expected during construction ▪ Relevant traffic safety measures, including appropriate signage, driver conduct and safety protocols ▪ Identify requirements for, and placement of, traffic barriers ▪ Any work that has potential to significantly disrupt traffic on the Riverina Highway must be scheduled to be carried out outside peak holiday periods.	Detailed design and Construction
TT2	Where works will affect the free flow of traffic, a Traffic Control Plan will be prepared and a Road Occupancy Licence will be obtained from Transport for NSW if necessary.	Prior to construction
TT3	Road maintenance will be managed through the following measures: ▪ A Road Dilapidation Report will be prepared and approved prior to and following the construction of the project. Any impacts identified as caused by the Project will be rectified as specified with any road maintenance agreements ▪ Routine defect identification and rectification of the access roads and tracks will be managed as part of the project maintenance procedure Access roads and tracks will be designed in accordance with the relevant vehicle loading requirements.	Prior to construction
TT4	Affected communities, visitors and emergency services will be notified in advance of any disruptions to traffic and restriction of access impacted by Project activities.	Construction

Surface water and hydrology		
W01	A Surface Water Management Plan (SWMP) would be developed as part of the Environmental Management Plan for the Project and include: ▪ Erosion sediment control sub-plan ▪ Designated parking and laydown areas ▪ Dedicated fuel and chemical storage areas ▪ Storage and handling of all chemicals, wastewater, and fuels in accordance with Australian Standards at suitable distance from drainage channels ▪ On-site storage of spill kits ▪ Inspections and maintenance of construction plant and machinery ▪ Management of acid sulfate soils ▪ Maintenance and restricted use of access tracks Recycling and re-use of stormwater (where practical).	Detailed design
W02	The Erosion Sediment Control Plan (ESCP) would include details on the following requirements: ▪ Avoidance of unnecessary clearing ▪ Management and maintenance of on-site stockpiles ▪ Grading of land to mitigate uncontrolled discharge / wasting ▪ Stabilisation and management of surfaces and construction roads ▪ Construction and maintenance of Sediment basin including temporary gravel construction access, temporary block and gravel drop inlet protection, outlet stabilisation structure ▪ Construction and maintenance of temporary diversion drains, lined channels, level spreader, temporary sediment trap and fences ▪ Dust control Required monitoring and management of water quality parameters within sediment basins and treatment to achieve requirements for discharge.	Detailed design
W03	The Surface Water Management Plan would be updated prior to operation to provide details of how stormwater management and peak flows would be managed to achieve pre-development levels including: ▪ Conversion of construction phase water quality basin to permanent operational retention basin / bio-retention basin ▪ Proposed monitoring to demonstrate effectiveness ▪ Flow control / attenuation structures at outlet of operational stormwater retention basin ▪ Additional drainage protection / stream stabilisation measures to mitigate potential scouring effects both upstream and downstream of operational stormwater detention basin.	Detailed Design

Hazards and risks		
DG01	Storage and management of dangerous goods and hazardous materials (if required) would occur in a safe, secure location consistent with the requirements of applicable Australian Standards.	All
DG02	The need to store or handle additional dangerous goods or hazardous substances would be subject to additional risk consideration prior to being undertaken.	All
DG03	Refuelling will take place in a designated area within the works area, away from ignition sources and trees or vegetation and with appropriate controls to prevent any spills coming into contact with the ground.	Construction
DG04	Minimal volumes of fuel, chemical and liquid will be handled and stored on site.	All
DG05	Appropriately stocked emergency spill kit will be at all works areas at all times while works are in progress. All staff will be made aware of the location of the spill kit and trained in its use.	Construction
BF01	Temporary construction compounds would be maintained in a tidy and orderly manner to minimise potential fuel loads in the event that any construction compounds are affected by fire.	Construction
BF02	Construction activities involving flammable materials and ignition sources (for example, welding) would be proactively managed to ensure that the potential for fire is effectively minimised. High risk construction activities, such as welding and metal work, would be subject to a risk assessment on total fire ban days and restricted or ceased as appropriate. Construction personnel would be inducted into the requirement to safely dispose of cigarette butts.	Construction
BF03	An emergency response plan would be prepared for the Project and provided to the Local Emergency Management Committee.	Prior to commissioning
EMF01	Design and selection of all electrical equipment is to minimise EMF levels and comply with ICNIRP reference levels	Detailed design
Socio-economic		
SE01	Identify opportunities to maximise the use of local suppliers and businesses in the provision of goods and services for construction.	Construction planning
SE02	Consultation with local tourist accommodation operators and consideration of timing of key tourist activities and events in the planning of peak construction works.	Construction planning
SE03	Maximise the use local labour where possible.	Construction and operation
SE04	Implementation of environmental and traffic management measures	All

