Dubbo Firming Power Station

SQUADRON ENERGY

Environmental Impact Statement

24 July 2023

Final

Revision Control

Revision	Date	Issue	Author	Reviewed	Approved	Signature
0	29/06/23	Draft	Tim Vesey, Ian Spence and Jade Rowarth	REAP Review: Gainsford Environmental	Jeff Allen, Squadron Energy	
1	11/07/23	Final Draft	Tim Vesey, Ian Spence and Jade Rowarth	REAP Review: Gainsford Environmental	Jeff Allen, Squadron Energy	
2	24/07/23	Final/Issued	Tim Vesey, Ian Spence and Jade Rowarth	REAP Review: Gainsford Environmental	Jeff Allen, Squadron Energy	

Confidentiality

Disclaimer

Project details	
Project name	**DUBBO FIRMING POWER STATION**
Application number	**SSD 28088034**
Address of the land in respect of which the development application is made	**28L YARRANDALE ROAD DUBBO, NSW (LOT 13 OF DP812799)**

Applicant details	
Applicant name	**DUBBO FIRMING NOMINEES PTY LTD ABN 24 660 017 854**
Applicant address	**SUITE 1.01, 17 MOORE STREET CANBERRA ACT 2601**

Details of person by whom this EIS was prepared	
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Declaration by registered environmental assessment practitioner	
Name	**FIONA GAINSFORD**
Registration number	**80002**
Organisation registered with	**CERTIFIED ENVIRONMENTAL PRACTITIONER PROGRAM (CEnvP)**

Declaration

The undersigned declares that this EIS:

- has been prepared in accordance with the Environmental Planning and Assessment Regulation 2021;
- contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates;
- does not contain information that is false or misleading;
- addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project;
- identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments;
- has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement;
- contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development;
- contains a consolidated description of the project in a single chapter of the EIS;
- contains an accurate summary of the findings of any community engagement; and
- contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.

Signature	Fiona Gainsford Digitally signed by Fiona Gainsford DN: cn=Fiona Gainsford, o, ou, email=fiona@gainsford.com.au, c=AU Date: 2023.07.11 18:09:55 +10'00'
Date	11 July 2023

Executive Summary

A Project Overview

Dubbo Firming Nominees Pty Ltd is a wholly owned subsidiary of Squadron Energy which is part of the Tattarang group of companies. Dubbo Firming Nominees was formerly part of CWP Renewables (CWPR). CWPR was acquired by Squadron Energy in late 2022 and all CWPR development and operational projects have continued as normal under the Squadron Energy brand. Squadron Energy is an Australian owned renewable energy company dedicated to accelerating the decarbonisation of Australia's economy. Squadron Energy employs around 160 people, and contracts many more for the construction and operation of its projects.

Squadron Energy has over 2 GW of renewable energy projects in construction and operations, including Crudine Ridge Wind Farm near Mudgee and has about 20 GW of renewable, storage and firming projects in the development pipeline, including the Project and Uungula Wind Farm near Wellington, which is due to start construction in 2023 and will create more than 260 jobs.

This Project is an integral part of the Squadron Energy vision as it supports Australia's energy transition and seeks to "firm" green power purchase agreement capabilities to satisfy changing customer needs.

The Proponent now seeks approval for the development of a dual fuel firming power station in Dubbo, New South Wales. The Project will operate as a "firming" generation facility supplying electricity at short notice with a capacity of up to 64MW and will firm up supply when the sun is not shining, and the wind is not blowing to guarantee that energy supply can be maintained irrespective of weather. The dual fuel power station will be capable of operating on biofuel and natural gas with hydrogen blends in the short to medium term with a view to transitioning to 100% hydrogen and biofuel systems. The Project will produce hydrogen when there is excess electricity in the grid.

The Project will connect into the existing 66KV substation at Yarrandale Road operated by Essential Energy and the existing Central West Pipeline operated by APA for gas supply.

The Project anticipates operating at a capacity factor of about 12% in any given year.

The Project has an anticipated capital cost of $190 million and is expected to be operational in the second half of 2025.

B Project Justification

Australia is targeting 80% renewable electricity generation by 2030, which will see an increase in the number of wind and solar farm projects. However, wind and solar can only power Australia when the sun shines and the wind blows. Firming is the term used for supporting energy supply provided by projects such as pumped hydro, battery storage, and gas for peak loads.

Firming projects supply dispatchable energy that can be activated quickly and effectively for a committed period to top up supply when the sun is not shining, the wind is not blowing, if there is a sudden surge in demand, or significant increase in maintenance outages.

The Project would support the electricity market:

- to provide consistent and constant energy supply to customers without interruption
- to promote increased renewable energy penetration in the market
- to optimise system constraints
- to match customer energy needs more appropriately; and

- to minimise costs.

Batteries are quick to build, but they currently only provide firming for up to around 4 hours. Pumped hydro provides longer duration but must be close to water and typically has significant lead times for approvals and construction. A hydrogen and biofuel capable power station like Dubbo Firming Power Station can bridge the gap. It has no finite duration, can be turned on and off very quickly and can support renewables on an intermittent basis.

The Australian Energy Market Operator has forecast that by 2050, the Australian energy market will need to firm renewable generation without relying on coal. Dubbo Firming Power Station might only be needed around 5 to 12 per cent of the time but providing a peak firming service is critical to keeping the lights on as coal stations continue to retire in the coming years.

C Location and Existing Environment

The Project site was selected as the preferred site for the Project due to its strategic location within the Central West Orana REZ. The dual fuel power station will provide firming services to the intermittent renewable energy developments and connections in the REZ whilst the hydrogen electrolysis plant can use cheap renewable electricity to produce, store and blend hydrogen into the gas mix. The city of Dubbo and industrial energy users in the area also provide for a source of localised demand for electricity.

The Project site is within the heavy industry zone and the intended land use as a firming power station is consistent with surrounding land use.

In addition to the Project's location within the REZ, the selected site also provides key infrastructure requirements for dual fuel power generation and hydrogen facilities, including:

- Proximity to existing gas transmission pipelines and facilities
- Proximity to the existing high voltage electricity transmission network and demand centre
- Proximity to industrial energy users
- Capacity of the electricity transmission network to accommodate the nominated generation at the proposed power station
- Availability of suitably zoned land with compatible existing land use
- Access to major roads and highways in proximity for the delivery of heavy vehicle loads and ongoing transport and deliveries to/from the Project
- Availability of skilled construction and operations workforce
- Proximity to Dubbo for operational maintenance, contractors, and suppliers
- Availability of water for industrial use.

The Project has been deliberately located on land that has been cleared historically for agricultural purposes and more recently, industrial purposes. The land surrounding the Project site is predominantly cleared for agricultural production with some infrastructure such as buildings and roads.

The Project site is ideally suited for the Project.

D Statutory Context

Under the *State Environmental Planning Policy (Planning Systems)* 2021, electricity generating works that have a capital investment value of more than $30 million are classified as State Significant Development and require approval under Part 4 of the EP&A Act through the preparation of an EIS.

The Project, as an energy generating facility with a capital investment value of approximately $190 million, satisfies the criteria for SSD under Division 4.7 of the EP&A Act and section 2.6(1) and paragraph 20(a) of Schedule 1 of the Planning Systems SEPP.

The EIS has been prepared to address the SEARs issued by DPE on 21 November 2022. The EIS focuses on the key issues of biodiversity, cultural heritage, hazards and risks, land and water, air quality, noise and vibration, transport, visual, socio-economic and waste impacts.

The EIS has not identified any significant potential impacts which would preclude the Minister from approving the development application for the Project.

E Biophysical Costs and Benefits

The Project site has been strategically selected due to its historical disturbance and clearing of vegetation. As a result, the Project would involve the clearing of only approximately 0.12 hectares of derived native grassland, 1.02 hectares of regenerating vegetation and the loss of three scattered trees. Of which only 0.12 hectares and

the three scattered trees would require biodiversity credits. The impact to this native vegetation would be offset in accordance with the BC Act.

No significant impacts on threatened flora or fauna species are anticipated.

The operation of the Project would generate primary pollutants from the exhaust emissions of Nitrogen dioxide (NO_2), Carbon monoxide (CO), and dust ($PM_{2.5}$). Whilst there is no significant risk of air quality impacts due to CO emissions from the Project when operating at maximum load whether fuelled by natural gas or biofuels and the contribution of $PM_{2.5}$ would be very small, the Project may require the application of emissions control technology to ensure that the NO_2 emissions can be managed in accordance with the Clean Air Regulation in the highly unlikely scenario of 100% load capacity (the Project anticipates operating at up to 12% utilisation only).

F Social and Cultural Impacts and Benefits

Infrastructure projects have the potential to generate social impacts if land occupation, land severance, or changes to amenity associated with the project affect social activity. Infrastructure projects may also change the social profile of a community and generate further impacts. The potential social impacts associated with the Project were assessed and it was found that only minor social impacts, both positive and negative, would result from the construction and operation of the Project.

The Project would generate up to approximately 150 full time jobs during the construction phase and about 6 permanent jobs during operation. The Project is also likely to indirectly support generation of employment in local, regional and national businesses and industries from increased economic activity and spending at businesses providing goods and services to support construction and operational activities.

Without experience installing electrolysers and managing renewable electricity generation in concert with hydrogen production, Australia is unlikely to have the scale and experience necessary to support a hydrogen industry. The Project would increase the capability of the local workforce to construct and operate a large-scale plant and to increase skills relevant to renewable energy technologies. The Project would leverage from the region's existing/developing expertise operating renewable energy infrastructure and make the Central West Orana REZ a unique place to train workers.

The creation of employment opportunities from the Project also has the potential to support improved social and economic outcomes for individuals through increased incomes and skills development in a nascent and emerging area.

The Project is expected to contribute to making the energy network more resilient to blackout events.

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. Construction vehicle movements generated by the Project are not expected to impact on the operation of the road network or its level of service. Traffic levels generated by the Project's operation would generally be limited to on-site staff and scheduled maintenance and delivery of consumables activities.

Construction activities for the Project are not expected to result in significant construction noise, dust or lighting impacts for nearby communities, with the nearest dwellings generally located more than one kilometre from the Project site. Potential impacts on community values in the operation phase would relate to visual, air and noise impacts from the presence and operation of the Project infrastructure. Potential visibility of the Project would not pose a significant adverse visual impact to potential receptors as the Project would be generally sympathetic to the existing development within the surrounding landscape in terms of scale and nature and would not be a dominant feature in the landscape or alter the landscape character (see Chapter 14 Visual Amenity). Operational emissions to air and noise from the Project would be managed within limits prescribed by the NSW EPA and subject to detailed assessments. Operation of the Project would be managed using attenuation measures for air quality and noise within the Project design (see Chapter 12 Noise and Vibration and Chapter 11 Air Quality).

It is likely that some short-term visitor accommodation or rental housing would be needed to accommodate workers from outside of the study area and surrounding region (for example, those required for speciality tasks). This accommodation is likely to be sourced from towns near the Project such as Dubbo, although some workers may choose to stay further away. Any

impacts associated with increased demand for tourist accommodation are expected to be managed using a variety of accommodation types and locations where workers are accommodated. It is possible that some construction workers may choose to rent within the social locality for the duration of the works. This has the potential to increase pressure on rental prices, particularly in the context of existing low rental vacancy rates within the social locality. Increases in rental costs may affect the availability of affordable rental housing and rental affordability for some groups on low or fixed incomes (e.g., unemployed, elderly, students), contributing to rental housing stress for some households or resulting in some households having to move to more affordable accommodation elsewhere. However, any such impacts from increased demand for rental accommodation are likely to be low given demand for rental accommodation near the social locality by workers is expected to be minimal.

An Aboriginal Cultural Heritage Assessment was undertaken in consultation with local Registered Aboriginal parties include an infield site survey. The main potential impact to Aboriginal cultural heritage is the disturbance of previously registered Aboriginal places during the construction phase, which has the potential to result in a loss of heritage value. The necessary processes to manage harm to identified Aboriginal places will be included within the Heritage Management Plan.

The Project would not result in any impacts on known items or places of historical cultural heritage significance.

G Hazards and Risks

A preliminary hazard assessment considered the operating hazards and risks of the Project. A Bushfire Risk Assessment and Plume Rise Assessment were also undertaken to assess the hazards associated with bushfire prone land and aviation hazard.

The risks from the proposed Project comply with all quantitative and qualitative land use safety risk criteria in HIPAP No.4. In addition to flammable gas fire and explosion, the preliminary hazard analysis considered and assessed a broad range of credible major hazard events, operational hazards and environmental impacts.

No unusual risks were identified that cannot be mitigated through the application of good industry practice, safety in design processes and operating practices.

The aviation risk assessment identified a potential hazard associated with plume velocity from the Project's power generation exhaust stacks given the Project's proximity to the Dubbo Regional Airport. The assessment concluded that the Project would not be hazardous to local aviation subject to the installation and operation of a low industry steady red obstacle light on the central stack.

A bushfire risk assessment was undertaken, and the assessment concluded that the Project would comply with the aim and objectives of the *Planning for Bush Fire Protection* (NSWRFS 2019) with certain limited controls being implemented.

H Summary and Conclusion

The EIS provides a description of the Project, an explanation of the need for the Project, information on the existing environment, the potential for environmental impacts and recommended mitigation measures. The EIS has been prepared to address the SEARs issued by the NSW DPE and focuses on key issues.

The overall benefits of the Project, including the provision of "firming" power, contributing to a resilient electricity network and to support the transition to renewable energy, are considered to outweigh the limited environmental and social impacts identified.

Contents

Figures

Tables

Glossary of terms and abbreviations

In this EIS, unless otherwise defined, capitalised words and phrases have the meaning given to them below.

Term	Definition
ABS	Australian Bureau of Statistics
ACHA	Aboriginal cultural heritage assessment
AEC	Area of environmental concern
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ALARP	As low as reasonably practicable
APA	APT Pipelines (NSW) Pty Limited
APZ	Asset Protection Zone
ARI	Average recurrence interval
ASC	Australian Soil Classification
ASS	Acid Sulphate Soils
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
Bioethanol	A renewable fuel mainly produced by yeast fermentation from different feedstocks.
Biofuel	Any fuel that is derived from biomass—that is, plant or algae material or animal waste.
BPL	Bushfire-prone land
Capacity Factor	The proportion of actual energy generated per year (expressed as MWh) compared with the total energy that could have been produced if operating at full load for every hour of the year (express as MWh).
CASA	Civil Aviation Safety Authority
CCTV	Closed-circuit television
CEMP	Construction Environmental Management Plan
CEMS	Continuous Emission Monitoring Systems
CH_4	Methane
Clean Air Regulation	*Protection of Environment Operations (Clean Air) Regulation 2022*
CO	Carbon monoxide
CO_2	Carbon dioxide
COPC	Concentrations of Contamination of Potential Concern
CRP	Central Ranges Pipeline
CTMP	Construction Traffic Management Plan

Term	Definition
CWO	Central West Orana
CWPL	Central West Pipeline
DAWE	Former Commonwealth Department of Agriculture, Water and the Environment
dB(A)	Decibel; A-weighted, approximates the sensitivity of the human ear
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
Development Application	A development application pursuant to the EP&A Act.
DGVs	Default guideline values
DLE	Dry Low Emission
DP	Deposited Plan
DPE	NSW Department of Planning and Environment
EIS	Environmental Impact Statement under the EP&A Act
EMF	Electric and magnetic fields
EOH	Equivalent operating hours
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPA	Environment Protection Authority (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation* 2021
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
EPI	Environmental Planning Instruments
ESB	Energy Security Board
ESCP	Erosion and sediment control plan
ESOO	An Electricity Statement of Opportunities
EfW Regulation	*The Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022*
FDR	Fire danger ratings
FFDI	Forest fire danger index
FIE	Fletchers International Exports Pty Ltd
FTE	Full time equivalent
GDE	Groundwater Dependent Ecosystems
GHG	Greenhouse gas
GIS	Geographic Information System
GJ	Gigajoules
GLC	Ground level concentrations
GPS	Global Positioning System
ha	Hectares
HGLS	Hydrogeological Landscape Systems
HIPAP No 4	Hazardous Industry Planning Advisory Paper No. 4 (Risk Criteria for Land Use Safety Planning)

Term	Definition
HIPAP No 6	Hazardous Industry Planning Advisory Paper No. 6 (Hazard Analysis)
Hz	Hertz
ICNG	Interim Construction Noise Guideline
IHS	Inner Horizontal Surface
ISP	Integrated System Plan
kV	kilovolt
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
LLS	Local Land Services
ML	Megalitre
MNES	Matters of National Environmental Significance
MPa	Megapascals
MW	Megawatt
N_2O	Nitrous oxide
NCAs	Noise Catchment Areas
NEM	National Electricity Market
NER	National Electricity Rules
NGER Act	*National Greenhouse and Energy Reporting Act 2007* (Cth)
NH_3	Ammonia
NHL	National Heritage List
NHVR	National Heavy Vehicle Regulator
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NSW	New South Wales
O_3	Ozone
OCGT	Open Cycle Gas Turbine
OCP	Organochlorine pesticides
OEMP	Operational Environment Management Plan
OLM	Ozone Limiting Method
OLS	Obstacle Limitation Surface
Option 2A Pipeline	The alternate (not preferred) storage pipeline area which included an approximately 2.5 km linear pipeline corridor to the east of the Project site which was offset from the alignment of the existing CRP.
OPP	Organophosphorus pesticides
OSOM	Oversize overmass (heavy vehicle transport)
PAH	Polycyclic Aromatic Hydrocarbons
Participation Rate	For any group, the labour force expressed as a percentage of the civilian population aged 15 years and over in the same group.

Term	Definition
PBP	*Planning for Bushfire Protection 2019 (NSW RFS)*
PCB	Polychlorinated Biphenyls
PCT	Plant Community Types
PFAS	Per- and polyfluoroalkyl substances
PHA	Preliminary hazard analysis
Pipelines Act	*Pipelines Act 1967* (NSW)
Planning System SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
PM_{10}	Airborne particulate matter 10 micrometres or less in diameter
$PM_{2.5}$	Airborne fine particles 2.5 micrometres or less in diameter
PMF	Probable Maximum Flood
PMST	Protected Matters Search Tool
POEO Act	*Protection of the Environment Operations Act* 1997
ppm	Parts per million
Project	Dubbo Firming Power Station
Proponent	Dubbo Firming Nominees Pty Ltd ABN 24 660 017 854 as trustee for the Dubbo Firming Trust ABN 99 782 343 862 of 171-173 Mounts Bay Road Perth Western Australia 6000
RAPs	Registered Aboriginal Parties
RBL	Rating Background Level
REZ	Renewable energy zone
RFS	Rural Fire Service
RNP	Road Noise Policy
RQOs	River Quality Objectives
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SO_2	Sulphur dioxide
SSD	State Significant Development
SU	Survey Unit
SWMP	Soil and Water Management Plan
TAPM	The Air Pollution Model
TEC	Threatened Ecological Communities
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
VI	Vegetation Integrity
WM Act	*Water Management Act* 2000
WQOs	Water Quality Objectives
WSP	Water Sharing Plan
ZVI	Zones of visual impact

1 INTRODUCTION

This Environmental Impact Statement (**EIS**) has been prepared on behalf of Dubbo Firming Nominees Pty Ltd (**Proponent**) to support a Development Application to build and operate a firming power station, approximately 4 kms from the Dubbo town centre, in the industrial zone of North Dubbo, New South Wales (**NSW**) within the Dubbo Regional Council Local Government Area and the Central West Orana Renewable Energy Zone (**REZ**), known as the Dubbo Firming Power Station project (**Project**).

Figure 1.1 sets out the location of the Project in the broader Dubbo region and Figure 1.2 sets out the Project's location in the industrial zone of North Dubbo.

The Project has a capital investment value of more than $190 million and is to be assessed as State Significant Development (**SSD**).

The EIS has been prepared under Part 4 of the EP&A Act in accordance with the Secretary's Environmental Assessment Requirements (**SEARs**) dated 21 November 2022 and the requirements of Part 8 of the *Environmental Planning and Assessment Regulation* 2021 (**EP&A Regulation**).

1.1 Project Overview

The Proponent proposes to develop a firming power station in Dubbo, NSW. The Proponent is seeking approval from the NSW Minister for Planning under the EP&A Act for the Project.

The Project will operate as a "firming" generation facility supplying electricity at short notice and will firm up supply when the sun is not shining, and the wind is not blowing to guarantee that energy supply can be maintained irrespective of weather conditions. The power station will be capable of operating on biofuel and natural gas with hydrogen blends in the short to medium term with a view to transitioning to 100% hydrogen and biofuel systems.

The EIS has been prepared based on hydrogen blends of up to 25% in line with the technology currently available.

The key aspects of the Project include:

- A new power generation facility with a nominal capacity of about 64MW comprising dual fuel turbine generator(s) capable of operating with gas/hydrogen blends or biofuels and all associated facilities
- A hydrogen generation facility with a nominal capacity of up to 20MW, along with hydrogen compression, storage, handling and blending facilities
- A new high pressure gas pipeline connection between the Project site and the boundary of the Central West Pipeline (CWPL) Dubbo Scraper Station (located to the south of the Project site)
- A new high pressure gas pipeline located within the Project site to be used for balancing storage and supplying feedstock during periods of operation; and
- A new 66kV electricity transmission line connection from the Project site to the boundary of the existing 66kV Yarrandale Substation on the opposite side of Yarrandale Road.

A detailed description of the Project is set out in Chapter 2.

Figure 1.1 – Project Location

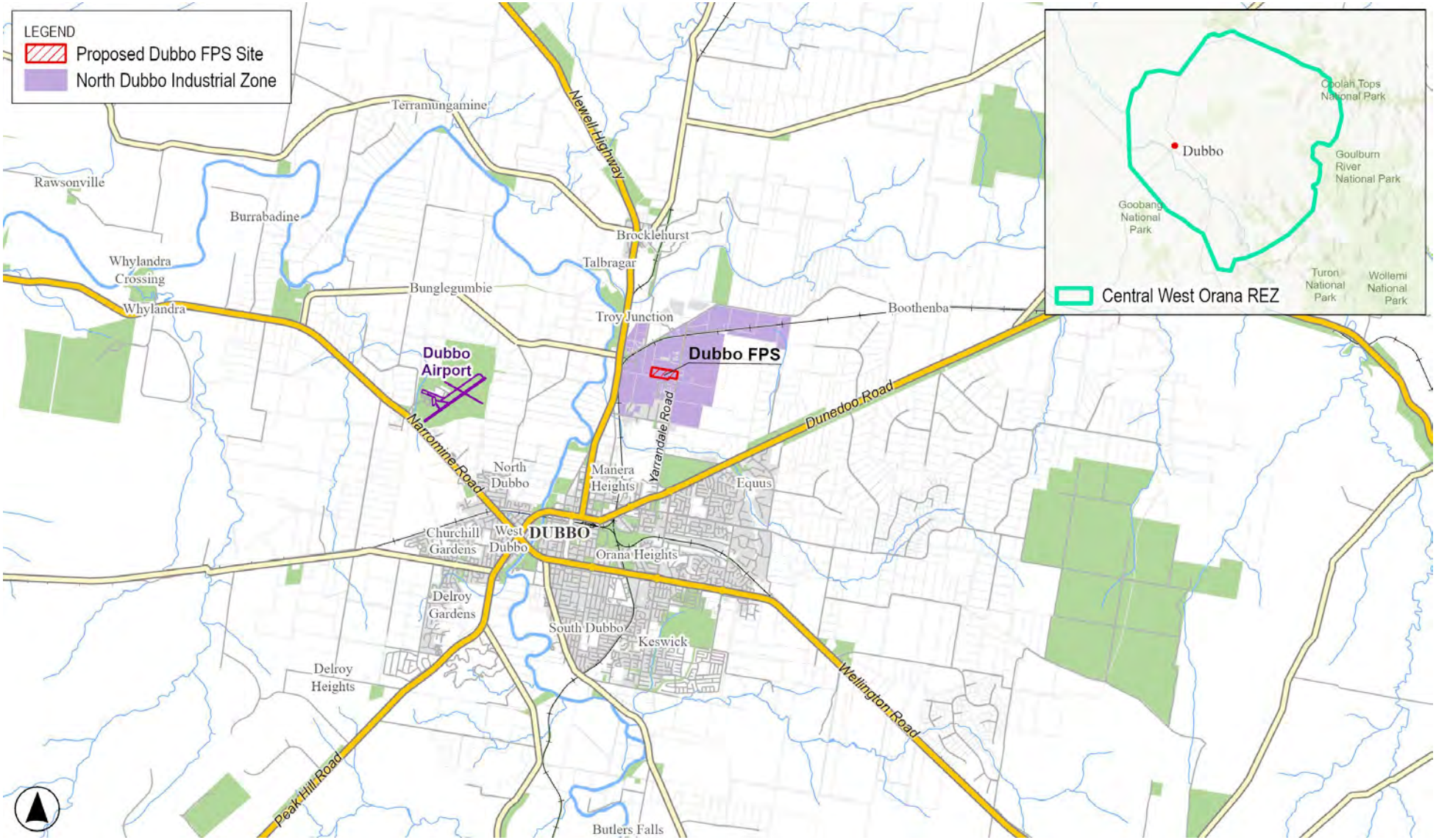
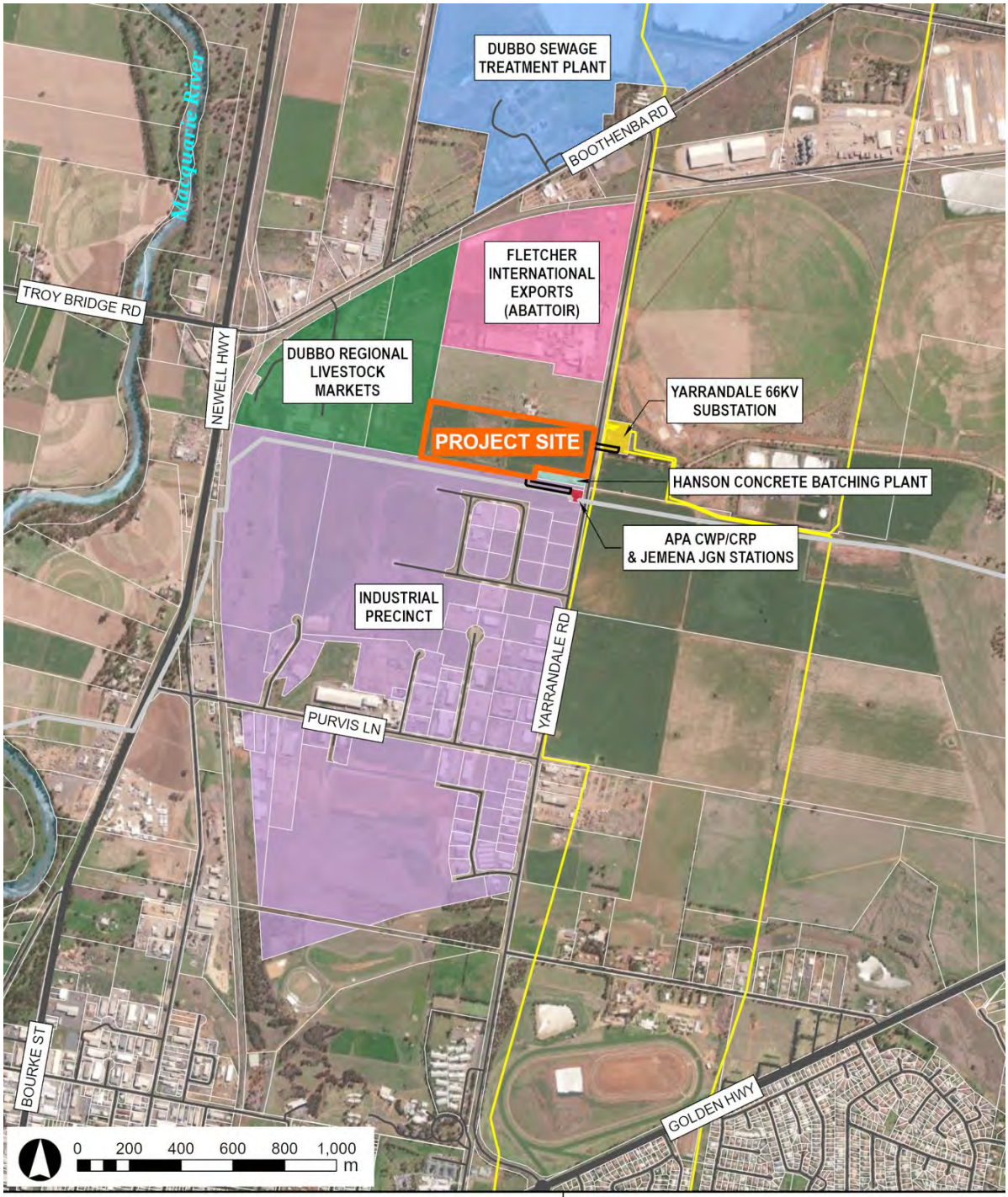


Figure 1.2 – Project Locality



1.2 The Proponent

The Proponent is a wholly owned subsidiary of Squadron Energy which is part of the Tattarang group of companies. The Proponent was formerly part of CWP Renewables (CWPR). CWPR was acquired by Squadron Energy in late 2022 and all CWPR development and operational projects have continued as normal under the Squadron Energy brand. Squadron Energy is an Australian owned renewable energy company dedicated to accelerating the decarbonisation of Australia's economy.