Waste		
WR01	A Waste Management Plan would be developed for the Project with the following criteria: ▪ A hierarchical waste management approach would be used, from the most preferable (reduce, reuse or recycle wastes) to the lease preferable (disposal) to prioritise waste management strategies to avoid waste generation ▪ The plans would promote the use of materials with minimal packaging requirements, removal of packaging offsite by suppliers and fabrication of parts offsite ▪ Where waste cannot be avoided, waste materials would be segregated by type for collection and removal (for processing or disposal) by licensed contractors ▪ All waste types would be separated at source for recycling ▪ A licensed service provider would be appointed to collect waste during construction and operation ▪ Each waste type would be classified for transport to ensure correct handling. Any waste that cannot be recovered or recycled would need to go to a licensed treatment or disposal facility where it would be treated and disposed of according to its classification.	Detailed design
WR02	Cleared vegetation would be either mulched for onsite reuse or used to created habitat piles, noting that any weeds and pathogens would be managed according to requirements under the *NSW Biosecurity Act 2015*.	Construction

19. Evaluation of costs and benefits

This Chapter presents an evaluation of the Project as a whole, drawing conclusions on the overall merits of the Project.

19.1 Justification

The benefits of the Project, being the improved electricity dispatchability and storage capacity outcomes for the operation of Hume Dam HPS offered by coupling BESS with existing hydropower generation asset, are considered to outweigh any identified adverse impacts in the short and long term. While some environmental impacts cannot be avoided, in all cases they would be minimised through the design process and implementation of mitigation measures.

19.1.1 The suitability of the site

As described in Sections 3.1.2, the Project is for the purpose of electricity generation and the land is appropriately zoned for this purpose. The objectives of the RU2 zoning where the majority of the Project would be located are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base
- To maintain the rural landscape character of the land
- To provide for a range of compatible land uses, including extensive agriculture.

The Project is considered a compatible use of this land and does not conflict with ongoing operations or existing surrounding land uses as described in Chapter 10.

19.1.2 Social costs and benefits

The Project would have some localised social impacts and local and regional benefits as described in Chapter 1. Offsite social impacts would be limited to temporary increase in traffic and noise impacts during construction. Construction of the Project would not impact on access to Lake Hume or Murray River for fishing, boating or other water based activities.

The Project does introduce a new facility which would be visible from existing viewpoints associated with the Hume Dam. Visual impacts would be limited due to the distance, intermittent screening vegetation and the existing presence of similar infrastructure in the vicinity of the Project as described in Chapter 11.

The Project does not introduce land use conflicts to any surrounding land uses and would not be audible off site at any sensitive receptor locations during operation. Additional workers during construction and operation would require accommodation but this would not exceed the capacity of the local townships. Positive social impacts include the flow-on effects of those workers accessing goods and services in the region and overall increase in reliability of the National Energy Market.

19.1.3 Biophysical costs and benefits

The Project involves approximately 1.2 hectares of ground disturbance including 0.44 hectares of native vegetation clearing. Vegetation to be cleared has been classified as in poor condition and consists largely of poor quality derived native grassland. These impacts would be offset in accordance with the BC Act in accordance with any approval conditions. Water management during construction and operational would be designed to prevent water quality impacts to the Murray River and to otherwise balance pre and post development flows to prevent erosion.