Squadron Energy employs around 160 people, and contracts many more for the construction and operation of its projects.

With proven experience and expertise across the project lifecycle, Squadron Energy works with local communities and customers to lead the transition to Australia's clean energy future. Many of the attributes that have driven Squadron Energy's success in the wind and solar energy spaces are transferrable to firming projects like the Project, most notably Squadron Energy's commitment to staying with a project from inception through to full operation. This philosophy ensures genuine levels of engagement from the team with all stakeholders but particularly the local community at every stage of the development.

Squadron Energy has 2GW of renewable energy projects in construction and operation, including Crudine Ridge Wind Farm near Mudgee and has approximately 20 GW of renewable, storage and firming projects in the development pipeline, including the Project and Uungula Wind Farm near Wellington, which is due to start construction in 2023 and will create more than 260 jobs.

The Project is an integral part of Squadron Energy's vision as it supports Australia's energy transition and seeks to "firm" green power purchase agreement capabilities to satisfy changing customer needs.

Squadron Energy recognises that being able to sell renewable generation in the forward contract market by firming it with dispatchable generation is the critical next step as the Australian energy market transitions. Having recognised this, the Project forms part of a wider strategy which encompasses future firming power stations and batteries in Renewable Energy Zones across NSW, including co-location with other projects which are strategically located to take advantage of the existing and proposed critical infrastructure available to support firming projects.

1.3 Project History and Need

As the energy market experiences a rapid increase in renewable energy generators and prepares for the retirement of large thermal power stations particularly coal fired power stations such as Liddell and Eraring in NSW over the next decade, there is an increasing need for dispatchable electricity generation to support and stabilise the NEM. The Project would act as a source of dispatchable firming power. The Project will contribute capital investment, generate jobs during the construction and operational phases, enable workforce upskilling in hydrogen generation, provide indirect benefits to local services throughout the life of the Project and deliver additional income to associated landowners.

The Project is a greenfield development that commenced engagement with local landowners and stakeholders from its inception in late 2020.

A detailed discussion of the strategic context of the Project is provided in Chapter 3 of the EIS.

1.4 Site Selection

Dubbo was selected as the preferred site for the Project due to its strategic location within the Central West Orana REZ. The power generation facility will provide firming services to the intermittent renewable energy developments and connections in the REZ whilst the hydrogen generation facility can utilise cheap renewable power to produce, store and blend hydrogen into the gas mix. The city of Dubbo and industrial energy users in the area also provide for a source of localised demand for reliable electricity.

In addition to Dubbo's location within the REZ, it also provides key infrastructure requirements for power generation and hydrogen facilities, including:

- Proximity to existing gas transmission pipelines and facilities
- Proximity to the existing high voltage electricity transmission network and demand centre
- Proximity to industrial energy users
- Capacity of the electricity transmission network to accommodate the nominated generation at the proposed power station
- Availability of suitably zoned land with compatible existing land use
- Access to major roads and highways in proximity for the delivery of heavy vehicle loads and ongoing transport and deliveries to/from the Project
- Availability of skilled construction and operations workforce
- Proximity to Dubbo for operational maintenance, contractors, and suppliers
- Availability of water for industrial use.

1.5 Purpose and Structure of the EIS

The EIS has been prepared to assess the potential impacts that may be raised from the design, construction and operation of the Project in accordance with the SEARs under Part 4 of the EP&A Act.

An overview of the structure of the EIS is provided below in Table 1.1.

Table 1.1 – Summary of EIS

Ch No.	Chapter Title	Content
	Executive Summary	Summarises the Project and the key findings of the EIS.
1	Introduction	Provides an overview of the Project, details the Proponent and outlines the purpose and structure of the EIS. It lists the SEARS and references to where in the EIS each requirement is addressed.
2	Project Description	A detailed description of the Project and the main design features and technology alternatives. Details the site selection and layout.
3	Strategic Context	Outlines the strategic context of the Project and the key factors determining the project need.
4	Statutory Context	Describes the applicable environmental legislation and policy and defines the pathway through which approval for the Project is sought.
5	Stakeholder Consultation	Describes the consultation conducted during development of the EIS.
6	Environmental Impacts	Introduces the key chapters of the EIS that summarise and present the findings of the technical impact assessment studies conducted for the Project.
7 - 16	Impact Assessment	Assessment of environmental impacts associated with the Project across the relevant aspects of the environment and where appropriate, provides management measures to avoid or minimise impact. These chapters include: • Biodiversity • Aboriginal Cultural Heritage and Non-Aboriginal Cultural Heritage • Noise and Vibration • Hazards and Risks • Land and Water • Visual

Ch No.	Chapter Title	Content
		• Air quality and greenhouse gases • Transport • Socio-economic impacts • Waste
17	Project Justification	A review of the Project against the principles of Ecologically Sustainable Development and the objects of the EP&A Act.
18	Summary of Mitigation Measures	A summary of the mitigation measures recommended in the impact assessments.
	Glossary of terms and abbreviations	
	References	
	Appendices	

1.6 Secretary's Environmental Assessment Requirements

The EIS has been prepared to address the matters identified in the SEARs dated 21 November 2022 which are attached in Appendix A.1.

A summary of where each of the SEARs is addressed in the EIS is provided in Appendix A.2.

1.7 Environmental Planning and Assessment Regulation 2021

Part 8 of the EP&A Regulation stipulates the general form and content requirements for an EIS. Table 1.2 identifies how this EIS addresses these form and content requirements.

Table 1.2 – Form and content Requirements

Requirement	Where addressed in the EIS
An EIS must contain the following information:	
a) the name, address and professional qualifications of the person by whom the statement is prepared.	EIS Certification Page (Statement of Validity)
b) the name and address of the responsible person	EIS Certification Page (Statement of Validity)
c) the address of the land:	28L Yarrandale Road Dubbo NSW 2830
i. in respect of which the development application is made, or	EIS Certification Page (Statement of Validity)
ii. on which the activity or infrastructure to which the statement relates is to be carried out	EIS Certification Page (Statement of Validity)
d) a description of the development, activity or infrastructure to which the statement relates	EIS Chapter 2

Requirement	Where addressed in the EIS
An EIS must also include each of the following:	
a) a summary of the environmental impact statement	Executive summary
b) a statement of objectives of the development, activity or infrastructure	EIS Chapter 3
c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure.	EIS Chapter 3
d) an analysis of the development, activity or infrastructure including:	
i. a full description of the development, activity or infrastructure	EIS 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 that are likely to be significantly affected	EIS Chapters 7 - 16
iii. the likely impact on the environment of the development, activity or infrastructure	EIS Chapters 7 - 16
iv. a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment and	EIS 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.	EIS Chapter 4
e) a compilation (in a single section of the environment impact statement) of the measures referred to in item (d)(iv)	EIS 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).	EIS Chapters 3and 17

2 PROJECT DESCRIPTION

2.1 Project Summary

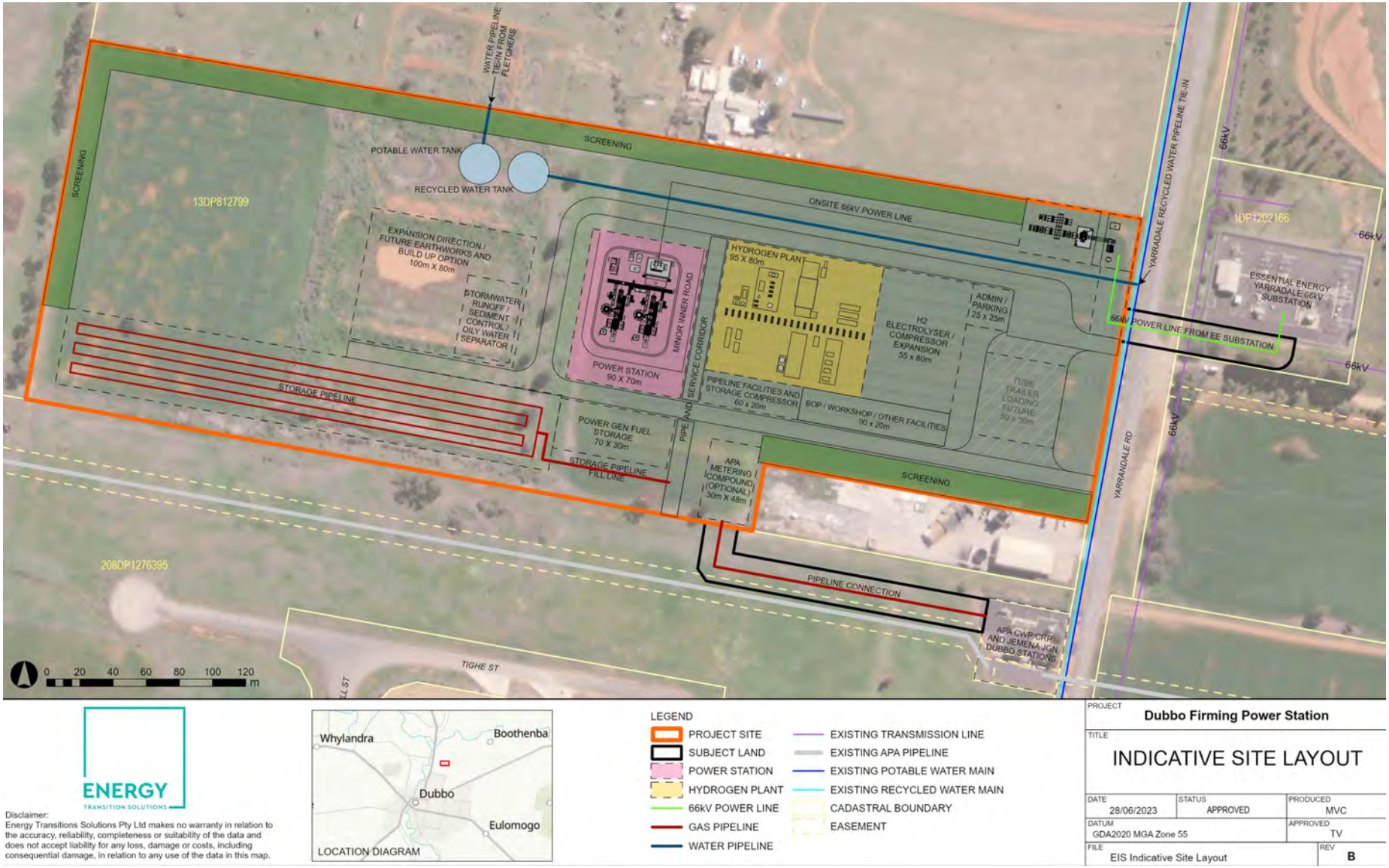
An overview of the Project listing details of the development for which approval is sought is summarised in Table 2.1 and shown in Figure 2.1 (**Proposed Site Layout**).

Table 2.1 – Summary of Project Elements

Project Element	Summary
Project Address	28L Yarrandale Road Dubbo NSW 2830
Project Site	The proposed site of the firming power station comprises approximately 13.9 hectares on the land described as Lot 13 of DP812799.
Zoning	The site is centrally located within the Heavy Industrial Zoning (E5) of the Dubbo Local Environmental Plan 2022.
Subject Land	The subject land comprises 14.1 hectares which includes the Project site at 28L Yarrandale Road Dubbo (Lot 13 DP812799) together with a 10 metre easement either side of the proposed gas and electricity points on immediately adjacent land parcels (partial Lot 208 DP1276395 and partial Lot 2510 DP876959).
Power Generation Facility	Dual fuel turbine generator(s) with a nominal capacity of 64MW. The power generation facility would be capable of operating with hydrogen blends based on hydrogen production at the site.
Hydrogen Generation Facility	Hydrogen electrolyser with a nominal capacity of up to 20MW, along with hydrogen compression, storage, handling and blending facilities.
Ancillary Facilities to Power Station	Facilities ancillary to the power station include (but are not limited to): • gas compression and regulation facilities • biofuel storage tanks • electrical cabling, switching and controls • new access (entry and exit) off Yarrandale road • truck parking, loading and unloading facilities • water supply, treatment and storage • office, administration and amenities • workshop and storage facilities; and • staff, contractor and visitor car parking area.
Gas Pipeline Connection	A new high pressure gas pipeline connection (approximately 150m in length) between the Project site and the APA CWPL Dubbo Scraper Station
Gas Storage Pipeline	A new high pressure gas pipeline up to 2.5km to be used for storage purposes.
Electricity Transmission Line	A new 66kV electricity transmission line connection (approximately 100m in length) from the Project site to the existing 66kV Yarrandale Substation.
Proposed Water Management	Water will be sourced from one or more sources which may include from the FIE abattoir commercial operations, from the Dubbo recycled water pipeline on Yarrandale Road or the mains system also on Yarrandale Road. The existing dams on site will be re-conditioned for water storage or removed and replaced with tanks.
Proposed commencement of operation	Q4 2025
Anticipated life of Project	40 years

Project Element	Summary
Design life of mechanical and electrical plant	40 years
Design life of civil and structural plant	40 years
Construction duration	Approximately 12 months
Construction hours	It is anticipated that works would be undertaken mostly during standard construction hours (7:00am to 6:00pm weekdays and 7:00am to 1:00pm on Saturdays). Out-of-hours construction activities would be required for some activities where the activity involves continuous work. These activities may include: • Pipeline integrity testing which is a critical end of construction activity. Pressure strength testing of pipe strings, lasting four hours, would be conducted during the daytime, while leak testing of a complete pipeline is conducted over 48-72 hrs period (test hold period 24 hrs). Since hydrostatic testing is integral to the safety of the pipeline, these works are considered unavoidable. • Commissioning testing for the introduction of gas may require continuous and/or 24 hour operation to be successfully completed.
Construction workforce	Expected peak construction workforce of approximately 150 full time equivalents.
Operation hours	The power station may operate for a continuous 24 hours on any given day depending on demand.
Operations workforce	Permanent site staff numbers are not expected to exceed an average of 5-6 full time equivalent persons. Some additional support staff and deliveries of consumables, waste disposal, sanitary services and specialist maintenance staff may also be required on a weekly basis. Local contractor workforce will be used (where practicable) during infrequent maintenance events, outages etc.
Capacity factor	It is anticipated that the Project would operate up to approximately 12 per cent of the year at 100 percent plant load.
Capital expenditure	Approximately $190 million

Figure 2.1 – Proposed Site Layout



2.2 Project Area and Location

The Project site and associated network connections are wholly within the Dubbo Regional Council LGA. Dubbo is in the Central West and Orana regions of NSW, and is the key agricultural, transport and industrial hub of the region. Retail trade, public administration, education and health care are also central to Dubbo's employment providing essential services to the city and surrounding region.

The Project site is in the heavy industrial area of North Dubbo. As set out in Figure 1.2, the proposed site is surrounded by Fletcher International Export Abattoir (the largest employer in Dubbo), the Dubbo Livestock Markets, the Dubbo Sewage Treatment Plant and commercial agricultural enterprises including pivot irrigation. To the south of the proposed site is a concrete batching plant and the Fletchers Industrial Estate which is currently undergoing subdivision for further industrial development.

The area around Dubbo is serviced by a road network well suited to heavy haulage vehicles due to the Newell Highway, Mitchell Highway and Golden Highway all intersecting within Dubbo. The proposed site is near the Newell Highway and Golden Highway, with access to the Newell Highway from Boothenba Road and Purvis Lane, and the Golden Highway from Yarrandale Road (further to the south).

2.3 The Site

The Project site is located at 28L Yarrandale Road, Dubbo (Lot 13 of DP812799) with proposed gas, water and electricity connections in immediately adjacent land parcels or road reserve.

The location is approximately 4km north of Dubbo's town centre. The Project site is approximately 14 hectares in size and is currently used for cultivation of crops and pastures for grazing. There are no existing dwellings or structures presently on the site. Adjacent buildings are light-medium industrial businesses.

The Macquarie River is the closest waterway, approximately 1km from the site, with the Newell Highway, Dubbo Railway and the Dubbo Livestock Markets located between the proposed site and the river.

The site is centrally located within the Heavy Industrial Zoning (E5) of the Dubbo LEP. The Western District Memorial Park (zoned Private Recreation – RE2) is the closest non-industrial or utility land use and is approximately 900m to the north of the site along Boothenba Road.

The land is currently owned by Fletcher International Exports Pty Ltd (FIE), which also owns most of the surrounding land (Fletchers Industrial Estate to the south and commercial agricultural land to the east) and owns and operates the abattoir to the north. The Proponent has secured tenure for the Project Site for the duration of the proposed life of the Project.

Road access to the site would be provided by a new entry/exit from Yarrandale Road.

The proposed utility connections, including the gas pipeline and the electrical transmission are directly adjacent to the proposed site with good access from Yarrandale Road.

The high-pressure gas pipeline connection would link the proposed Project site to the CWPL Dubbo Scraper Station operated by APA Group. The new pipeline connection would traverse the northern boundary of adjacent land (Lot 208 of DP1276395) to the south of the proposed Project site (also owned by FIE as part of the Fletchers Industrial Estate) for approximately 150m. The new pipeline would then terminate in the existing CWPL Dubbo Scraper Station (Lot 4561 of DP1002246).

The 66kV electricity connection would connect the Project site to the Yarrandale 66kV Substation operated by Essential Energy to the east (on the opposite side of Yarrandale Road). The new 66kV connection would include a crossing of the Yarrandale Road reserve and terminate within the existing 66kV Yarrandale substation (Lot 2510 of DP876959). Electrical substation and switching would also be included at the site to support independent connection and metering of the power generation and hydrogen generation facilities.

Water would be sourced from one or more sources which may include the FIE abattoir commercial operations, from the Dubbo recycled water pipeline on Yarrandale Road and/or the mains system also on Yarrandale Road.

2.4 Land Requirements

Construction and operation of the Project will require approximately 14.1 hectares of land. Table 2.2 sets out the relevant land required for the Project.

Table 2.2 – Relevant Land

Affected Land (Lot/Plan)	Proposed Infrastructure
Lot 13 of DP812799	Proposed Dubbo FPS site
Lot 2510 of DP876959	Connection to the 66kV Yarrandale Substation
Lot 208 of DP1276395	Gas Pipeline – Connection
Yarrandale Road (Municipal road reserve)	Site access 66kV electrical connection Water supply pipeline

Note: The following land has been excluded from the development (as previously identified in the Project's Scoping Report) through refinement of the Project Area:

- Lot 2451 of DP1049405 (Gas Storage Pipeline contained to the proposed site)
- Lot 2 of DP1235422 (water connections available in Yarrandale Road reserve)
- Lot 11 of DP812799 (water connections available in Yarrandale Road reserve)

2.5 Interaction with Other Infrastructure and Projects

As noted in section 2.3, the Project's proposed utility connections, including the gas pipeline and the electrical transmission are directly adjacent to the proposed site. The Proponent has engaged, and continues to engage with APA Group, as asset owner, in respect of the Dubbo Scraper Station, the CWPL and the CRP, Essential Energy, as asset owner, of the Yarrandale Substation and Dubbo Regional Council, as asset owner, of the Yarrandale water pipeline in respect of the Project and its interaction with this existing infrastructure including as part of the Project's utility connection process.

Sections 3.4 and 15.5 of the EIS details the Project's likely interactions with other approved or proposed major projects in the vicinity of the Project site.

2.6 Proposed Design

The firming power station is comprised of two main components – a power generation facility and a hydrogen generation facility. These are described in more detail below.

2.6.1 Power Generation Facility

The power generation facility would comprise up to three open cycle gas turbine generators with a nominal total output of 64MW. Three turbine equipment manufacturers have been considered to supply the power generation turbine/s. Each of these equipment manufacturers offer a Dry Low Emissions (DLE) or Conventional type combustion/ignition system which can operate on dual fuel with varying levels of hydrogen blend capabilities. One of the turbines under consideration can operate on up to 25% hydrogen (blended with natural gas) and 100% biofuel and represents the most conservative turbine and fuel compatibility limits under consideration for a commercially available turbine. The burning characteristics (heat rate kJ/kWh) of this unit are generally comparable operating on 100% natural gas (9,324), 25% hydrogen plus 75% natural gas blend (9,311), and 100% biofuels (9,448).

The final number of turbines (up to a maximum of 3) would be dependent on the ultimate turbine selected from available manufacturers. The final decision on the choice of turbine would be based on a range of environmental, engineering and economic factors to be considered during the detailed design phase of the Project. These factors may include:

- Fuel compatibility and ability to operate on hydrogen blends and biofuels
- Performance characteristics such as thermal efficiency, heat rate and output at different ambient conditions and loading, firing gas/hydrogen or biofuels
- Operational characteristics such as start-up times and operational flexibility, usage rates of consumables such as water and auxiliary power consumption when off-line and in service
- Environmental factors such as emissions, air quality, noise and water use
- Compliance with applicable legislation, codes and standards
- Capital expenditure, operating and maintenance costs

The turbines would operate on natural gas (with hydrogen blends of up to 25%) as the primary fuel source in the short term. However, the generation units would be biofuel and hydrogen fuel capable, meaning they would be able to be supplied by biofuels or natural gas (with low hydrogen blends) in the short term, and high hydrogen blends or biofuels into the future. Consent is expressly sought for each of these fuel sources.

The power generation facility would be monitored and controlled from the Proponent's control room in Canberra with local control also able to be taken as required. Local staff would be in attendance at the Project site during business hours and would respond to callouts as required.

Note: Reciprocating engines for the power station as contemplated in the Project's Scoping Report are least preferred following concept studies and technology vendor engagement and are not assessed in the EIS. These engines did not offer the ability to transition to the targeted hydrogen blends or offer biofuel compatibility in the short term.

2.6.1.1 Dual Fuel Technology

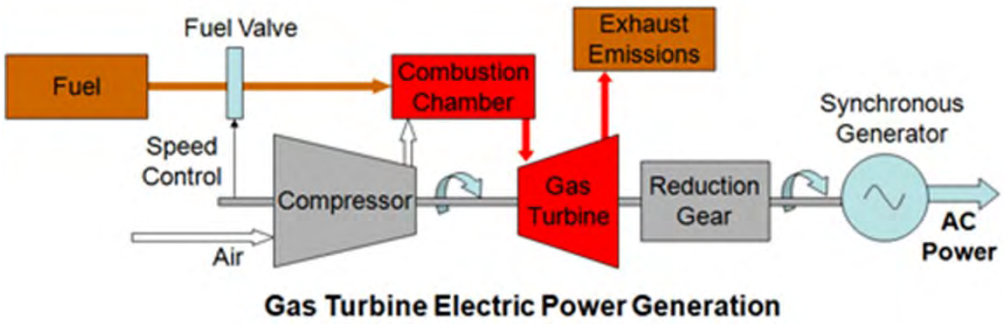
Dual fuel turbine units typically consist of a compressor, combustion chamber, turbine and generator. Air is compressed to a high pressure before being forced into the combustion chamber. Fuel (biofuel, natural gas, hydrogen or blends as required) is injected into the combustion chamber where combustion occurs at very high temperatures and the gases (air and combusted fuel) expands. The resulting hot air is forced into the turbine causing the turbine to turn, generating power. In an open cycle configuration, hot exhaust air is vented directly to the atmosphere through an exhaust stack, without heat recovery.

The open cycle configuration enables fast start and firming generation for intermittent renewable generation.

Figure 2.2 contains a schematic of the operation of an OCGT unit.

Figure 2.2 – Schematic of Operation of an OCGT

Source: https://www.mpoweruk.com/gas_turbines.htm



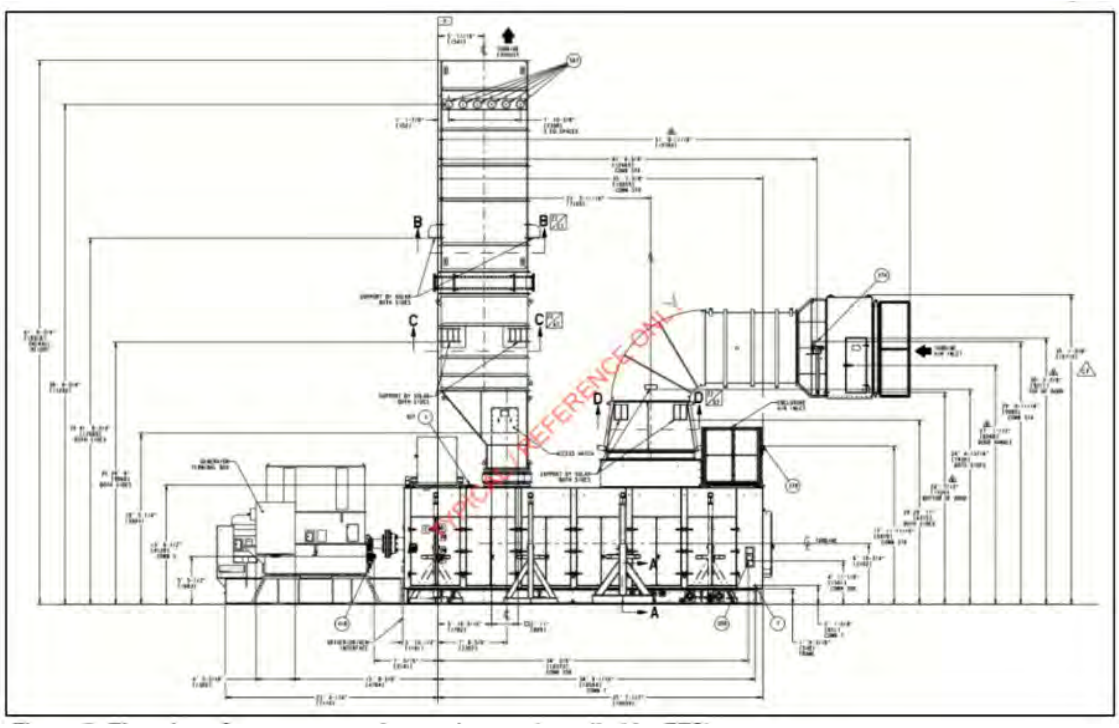
2.6.1.2 Turbines

The dual fuel turbines are proposed to be configured with the following equipment:

- Turbine and generator
- Dual fuel combustors capable of firing natural gas / hydrogen gas blends and biofuels
- Air intake filter house and ducts
- Evaporative inlet air cooling and fogging/wet compression systems (introducing air with fine water droplets) on the turbines to maximise output during hot weather
- Exhaust stack (with a maximum stack height of approximately 18 metres)
- Natural gas, hydrogen blending to be located prior to the inlet of the turbine to blend up to 25% hydrogen and biofuel fuel package skids
- Fin fan coolers for lube oil and generator systems
- Power control centre including all electronic control cabinets and battery rooms/compartments
- Lube oil and water injection modules
- All instrumentation, control, monitoring and protection equipment for the turbines

Figure 2.3 provides an illustration of the turbines and the elevations.