19.1.4 Economic costs and benefits

The Project has an estimated capital investment value of $32 million. This would be spent on the engagement of labour, materials, project components, plant and equipment. Plant, materials and equipment would be procured locally to the extent possible noting that battery components would be imported and some specialised labour would be required. Local benefits would also include spending by additional workers required for the Project on accommodation, food and services in the local area.

More broadly, the Project facilitates the connection of dispatchable electricity and network services identified as critical to energy security within the NEM and supports the transition to a low carbon energy future.

19.1.5 Public Interest

Community and stakeholder engagement has been undertaken as described in Chapter 5. The Project represents a cost-efficient private investment in the provision of dispatchable electricity and other network services into the NEM. It would maximise the long-term social and economic benefits of the Hume Power Station while minimising the short term negative impacts on communities and the environment during construction.

The additional traffic and noise generation during construction have been found not to result in significant offsite impacts with the implementation of standard mitigation measures. While biodiversity and heritage impacts are anticipated, these would be minimised and mitigated to the extent possible. Biodiversity offsets would also be provided in accordance with the BC Act aimed at resulting in a neutral or beneficial biodiversity outcome.

As a result, the Project is considered to be in the public interest.

A response to submissions report would be prepared to address any issues raised in submissions and this report, along with submissions, is required to be considered by the relevant consent authority (being the Independent Planning Commission or the Minister for Planning and Public Spaces by delegate) in determining whether to approve the Project and, if so, on what conditions.

19.2 Consideration of the Objectives of the EP&A Act

The objectives of the EP&A Act, and how these are addressed in relation to the Project, are presented in Table 19-1 below.

Table 19-1: Consideration of Objectives of the EP&A Act

Objective	Comment
To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The Project planning, impacts, safeguards and management measures detailed in this EIS allow for the proper management, development and conservation of natural and artificial resources. The Project is aimed at providing long-term positive impacts through provision of dispatchable electricity and other network services and limited short-term environmental impacts. Some permanent impacts to visual, biodiversity and Aboriginal heritage values are required but these would be avoided to the extent possible.
To facilitate ecologically sustainable development by integrating relevant	Ecologically sustainable development is considered in Sections 19.3.1 to 19.3.4 below.

Objective	Comment
economic, environmental and social considerations in decision-making about environmental planning and assessment.	
To promote the orderly and economic use and development of land.	This objective is largely achieved through land use zoning. As described in Section 3.1.2 the Project is for the purpose of electricity generation and the land is appropriately zoned for this purpose. The site is largely cleared associated with the historic land uses and development of the Hume Dam and the Project objective is to improve the dispatchability of the run of river hydro power generation while enabling the HPS and the connected electricity grid to be more responsive to fluctuations in demand through the installation of a Battery Energy Storage System. The Project is considered a compatible use of this and does not conflict with these ongoing operations or any other proposed land uses.
To promote the delivery and maintenance of affordable housing.	Not applicable.
To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	This object is obtained via the application of the BC Act. The Project impacts have been assessed in accordance with the BC Act and planned to avoid clearing to the extent possible. Meridian are required to retire biodiversity credits as described in Section 7.5.
To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The Project has assessed the potential for impacts on built and cultural heritage. While impacts to one potential archaeological deposit is necessary, management measures have been proposed and endorsement by RAPs has been sought. No impacts to listed built heritage would result from the Project.
To promote good design and amenity of the built environment.	Design would be completed in accordance with applicable standards.
To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Design, construction and maintenance of Project components would be undertaken in accordance with applicable standards.
To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	The application has been made in accordance with relevant State and Local environmental planning instruments and has been prepared to respond to applicable environmental planning legislation.
To provide increased opportunity for community participation in environmental planning and assessment.	The Project development process involved consultation with relevant stakeholders. Consultation undertaken is outlined in Chapter 5. The EIS would be exhibited and any submissions received would be responded to and

Objective	Comment
	considered by the Consent authority in determining the development application.