Figure 2.3 – Elevation of Power Generation Facility



2.6.1.3 Ancillary Facilities

In addition to the common ancillary facilities listed in section 2.6.3 below, the power generation facility would also require supporting ancillary facilities, the primary ones being the following:

- Biofuel storage tanks
- Natural gas receiving station which may include gas metering, pressure regulation, compression, heating, pigging facilities and blowdown or venting; and/or
- Generator circuit breakers, generator step-up transformers and switchyard including overhead line support gantry.

2.6.1.4 Gas Fuel Systems

The power generation facility would be capable of being fuelled by natural gas (with hydrogen blends). The natural gas will be sourced via a high-pressure gas pipeline connection between the Project site and the adjacent APA CWPL Dubbo Scraper Station. Natural gas transportation will be provided via the existing APA Central West and Moomba Sydney Pipelines. The gas receiving station would comprise facilities for gas metering, pressure regulation, heating, distribution manifold, piping and valves and potential provision for venting.

The gas fuel system would be designed to provide gas at a pressure and temperature as required by the power generation facility.

2.6.1.5 Biofuel Fuel System

The power generation facility would also be capable of operating on biofuel.

Biofuel would be delivered to the site using road tankers and stored in biofuel storage tanks with a maximum capacity of 240m³ for biodiesel and 350m³ for ethanol. This storage would enable the Project to operate at maximum capacity for a nominal 12 consecutive hours. The tanks would be bunded with net capacity in accordance with Australian Standards.

Permanent on-site biofuel pumps would be installed with sufficient capacity to unload B-double tankers and to transfer biofuel into the storage tanks. These pumps will also allow for pumping from tank to truck if required. Biofuel pumps would be installed to pump biofuel from storage tanks into the turbines, through a filter and flow control valve. The biofuel pumps would be in a bund.

2.6.1.6 Emission Controls

The primary emission of concern from the power generation facility operation is the oxides of nitrogen. Pollutants such as particulate matter and oxides of sulphur are controlled through fuel quality and not as part of the turbine technology. Other airborne by-products and pollutants occurring from the combustion of natural gas and biofuel in turbines are:

- Nitrogen
- Oxygen
- Carbon dioxide
- Water vapour
- Carbon monoxide
- Unburned hydrocarbons
- Oxides of sulphur
- Particulates

A detailed discussion of the Project's potential air quality impacts and the measures proposed to mitigate any potential impacts are contained in Chapter 11 (AIR QUALITY).

2.6.2 Hydrogen Generation Facility

The Project would include a new hydrogen generation facility with a nominal total output of up to 20MW utilising polymer electrolyte membrane (PEM) electrolysis technology.

The electrolysis units would be modular, and the type, size and number of electrolysers installed will be based on conversion efficiency, water consumption, startup times and a range of environmental, social, engineering and economic factors that will be considered as the electrolysis plant design progresses. The maximum total output of these units would be 20MW.

Auxiliary equipment required to support the electrolysis process would include compressors, heat exchangers, water purifiers and pumps, storage vessels and handling/blending facilities.

Note: Alkaline electrolysers for the hydrogen generation plant as contemplated in the Project's Scoping Report are least preferred following concept studies and engagement with technology vendors. Impact assessments in the EIS are based on PEM technology. Alkaline electrolysers do not offer the operational flexibility to meet the intermittent availability of cheap electricity.

2.6.2.1 Polymer Electrolyte Membrane Technology

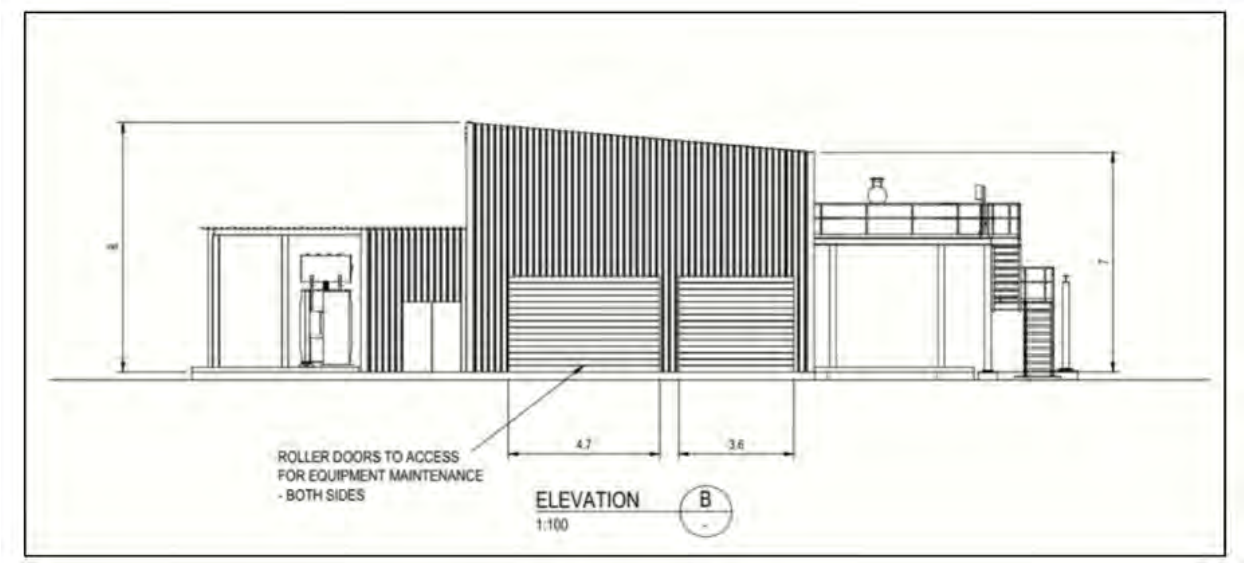
The PEM electrolysis technology includes a hydrogen production system, a control system, and a DC power supply. Compared with the alkaline water hydrogen production system, the PEM system is quite simple: the gas after treatment device is relatively small, no special alkali tank is needed, and the water tank can also be used as an oxygen separator.

The PEM electrolyser modules broadly consist of the following sub-components:

- feed water pump
- demister
- water tank
- cooler/chiller
- water purification package
- PEM electrolyser stack (with a maximum of 8 metres in height)
- hydrogen separator
- control valves

Figure 2.4 is an illustration of the hydrogen generation facility.

Figure 2.4 – Illustration of Hydrogen Generation Facility and Elevations



2.6.2.2 Hydrogen Generation Facility Operation

The hydrogen generation facility would operate when there is low electricity demand or an excess of electricity in the grid. Hydrogen produced would initially be used for blending with natural gas to supply the dual fuel power generation facility.

2.6.2.3 Ancillary Facilities

Facilities ancillary to the hydrogen generation facility include:

- compression, pressure regulation and metering facilities
- hydrogen storage vessels which would store hydrogen and would be used to blend hydrogen at the turbine fuel gas skid to provide the turbine with the exact hydrogen blend.

2.6.3 Common Ancillary Facilities

The following ancillary facilities are common to the power generation facility and hydrogen generation facility:

- Water supply, treatment and storage facilities
- Internal roads
- Heavy vehicle entrance / exit on Yarrandale Road
- Hard stand area for truck parking, loading and unloading facilities
- Closed circuit cooling systems
- Control room, offices and amenities facilities
- Electrical switch rooms
- Occupational health and safety systems including an emergency warning and evacuation system
- Workshop and warehouse
- Firefighting system (no PFAs are to be used)
- Communication systems
- Security fence, security lighting, stack aviation warning lights (if required) and surveillance system
- Landscaped areas and staff, contractor and visitor parking areas
- Civil features including concrete bunds, engineered batters and diversion drains for control of chemicals, oils, fuels and stormwater run-off.

2.6.4 Gas Connection Pipeline

The high-pressure gas connection pipeline would be approximately 150m in length and connect the Project site to the boundary of the CWPL Dubbo Scraper Station which is currently operated by APA Group. The connection pipeline would be designed to transport sales quality gas from the existing CWPL Dubbo Scraper Station to the Project site.

The connection pipeline would be designed in accordance with AS 2885.1:2018 (**AS 2885**). Piping in pipeline facilities would be designed as pipeline assemblies in accordance with Section 5.9 of AS 2885. Hydraulic design, process conditions, or flow and pressure control would be defined during detailed design.

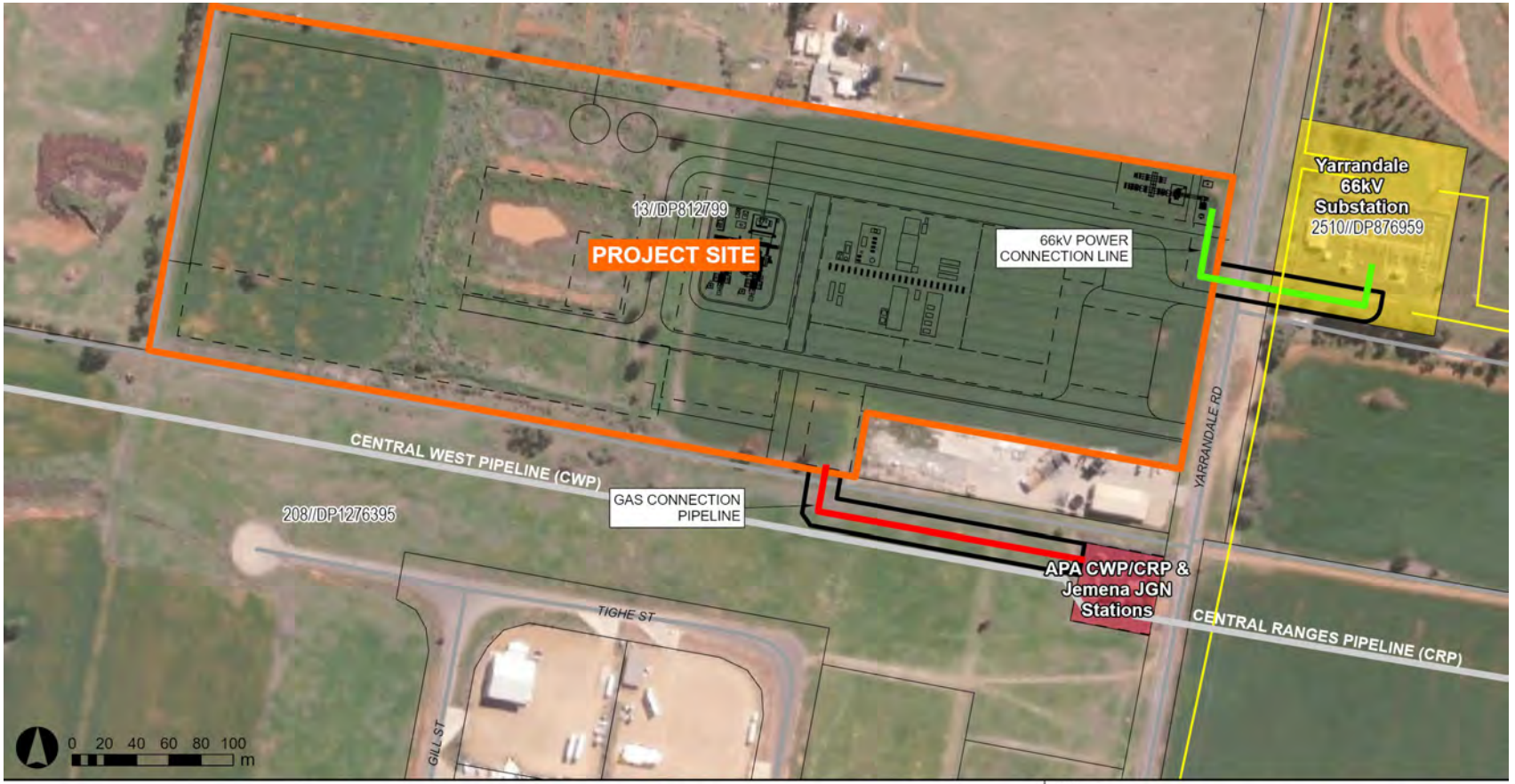
The pipeline would be constructed of materials that are suitable for hydrogen transport and storage. It is not currently proposed to inject any hydrogen into the gas network but this pipeline would be designed to allow for future injection where appropriate and permissible. The design and operating conditions of the connection pipeline would be consistent with AS2885, ASME B31.12 and NSW regulatory requirements under the *Pipelines Act 1967* (NSW) (**Pipelines Act**).

The connection pipeline would be buried, and the pipeline geometry would be defined during the design stage using detailed flow assurance modelling and considering gas supply availability and a range of environmental, engineering and economic factors.

The gas connection pipeline would be designed, constructed and operated separately to the Project by a third-party provider, APA Group.

The network connections are defined in Figure 2.5 – Network Connections.

Figure 2.5 – Network Connections



2.6.5 Gas Storage Pipeline

The approximate 2.5km high pressure gas storage pipeline would provide a storage vessel that can be filled with natural gas and/or hydrogen during off-peak periods to provide supplementary feedstock (from the Central West Pipeline) for the power station during operation. Several options in respect of the location of the storage pipeline were considered as part of the EIS. As depicted in the Proposed Site Layout in Figure 2.1, the preferred option would be to locate the storage pipeline on the Project site and has been the basis of the EIS.

The pipeline would be designed in accordance with AS 2885 and ASME B31.12. Piping in pipeline facilities would be designed as pipeline assemblies in accordance with Section 5.9 of AS 2885. Hydraulic design, process conditions, or flow and pressure control would be accurately defined following the concept development stage of the Project.

The pipeline would be constructed of materials that are suitable for hydrogen storage. The pipeline would be designed to store gas with hydrogen blends of up to 25 % (% volume). Hydrogen would be blended into the storage pipeline (upstream of the storage compressor).

The design and operating conditions of the pipeline would be consistent with AS2885 and ASME B31.12.

The storage pipeline would be buried, and the pipeline geometry would be defined during the design stage using detailed flow assurance modelling and would take into account gas supply availability and a range of environmental, engineering and economic factors.

As it is anticipated that the gas storage pipeline would be situated on the Project site and designed to be used solely for commercial purposes, a pipeline licence would not be required for this pipeline under the Pipelines Act.

2.6.6 Electricity Transmission Line

A high voltage 66kV electricity transmission line would be required to connect the proposed power station to the boundary of the Essential Energy Yarrandale 66kV substation on the opposite side (eastern side) of Yarrandale Road.

The new electricity transmission line would be approximately 100 metres in length and would either be buried below Yarrandale Road or connected via overhead poles/wires.

The infrastructure required for connection and upgrade of the Yarrandale substation would be determined in conjunction with the connection agreement with Essential Energy.

The electricity transmission line would be designed, constructed and operated separately to the Project by a third-party provider, Essential Energy.

Figure 2.5 sets out the electricity network connection.

2.7 Project Schedule

The project schedule in Table 2.3 is indicative and will be confirmed based on a final investment decision.

Table 2.3 – Indicative Project Schedule

Milestone	Target Date
Environmental assessment and approvals	Completion Late 2023
Design and procurement	Completion Early 2024
Project construction	Commencement Mid 2024
Project commissioning and operations	Late 2025

2.8 Construction Methodology

The construction and commissioning of the various project components is expected to take up to 12 months. A summary of the timeframes and workforce required for the construction of each component is set out in more detail below.

The power station would comprise a compound of approximately 640 metres x 220 metres in size, with some additional workspace surrounding the compounds for construction. The additional workspace would also provide areas for a common site office, car parking, equipment and material laydown areas, workshops and other facilities as required.

The power station would predominantly be prefabricated offsite to the maximum possible extent and assembled on site.

Construction would be carried out according to the following basic sequence:

- Site establishment, including temporary construction facilities and laydown
- Site Survey
- Bulk earthworks and drainage
- Concrete foundations
- Structural, Mechanical and Piping Construction
- Equipment load-out and landing on foundations
- Tanks and storage installation
- Electrical, Instrumentation and Control Construction
- Hydrogen pipeline construction and testing
- Buildings
- Construction quality testing
- Construction demobilisation and make-good

2.8.1 Site Establishment and Earthworks

The initial phase of construction would involve the establishment of the construction site including temporary sheds and amenities, fencing, erosion and sediment controls, internal roads and laydown, stockpiling areas and site surveys.

Once the site has been established, earthworks would commence with the following high level key activities occurring:

- initial site clearing and grading works
- trenching for underground utilities and services would be installed such as stormwater, water and sewer reticulation, electrical cables and gas pipes

- preparation and construction of foundations for the proposed site. Deep piling is expected to support the heaviest infrastructure such as the turbines, generator and the main step-up transformers while shallower piling or pad type foundations would underpin the foundations of the site where the proposed surface loads are less (e.g. site office, car park and landscaped areas). Final numbers, depth of foundation piles and the piling method (bored, driven, vibration piling) are subject to detailed design; and
- reinforced concrete slabs would be constructed in certain pavement areas of the proposed site with other areas being surfaced with crushed rock or other suitable materials.

2.8.2 Internal Roadworks and Hardstands

The finished site would be a combination of sealed asphalt, concrete hardstand areas and/or surfaced with crushed rock. It is expected that some of these works may closely follow the site earthworks and foundation works and would be implemented prior to commencement of above ground construction and installation of major plant items.

Roadworks and hardstand areas would also be provided for permanent staff parking (light vehicles), delivery/laydown areas and where required, bunded areas for delivery, handling and storage of fuel and other hazardous materials.

2.8.3 Civil, electrical and mechanical construction

Once the proposed site is ready, delivery and installation of the major plant items associated with the power generation and hydrogen generation would commence. The size of the construction workforce would likely peak during this phase of construction and the levels of construction activity, including construction traffic, would also peak.

The following equipment would require oversize overmass (heavy vehicle transport) transportation to the Project site:

- Demineralised water treatment package
- O_2 gas coolers x 2
- LP reciprocating compressor
- LP aftercooler
- HP diaphragm compressor
- Gas storage compressor
- Cooling water surge tank
- Condensed water surge tank
- Electrolyser array modules x 6
- Electrical and control room building
- HV transformers x 2
- HV control room
- Earthmoving equipment x 4

2.8.4 Connection and Storage Pipeline Construction

The connection and storage pipeline has an estimated construction period of 4 months (concurrent with the power station).

The connection and storage pipelines would be constructed in accordance with the Australian Pipelines and Gas Association (**APGA**) Code of Environmental Practice – Onshore Pipelines. The pipeline construction

work would involve the clearing of pastures and vegetation to provide a safe and efficient area for construction activities. It is expected that pipeline construction work would be carried out according to the following sequence:

- clearing and grading the construction area, with topsoil and seedstock windrowed or stockpiled along the edge
- stringing (laying the pipe sections end to end) and bending of the pipe
- welding, non-destructive testing and field joint coating of the pipe
- digging the pipeline trench and trench spoil placement (with sufficient separation from topsoil)
- lowering the pipe into the trench
- backfilling the trench with spoil
- hydrostatic testing to confirm integrity of the pipeline
- rehabilitating the area and additional workspaces by contouring the surface to the surrounding profiles and then re-spreading the stockpiled topsoil and seedstock across the disturbed areas (along with soil treatment and re-seeding where required). Other areas used in construction (such as truck turnarounds) would be rehabilitated as soon as practical after the area's construction activities were completed.

2.8.5 Commissioning and Testing

Prior to the commencement of operation, the Project would be subject to a comprehensive and rigorous program of testing and certification of all components, systems, and processes. The primary objective of the commissioning and testing process would be to demonstrate that the Project can operate to the required standards of safety, efficiency, NEM and environmental performance specified by the design and by industry and regulatory standards.

All aspects of the commissioning and testing phase would be verified and documented prior to the Project commencing operation.

2.8.6 Landscaping and Demobilisation

The final construction element would be the installation and establishment of landscaping and other civil requirements (such as final site grading) which would primarily involve planting vegetation around the perimeter of the proposed site. The purpose of the proposed site landscaping would be aesthetic and would be designed not to compromise any site safety, fire risk or operational requirements and maintaining the minimum expected width of the Asset Protection Zone.

2.9 Operation and Maintenance

The Project would feature fast start heavy duty turbines which are suitable for firming power generation. The Project anticipates the power station operating at a capacity factor of up to 12% (approximately 1,000 hours) in any given year. Start-up would take approximately 10 - 15 minutes to reach the full rated output.

The minimum gas supply for the power generation at peak output would be a minimum of 521GJ/hour to a maximum of 667GJ/hr depending on turbine technology selected.

The Project anticipates the hydrogen plant operating at a capacity factor of up to 30% (approximately 2,800 hours) in any given year.

The minimum water supply for the hydrogen plant would be 3240L/hour, with an anticipated annual water consumption of a minimum of 8.5ML to a maximum of 15.1ML.

2.9.1 Operational Hours

The power station would be available to operate 24 hours a day, seven days a week but operating hours would vary depending on demand. It is anticipated to operate when there is a shortfall of electricity in the grid (when the wind is not blowing and/or the sun is not shining, and demand is high). Based on historical and forecast information, it is anticipated that the power station would operate for greater periods between May and August and generally in the morning and/or evening periods.

Operation of the hydrogen plant would vary and is anticipated to operate when there is excess electricity in the grid (when the sun is shining and/or the wind is blowing, and electricity demand is low). Based on historical and forecast information, it is anticipated that the hydrogen plant would operate through day or late evening periods throughout the year.

It is anticipated that the power station would be attended by staff during the hours of approximately 7:00am – 4:00pm weekdays. On site staff would manage plant availability, regular maintenance requirements, functional tests, and facility upkeep. Outside of standard operating hours the site would be operated remotely, and a roster of staff members would be on-call to address any immediate operational or maintenance requirements.

2.9.2 Safety and Emergency Response

The design, construction, maintenance and operation of the Project would be in full compliance with applicable legislation and Australian codes and standards incorporating recognised international standards where applicable. The storage pipeline would be operated in accordance with AS2885.

The Project would be designed to include an automatic shutdown to a safe condition in the event of an emergency.

All ancillary facilities and buildings would include smoke, fire and gas detection devices and firefighting equipment as required. Operating personnel would be trained in emergency response as the first responders to an on-site incident.

Emergency access and egress would be constructed to allow for emergency services to access the facility without barriers either remotely from the control room or by way of gate access by electronic code.

The Project would be continuously monitored by CCTV for crime prevention with appropriate lighting and clear signage for the safety of staff and contractors. The Project would also include cyber security measures to be operated remotely to protect critical electronic components of the Project from cyber-attack.

The operation of the gas pipeline would require periodic running of a pipeline inspection gauge (pig) to clean and inspect the pipeline wall integrity. Inline intelligent pigging, for pipeline integrity assessment, would be undertaken every three to five years subject to pipeline performance and corrosion rates.

Marker posts would be placed above the pipeline so that the pipeline can be properly located and identified to increase safety awareness and protection of the pipeline.

2.9.3 Water Use and Wastewater

Water would be stored on site for process, domestic and firefighting uses. The process water which may be required for the Project may be sourced from one or more sources which may include the FIE abattoir commercial operations (refer to Figure 1.2 for location of abattoir), from the Dubbo recycled water pipeline on Yarrandale Road and/or the mains system also on Yarrandale Road. The existing dams on site will be re-conditioned for water storage or removed and replaced with tanks.

Water sourced from the Dubbo recycled water pipeline would likely require additional treatment at the Dubbo Regional Council Water Treatment Facility for use at the site as general process water or demineralised water for hydrogen production. The Proponent is currently working with Dubbo Regional Council in relation to recycled water treatment upgrades to support water quality requirements for the Project (negating further treatment at the site) and for other users in the Dubbo region.

Closed drains to manage process waste streams from the Project would be used where required and any flows from the closed drains would be collected and disposed of via approved waste collection facilities.

In the absence of a mains water connection, to the extent practicable, rainwater would be captured and used as potable water on site.

Sewerage would be directed to the Dubbo sewage system.

A drainage collection and bund system including an oil and grit interceptor and appropriate traps would mitigate any risk of spills in and around plant and equipment areas.

The main requirement for process water is for the turbine inlet air cooling, turbine NOx emission control and for hydrogen generation purposes.

Actual water consumption would vary with ambient and operating conditions. It is expected that some evaporative cooling water will be required during most summer months when there is a high ambient temperature. Evaporative cooling may not be required during winter months.

The estimated maximum water demand for the operation of the Project is 11 to 20ML, of which 2.5 to 5ML is associated with the power generation facility and 8.5 to 15.1ML for the hydrogen generation facility. Further information on water consumption is detailed in Chapter 10 (Land and Water).

2.9.4 Solid Waste

It is not anticipated that the operation of the Project would generate high volumes of solid waste. Solid waste is expected to be limited to general waste generated from the amenities facility such as paper, plastics, kitchen and bathroom waste and maintenance waste such as scrap metal, chemical containers and cloth.

2.9.5 Hazardous Chemicals

All hazardous chemicals stored on site would be stored, managed and labelled in accordance with relevant Australian standards in purpose built chemical storage facilities.

The following is a list of hazardous chemicals that may reasonably be expected to be on site during maintenance and operation of the Project:

- Methane (CH_4)
- Hydrogen (H_2)
- Carbon dioxide (CO_2)
- Nitrogen (N_2)
- Sulphur hexafluoride (SF_6)
- Acetone (C_3H_6O)
- Aerosols (propellant)
- Acids, hydrochloric acid (HCl) or sulphuric acid (H_2SO_4)
- Caustic, sodium hydroxide (NaOH)
- Chlorine remover, e.g., Sodium bisulphate
- Biocide, e.g., DNBPA based solution
- Aqueous Ammonia
- Antiscalant
- Antifoam
- Fire suppression foam
- Various herbicides for weed control

- Hydrocarbons including diesel, lubricating oil and grease

2.10 Decommissioning

At the end of the Project life of 40 years, the Project would be decommissioned.

Decommissioning would involve the ceasing of operations through the dismantling and removal of above-ground infrastructure and any other infrastructure and the rehabilitation of the land.

Decommissioning would have the following two aims:

- returning the land to a condition that is as near as practicable to pre-existing environmental conditions; and
- decommissioning the infrastructure in a manner that minimises potential impacts to the environment, land use and third parties.

Prior to commencing decommissioning, a decommissioning plan would be prepared in consultation with landholders and regulators, this plan would include an environmental risk assessment.