19.3 Consideration of Section 4.15 of the EP&A Act

In determining an application for development consent, the consent authority must take into consideration such of the matters referred to in Section 4.15(1) of the EP&A Act as are of relevance. The factors listed in Section 4.15(1) have been considered in Table 19-2 below in order to summarise the likely impacts of proposed works on the natural and built environment.

Table 19-2: EP&A Act Section 4.15 Consideration

Matter for consideration	Consideration
The provisions of any environmental planning instrument.	Environmental planning instruments applicable to the site and project include: State Environmental Planning Policy (State and Regional Development) 2011 State Environmental Planning Policy (Infrastructure) 2007 State Environmental Planning Policy No 33 – Hazardous and Offensive Development State Environmental Planning Policy No. 55 – Remediation of Land Albury Local Environment Plan 2010 Murray Regional Environment Plan no 2 – Riverine Land The relevant provisions of applicable environmental planning instruments are considered in Chapter 3. The proposed works are considered permissible under these instruments.
The provisions of any proposed instrument.	No proposed environmental planning instruments have been identified as applying to the Project.
The provisions of any Development Control Plan.	Clause 11 of State Environmental Planning Policy (State and Regional Development) 2011 identifies that development control plans do not apply to State significant development. Nevertheless, the Albury Development Control Plan 2010 was consulted briefly and otherwise relevant provisions requiring assessment are generally aligned with the SEARs.
The provisions of any planning agreement that has been entered into under Section 7.4, or any draft planning agreement that a developer has offered to enter into under Section 7.4.	No planning agreements affecting the proposed works locations have been entered into or are proposed.
The provisions of the regulations (to the extent that they prescribe matters	Clause 92 of *Environmental Planning and Assessment Regulation 2000* identifies matters prescribed for the purposes of Section 4.15 (1) (a) (iv) of the Act, to be taken into consideration by a consent authority in determining a development application and identifies that in the case of a development

Matter for consideration	Consideration
for the purposes of this paragraph).	application for the demolition of a building, the provisions of Australian Standard AS 2601—1991*: The Demolition of Structures*, published by Standards Australia, and as in force at 1 July 1993. The Project involves the removal of a small shed in the vicinity of the Switchyard and this would be undertaken in accordance with AS2601.
The provisions of any coastal zone management plan	The Project is not within the coastal zone.
The likely impacts of the development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	Environmental and socio-economic impacts are assessed in Chapters 7 to 17.
The suitability of the site for the development	The site is appropriately zoned and no significant land use conflicts have been identified. The Project design has focused on previously cleared land that is not otherwise constrained by topography, easements, subterranean infrastructure or elevated heritage potential and within suitable proximity to the Hume Power Station.
Any submissions made in accordance with this Act or the regulations.	To be considered by DPIE following exhibition.
The public interest.	The proposed works are considered to be in the public interest as described in Section 19.1.5.

19.3.1 The Precautionary Principle

This principle states: 'if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.

The Project planning has sought to take a precautionary approach to minimising environmental impact through the avoidance of impacts. A range of environmental safeguards are proposed to address identified impacts. These safeguards would be implemented during the Project.

No safeguards have been postponed as a result of lack of scientific certainty. No threat of serious or irreversible damage is considered likely as a result of the Project.

19.3.2 Intergenerational Equity

The principle states: 'the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations'.

The Project is not considered to sterilise land to any significant extent with Project components located in previously disturbed areas to the extent possible.

The objective of the Project is to provide dispatchable electricity and other network services that allows the increased penetration of renewable electricity generation into the National Energy Market. This ultimately benefits future generations by facilitating the displacement of carbon based electricity generation.

19.3.3 Conservation of Biological Diversity and Ecological Integrity

This principle states: 'the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival'.

The Project would include securing biodiversity offsets with the objective of attaining a neutral or beneficial biodiversity outcome.

19.3.4 Improved Valuation, Pricing and Incentive Mechanisms

This principle is defined as:

Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The Project represents an estimated $32 million investment by Meridian aimed at increasing reliability of the National Energy Market through the provision of storage and other network services. The Project would be designed and implemented to achieve the most viable manner from an economic and social perspective.