For the purposes of this EIS, it is assumed that decommissioning would be undertaken in line with current standards (however this may be subject to change given the passage of time) and would include the following activities:

- provided that the pipeline/s did not pose an environmental or safety risk, they would likely be left in situ in the ground. This process could involve stabilisation and plugging where there is risk of subsidence or erosion. If the pipeline was to be removed, it would be excavated, cut in sections and disposed of
- removal of the above-ground facilities would involve removal and disposal of all above-ground infrastructure such as turbines, electrolysers, compressors, skids, and fencing
- all above-ground signs and markers above the pipeline would also be removed, including disconnection of the cathodic protection system from the pipeline and removal of test posts; and
- in consultation with the landowner, consideration would be given to whether hardstands, access tracks and paved areas would be retained, or the site rehabilitated to pre-existing conditions.

Following decommissioning activities, administrative close out would be undertaken. This would involve any easements and licences potentially being surrendered (or forfeited) in consultation with landholders and regulators. This would remove any restrictions or encumbrances posed on the land use.

2.11 Timeframes and Workforce Requirements

2.11.1 Construction

Dubbo experiences the lowest amount of rainfall through the winter season. Construction would aim to commence around April to June to minimise the impact of wet weather on civil activities. The overall construction timeline is estimated to last 12 months with civil activities taking place during the first 6 months. Typically, facilities construction personnel would work a 6 workday/week roster to accommodate the use of local subcontractors and personnel for the Project. Non-local subcontractors may be required to work on an alternate roster to the facilities construction personnel depending on construction requirements. Typical site construction working days are expected to be 10.5 hours.

The approximate timeframes and peak workforce numbers required for the construction of the major components of the Project are presented below in Table 2.4.

Table 2.4 – Approximate Construction Timeframes and Peak Workforce

Project Component	Duration	Peak Workforce
Power Generation Facility and Electricity Connection	12 months	70
Hydrogen Generation Facility	11 months	40
Connection and Storage Pipelines	4 months	20
Workshop, Office, General and Tanks	5 months	20

2.11.2 Operation

It is anticipated that the power station would operate for 40 years. During operation, it is anticipated that 5 – 6 full time equivalent staff would be required onsite to operate the Project.

Specialist contractors and trades will be used to support emergency or routine maintenance at the site.

3 STRATEGIC CONTEXT

3.1 Project Objectives

The Project aims to provide firming services that will support reliability in the overall energy supply system.

The key operational, economic and functional objective of the Project is to supplement the Proponent's renewable energy generation portfolio with dispatchable capacity when the needs of its customers are highest. The key environmental objective of the Project is to provide firming capacity to support renewable generation projects in the areas where it is required, at a scale that is suitable to the region.

3.2 Project Need and Justification

The AEMO's[1] long-term plan (AEMO's 2022 Integrated System Plan) is targeting 80% renewable electricity generation by 2030. To meet this target, an increasing number of renewable energy projects including wind and solar projects is needed. However, wind and solar can only power Australia when the sun shines and the wind blows and in the absence of supporting energy sources, there would be no guarantee that energy supply could be maintained. Firming is the term used for this supporting energy supply which is typically derived using alternative sources such as pumped hydro, battery storage, and gas to ensure continuity of supply during peak loads.

Firming provides dispatchable energy supply that can be activated efficiently and effectively for a committed period to top up supply when the sun is not shining, the wind is not blowing or if there is a sudden surge in demand, or large increase in maintenance outages.

Whilst the Project might only be needed around 5 - 12 per cent of the time, providing a peaking firming service is critical to maintaining energy supply during the transition to renewable energy as coal power stations continue to retire in the coming years.

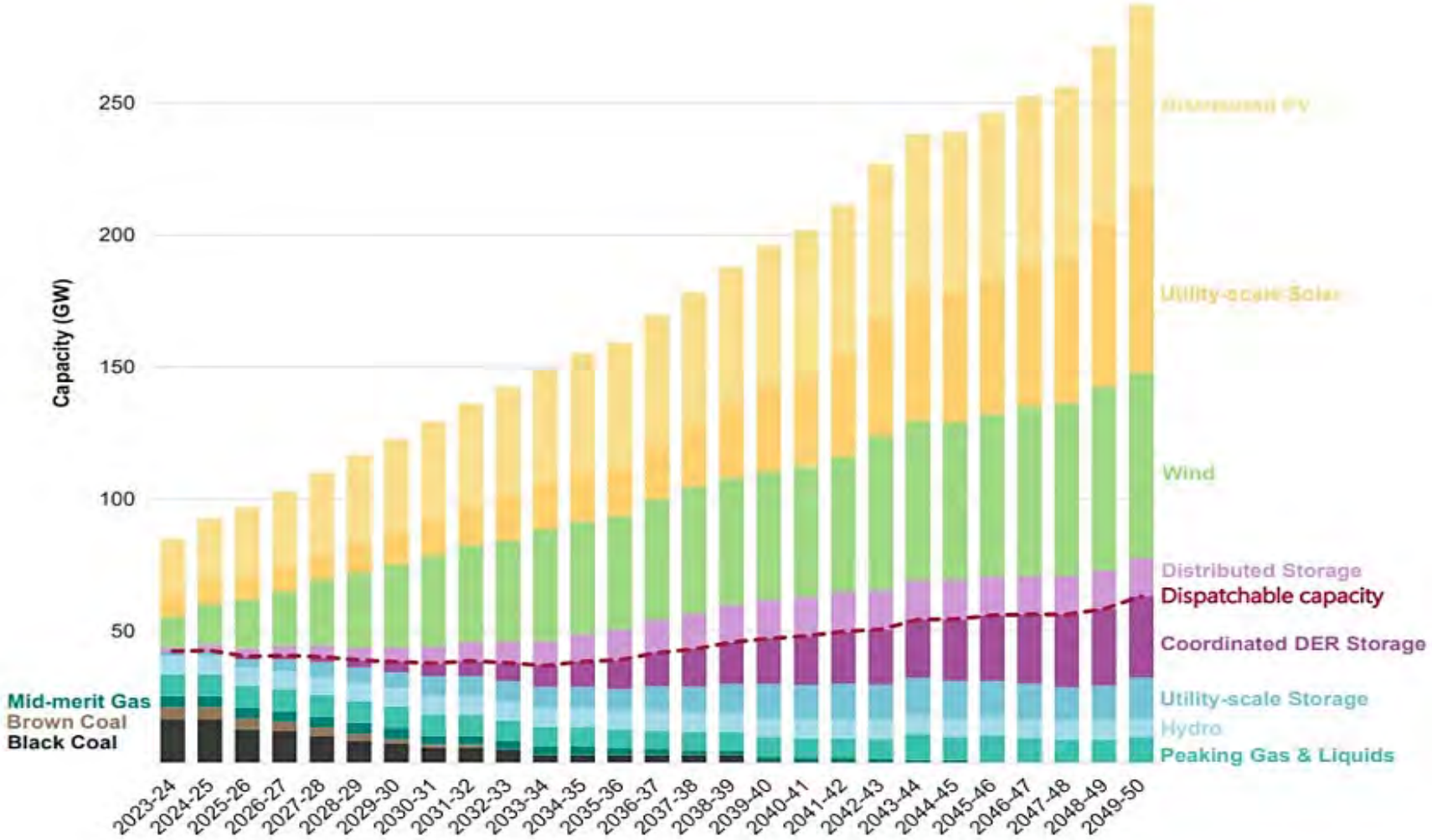
The AEMO has advised the Australian Government that due to the planned closure of Liddell Power Station in 2023 and the proposed closure of Eraring Power Station in 2025, there will be a gap in dispatchable capacity for the East Coast of Australia that will need to be filled through the addition of firming capacity.

As Figure 3.1 illustrates, by 2050 the firming capacity needed for the Australian energy market will need to be met without coal.

[1] AEMO is responsible for operating Australia's largest gas and electricity markets and power systems.

Figure 3.1 – Forecasted capacity to 2050

Source AEMO



Forecasted NEM capacity to 2050 under AEMO's Step Change scenario. Source: AEMO.

The NSW Government's Electricity Strategy and Electricity Infrastructure Roadmap sets out a plan to deliver the state's first 5 Renewable Energy Zones (REZs) in the Central-West Orana, New England, South-West, Hunter-Central Coast and Illawarra regions. This builds on the NSW Transmission Infrastructure Strategy and supports the implementation of the AEMO's Integrated System Plan.

NSW REZs will play a vital role in delivering affordable, reliable energy generation to help replace the State's existing power stations as they come to their scheduled end of operational life.

With the increased focus on renewables, firming projects like the Project allow energy providers the ability to:

- provide consistent and constant energy supply to end users without interruption
- promote increased renewable energy penetration in the market
- optimise system constraints
- more appropriately match end user loads
- minimise costs
- trade on the wholesale market because these providers can guarantee supply

There is a clear need to provide firming capacity that will achieve the necessary reliability in the overall energy supply system. The Project's primary aim is to meet this need.

There are several existing and nascent firming solutions available to firm renewables depending on the period required to be firmed. Batteries, pumped hydro and turbine generation are solutions which are readily available today for varying durations.

Whilst batteries are quick to build, the current technology means they are only able to provide firming for up to approximately 4 hours. Hydro, whilst providing longer duration, is site specific close to water and typically has significant lead times for approvals and construction. A dual fuel power station can act as a firming solution to bridge the gap. It has no finite operational duration and can be turned on and off very quickly and can support renewables on an intermittent basis.

Three quarters of NSW's electricity supply is expected to reach the end of its technical life within 15 years. This has the potential to lead to significant price increases and interruptions in energy supply, particularly with the integration of intermittent renewable energy into the electricity grid.

The Project aligns with the NSW Government's objectives for energy security and reliability outlined in the objects of the *Electricity Infrastructure Investment Act* 2020. The Project would provide firming services to facilitate the continued growth of the region's renewable energy generation within the Central-West Orana REZ and create a new market for hydrogen production for excess electricity in the REZ.

The Project is consistent with the State and Federal Government's priority to deliver a reliable, secure and affordable energy system with improved outcomes for energy consumers.

3.2.1 AEMO Gas Statement of Opportunities 2022 (GSOO)

The Project aligns with the GSOO's expectation that gas demand may become more 'peaky' in support of the anticipated increase in variable renewable energy production. The GSOO includes an outlook for hydrogen production and recognises the role that green hydrogen can play in the realisation of carbon emission reduction objectives.

3.2.2 AEMO Integrated System Plan 2022

The Integrated System Plan (ISP) has been prepared by AEMO since 2018 and has guided governments, industry and consumers on investments needed for an affordable, secure and reliable energy future while meeting prescribed emissions trajectories.

The AEMO 2022 Integrated System Plan (2022 ISP) was released on 30 June 2022. The 2022 ISP provides an actionable roadmap for eastern Australia's power system. The 2022 ISP draws on extensive stakeholder

engagement and internal and external industry and power system expertise to develop a blueprint that maximises consumer benefits through a transition period of great complexity and uncertainty.

The 2022 ISP states that:

- Australia needs to treble the firming capacity from alternative sources to coal that can respond to a dispatch signal including utility-scale batteries, hydro storage, gas-fired generation and smart behind-the-meter “virtual power plants”
- Gas Powered Generation can provide the synchronous generation needed to balance variable renewable supply and is a potential complement to storage
- There will be a critical need for peaking gas-fired generation through to 2050

The Project would contribute to the dispatchable resources required to back up renewables.

3.2.3 NSW Energy Strategy 2019

The ‘Affordable, reliable power for NSW’ Strategy was released in November 2019 and is focussed on encouraging an estimated $8 billion of new private investment in NSW’s electricity system in the next ten years including $5.6 billion in regional NSW.

By supplying firming capacity to the Central-West Orana REZ, the Project would provide security of supply when the sun is not shining, and the wind is not blowing ensuring continued reliability to the grid.

3.2.4 Electricity Infrastructure Investment Act 2020 (NSW)

The objectives of the Act that are relevant to the Project include:

- Encouraging and coordinating investment in new generation, storage network and related infrastructure
- Fostering local community support for investment in new generation, storage network and related infrastructure
- Creating employment and increasing opportunities for Aboriginal and Torres Strait Islander people
- Promoting consultation and negotiation with the traditional Aboriginal owners of land on which generation, storage and network infrastructure is proposed to be constructed.

The Project is consistent with the objectives of the Act by progressing the development of renewable energy and hydrogen production, fostering community support, creating employment opportunities and promoting engagement with the Traditional Owners of the land.

3.2.5 NSW Electricity Infrastructure Roadmap 2020

Pursuant to the *Electricity Infrastructure Investment Act*, the roadmap is a plan to transition the NSW electricity sector into one that is cheaper, cleaner and more reliable.

It includes the declaration of five REZ (including the Central-West Orana REZ) and lays down the framework to attract private investment into regional areas focussed on clean regional energy, including the establishment of an Electricity Infrastructure Investment Safeguard to deliver new generation, long duration storage and firming capacity. It aims to reduce NSW electricity emissions by 90 million tonnes by 2030.

The Project is consistent with the objectives of the Act by progressing the development of renewable energy and hydrogen production within the designated Central-West Orana REZ.

3.2.6 NSW Climate Change Policy Framework 2016

This framework aims to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate, current and emerging international and national policy settings and actions to address climate change.

The Project is consistent with the framework's Aspirational Objectives and Policy Directions by facilitating the development of renewable energy and hydrogen production.

3.2.7 NSW Net Zero Plan Stage 1 2020-2030

The Plan outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions whilst taking practical steps towards reaching zero emissions by 2050. The Project would assist the NSW Government in supporting Net Zero Priority 1 and Net Zero Priority 3. With a proposed commissioning date in 2025, the Project has the potential to contribute to the 2020-2030 transition towards net zero by promoting renewable energy uptake and development in the Central-West Orana REZ.

3.3 Feasible Project Alternatives

3.3.1 The Do Nothing Option

Under the "do nothing" option, the Project would not be constructed and the benefits resulting from the opportunity to provide firming power to support renewable energy and the energy transition process as well as the local socioeconomic benefits resulting from the Project would be foregone.

The 'do-nothing' option would not be consistent with Commonwealth or State policy and would not enable the Proponent to firm its intermittent renewable energy portfolio or for it to provide firmed power to the local community.