19.3.5 Summary and conclusion

This EIS provides a description of the Project, existing information on environmental context and potential for environmental impacts. This EIS has been prepared addressing the SEARs issued by the NSW DPIE on 14 May 2020 and focuses on key issues of biodiversity, heritage, land, visual, noise, traffic, water hazards, socio-economic and waste impacts. Based on the findings of the EIS the Project is considered able to be approved by the consent authority. The overall Project benefits including dispatchable electricity and other network services are considered to outweigh the environmental and limited social impacts.

20. Bibliography

ABS. (2016). *Census of Population and Housing, QuickStats for SA1 1117228, Albury City LGA (LGA100050), and Rest of NSW (1RSW GSSCA)*. Retrieved from https://www.abs.gov.au/websitedbs/D3310114.nsf/Home/2016%20QuickStats

AEMO. (2018). *Integrated System Plan.* Retrieved from https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2018/integrated-system-plan-2018_final.pdf?la=en&hash=40A09040B912C8DE0298FDF4D2C02C6C

Aitken Rowe Geotechnical Engineering. (2020). *Geotechnical Inverstigation - Proposed Hume Power Station Battery Site - Stage 1, Murray Street, Lake Hume Village, NSW, NSW 2640.*

Albury City. (2014). *Bush Fire Prone Land Map*. Retrieved from https://eservice.alburycity.nsw.gov.au/ACCPublicDocs/DocumentViewer.aspx?DocID=661126

Albury City. (2020). *Wastewater*. Retrieved from https://www.alburycity.nsw.gov.au/services/water-and-sewer/wastewater

Andrews, A. (1920). *The first settlement of the Upper Murray 1835-45.* Sydney: D.S. Ford.

ANZECC & ARMCANZ. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra: Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand. Retrieved from https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments.* Canberra. Retrieved from www.waterquality.gov.au/anz-guidelines

Australia ICOMOS. (2000). *The Burra Charter: The Australia ICOMOS charter for places of cultural significance 1999.* Burwood, Victoria: Australia ICOMOS Inc.

Austroads. (2009). *Guide to Traffic Management: Traffic Studies and Analysis (Part 3).*

British Standards Group. (1993). *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration.*

British Standards Group. (2008). *British Standard 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting .*

DEC. (2006). *Assessing Vibration: A technical guideline.* Retrieved from https://www.environment.nsw.gov.au/resources/noise/vibrationguide0643.pdf

DECC. (2008). *Managing Urban Stormwater–Soils and Construction Volume 2D.* Retrieved from https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-2d-main-road-construction

DECC. (2009). *Interim Construction Noise Guideline.* Retrieved from https://www.environment.nsw.gov.au/resources/noise/09265cng.pdf

DECCW. (2010). *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.* Retrieved from https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Aboriginal-cultural-heritage/aboriginal-cultural-heritage-consultation-requirements-for-proponents-2010-090781.pdf

DELWP. (2015). *Victoria's renewable energy roadmap.* Retrieved from https://www.energy.vic.gov.au/__data/assets/pdf_file/0026/57914/Victorias-Renewable-Energy-Roadmap.PDF

DELWP. (2020). *Victoria's renewable energy targets*. Retrieved from https://www.energy.vic.gov.au/renewable-energy/victorias-renewable-energy-targets

Department of Planning. (2011). *The Hazardous and Offensive Development Application Guidelines - Applying SEPP 33* .

Department of Planning, Industry and Environment. (2019). *NSW Murray and Lower Darling Surface Water Resource Plan 2012* .

Department of Primary Industries. (2011). *Land Use Conflict Risk Assessment Guide.*

Destination NSW. (2016). *Albury Local Government Area Tourist Accommodation Profile.* Retrieved from https://www.destinationnsw.com.au/wp-content/uploads/2017/02/Albury.pdf

DPE. (2017). *Social impact assessment guideline for State significant mining, petroleum production, and extractive industry development.* Retrieved from https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/social-impact-assessment-guideline-2017-09.ashx

DPIE. (2020, April). *eSPADE*. Retrieved from https://www.environment.nsw.gov.au/eSpade2Webapp

ENA. (2016). *EMF Management Handbook.* Retrieved from https://www.energynetworks.com.au/resources/fact-sheets/emf-management-handbook/

EPA. (2017). *Noise Policy for Industry.* Retrieved from https://www.epa.nsw.gov.au/publications/noise/17p0524-noise-policy-for-industry

Goulburn-Murray Water. (2015). *Lake Hume Land and On-water Management Plan.*

ICNIRP. (2010). *ICNIRP Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.* Retrieved from https://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf

Jacobs. (2020a). *Hume Battery Energy Storage System Project Scoping Report.*

Jacobs. (2020b). *Hume Battery Energy Storage System Biodiversity Development Assessment Report.*

Jacobs. (2020c). *Hume Battery Energy Storage System Aboriginal Cultural Heritage Assessment Report.*

Jacobs. (2020d). *Hume Battery Energy Storage System Statement of Heritage Impact.*

Jacobs. (2020e). *Hume Battery Energy Storage System Noise and Vibration Impact Assessment Report.*

Jacobs. (2020f). *Hume Battery Energy Storage System Traffic and Transport Impact Assessment Report.*

Jacobs. (2020g). *Hume Battery Energy Storage System Visual Impact Assessment.*

Landcom. (2004). *Managing Urban Stormwater: Soils and construction.* Retrieved from https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-1-4th-editon

Local Land Services. (2019). *Travelling Stock Reserves State-wide Plan of Management.*

Meridian Energy. (2019). *Climate Risk Disclosures Meridian Energy Limited FY19.* Retrieved from https://www.meridianenergy.co.nz/assets/Sustainability/e93f942ead/Meridian-Climate-Disclosures-TCFD-Report-FY19.pdf

Mulvaney, D., & Kamminga, J. (1999). *Prehistory of Australia.* St Leonards: Allen & Unwin.

Murray Darling Basin Authority. (2018, July 6). *Hume Dam*. Retrieved from https://www.mdba.gov.au/river-information/running-river-murray/hume-dam

National Heritage Consultants. (2007). *Lake Hume Aboriginal Heritage Study.*

NSW Chief Scientist & Engineer. (2017). *Final report form the Energy Security Taskforce.* Retrieved from https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0019/136711/171219-MASTER-NSW-Energy-Security-Taskforce-report-FINAL-SIGNED.pdf

NSW Environment Protection Authority. (2014). *Waste Classification Guidelines.*

Office of Environment and Heritage. (2012). *The land and soil capability assessment scheme: A general rural land evaluation system for NSW.* Office of Environment and Heritage.

Office of Environment and Heritage. (2016). *Climate Change Policy Framework.* Retrieved from https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/nsw-climate-change-policy-framework-160618.pdf

Office of Environment and Heritage. (2020). *NSW BioNet Atlas*. Retrieved from http://www.bionet.nsw.gov.au/

Roads and Maritime. (2016a). *Construction Noise and Vibration Guideline.* Retrieved from https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/guides-manuals/construction-noise-and-vibration-guideline.pdf

Roads and Maritime. (2016b). *Riverina Highway (HW20) Stage 2 Safety Improvement Work Review of Environmental Factors.* Retrieved from https://www.rms.nsw.gov.au/projects/01documents/riverina-highway/riverina-hwy-stage-2-ref-0616.pdf

Roads and Maritime. (2018). *Guideline for Landscape Character and Visual Impact Assessment.* Retrieved from https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/centre-for-urban-design/guideline-landscape-character-and-visual-impact.pdf

Tourism Research Australia. (2019). *Local Government Area Profiles 2018*. Retrieved from https://www.tra.gov.au/regional/local-government-area-profiles/local-government-area-profiles

Urbis. (2013). *Conservation Management Plan - Hume Dam (unpublished).*

Vigilante, T., & Bowman, D. (2004). Effects of individual fire events on the flower production of fruit-bearing tree species, with reference to Aboriginal people's management and use, at Kalumburu, North Kimberley, Australia. *Australian Journal of Botany*, 405-415.