3.3.2 Alternative Technology

Whilst there are alternative firming technologies in the market such as batteries and hydro, a dual fuel power station has no finite duration and can be turned on and off very quickly to support renewables on an intermittent basis. This allows the Project to complement the Proponent's existing renewables projects in a way other alternative technologies such as batteries would not.

Whilst batteries are quick to build, the current technology means they are only able to provide firming for up to approximately 4 hours which is insufficient to enable the Proponent to "firm" green power purchase agreement capabilities to satisfy changing customer needs. Hydro, whilst providing longer duration, is site specific, close to water and typically has significant lead times for approvals and construction.

3.3.3 Alternative Fuel Sources

Natural gas sourced from the NSW gas networks is the primary fuel for the Project. The Project is continuing to investigate alternative fuel sources for the power station. The power station would be dual fuel capable (i.e., liquids and gas), and to reduce or remove reliance on fossil fuels, the Project is currently investigating the following alternative fuels:

Gas fuels:

- Biomethane generated through anaerobic digestion or similar technologies that convert organic agricultural green wastes or treated sewage into biogas. The biogas is treated to a quality that can be injected into the gas networks in NSW and then transported to the Project via existing pipelines, similar to natural gas. Biomethane would be sourced from a third party and production is not proposed at the Project site.
- Hydrogen generated on the Project site and blended with natural gas (to current turbine technology capability)

Liquid fuels:

- The following biofuels are being considered for the Project:

- Bioethanol (E100) can be produced from almost any plant-based material. All plants contain sugars, and these sugars can be fermented to make ethanol.
- Biodiesel (B100 & HVO100) can be produced from agricultural green wastes, vegetable oils and/or used cooking oils.

Biofuels would be sourced from eligible waste fuels in accordance with the EfW Regulation.

Petroleum diesel is not proposed at the Project.

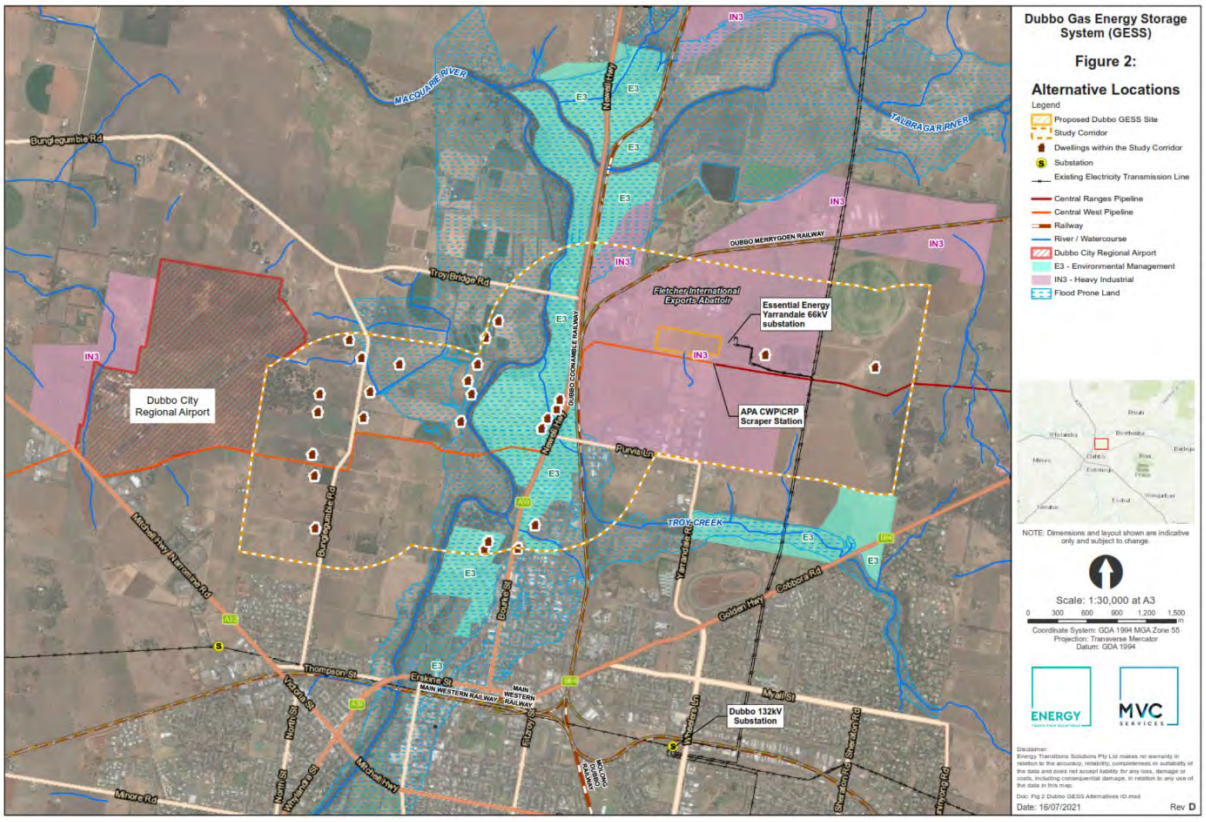
3.3.4 Alternative Locations

Several sites were investigated in proximity to Dubbo for the Project but were ultimately not selected due to one or more of the following reasons:

- Existing land zoning not conducive
- Presence of restrictive planning overlays
- Existing land condition including presence of native vegetation
- Consideration of proximity to residential dwellings
- Longer distance required to connect to existing high pressure transmission gas, high voltage power or water assets; and
- Accessibility (low road quality, high traffic volume, longer distance to the Newell Hwy)
- The area to the west of the Newell Highway was given least preference in comparison to the industrial area to the east due to:
  - Proximity to the Dubbo airport
  - Proximity to the Macquarie River and Environmental Management (E3) Zoning adjacent
  - Number and proximity of residential receptors in the area; and
  - Macquarie River, Dubbo township and transport corridor crossings if a connection to the Dubbo 132kV substation required.

Figure 3.2 below sets out the alternative site locations that were investigated.

Figure 3.2 – Dubbo Project site alternative locations



To negate the need for crossings of rail infrastructure for a gas pipeline connection to the proposed site and for compatible development and land use, the site selection area was refined to the heavy industrial zoned area (E5) between the rail line to the north and rail line to the west. A key landowner was identified when undertaking land searches in the area. Through engagement with the landowner, preference to the subject land was agreed due to proximity to the CWPL Dubbo Scraper Station and the Yarrandale 66kV substation, negating the need for the further encumbrance of additional land with easements. The Project Site also avoids key operational areas of the landowner's abattoir, commercial agricultural operations, and the current and future subdivision of Fletchers Industrial Estate.

The Project Site was also preferred due to previous disturbance and current land use for cultivation of crops - presenting low potential impact to native vegetation and wildlife, and the Project will have limited harm to intact cultural heritage. In addition, the site is within the E5 zoning and consistent with the land use under the Dubbo LEP.

An additional area away from the Project site was earmarked initially for the storage pipeline. This additional area was an approximate 2.5km linear corridor to the east of the Project site which was offset from the alignment of the CRP. Whilst certain of the impact assessments have assessed this additional area also, the area will not be pursued due to the potential impacts to biodiversity and cultural heritage and to avoid the need to encumber additional land away from the Project site.

3.4 Relationship to Other Developments

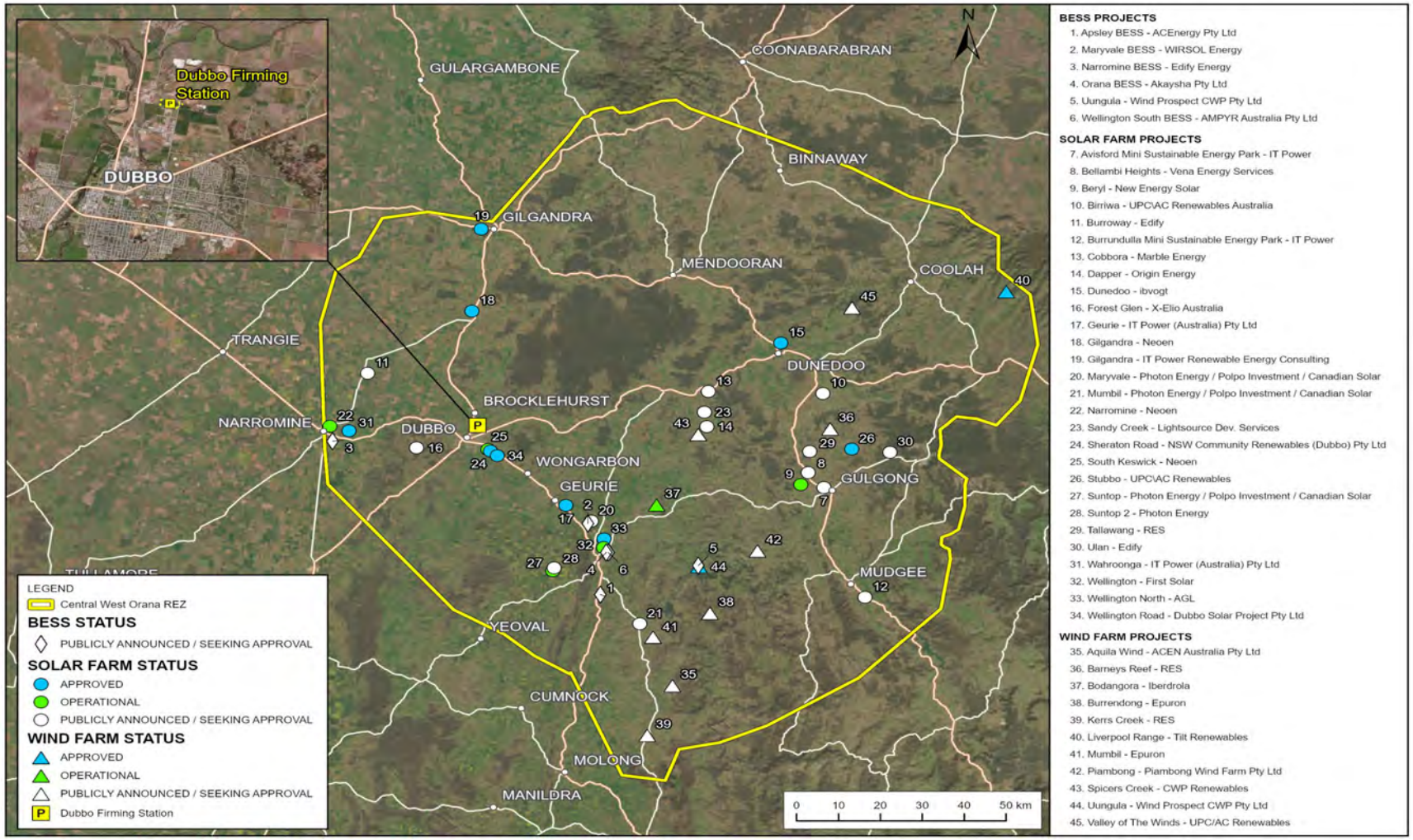
The NSW Government's Electricity Strategy and Electricity Infrastructure Roadmap sets out a plan to deliver the state's first 5 Renewable Energy Zones (**REZs**) in the Central-West Orana, New England, South-West, Hunter-Central Coast and Illawarra regions. This builds on the NSW Transmission Infrastructure Strategy and supports the implementation of the Australian Energy Market Operator's Integrated System Plan.

NSW REZs will play a vital role in delivering affordable, reliable energy generation to help replace the State's existing power stations as they come to their scheduled end of operational life.

The Proponent has other wind farm developments (Uungula and Spicers Creek) in the Central West Orana REZ, and the Project will complement and firm the intermittency of these developments.

Figure 3.3 sets out the other developments in the Central West Orana REZ.

Figure 3.3 – Other Developments in CWO REZ



4 STATUTORY CONTEXT

4.1 Summary of Statutory Context

The EP&A Act and the EP&A Regulation are the primary legislative instruments regulating land use planning and development assessment in NSW. Subordinate to this primary legislation are several other statutory instruments including State environmental planning policies and local environmental plans.

At a Commonwealth level, the *Environment Protection and Biodiversity Conservation Act* 1999 (Cth) (**EPBC Act**) provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as 'matters of national environmental significance' (**MNES**). The EPBC Act is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (**DCCEEW**).

The EIS has been prepared under Part 4 of the EP&A Act in accordance with the SEARs dated 21 November 2022 and the requirements of Part 8 of the EP&A Regulation.

4.2 Statutory Requirements

Table 4.1 below summarises the relevant requirements in accordance with the DPE *State Significant Development Guidelines*.

Table 4.1 – Statutory Requirements

Statutory Relevance	Legislation	Project Relevance
NEW SOUTH WALES		
Power to grant approval	*Environmental Planning and Assessment Act 1979*	The Project, as an energy generating facility, satisfies the criteria for SSD under Division 4.7 of the EP&A Act and section 2.6(1) and paragraph 20(a) of Schedule 1 of the Planning Systems SEPP. The Minister for Planning is the consent authority.
	State Environmental Planning Policy (Planning Systems) 2021	Paragraph 20(a) of Schedule 1 of the Planning Systems SEPP includes development for the purpose of electricity generating works (using any energy source including gas) that has a capital investment value of more than $30m. The Project has an estimated capital investment value of $190 million.
	State Environmental Planning Policy (Resilience and Hazards) 2021	Developments that are classified as potentially hazardous under the Resilience and Hazards SEPP are required by clause 3.11 to have a preliminary hazard analysis (PHA) prepared to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls. A PHA was undertaken for the Project and is detailed in Chapter 9 (Hazards and Risks) and Appendix E.
Permissibility	*Dubbo Local Environmental Plan 2022*	The Dubbo LEP does not prohibit energy generating facilities under Item 4 of the Land Use Table for E5 and accordingly the Project is a development permitted with consent pursuant to Item 3 of the Land Use Table.
	State Environmental Planning Policy (Transport and Infrastructure) 2021	Development for the purposes of electricity generating works, such as the Project, is permissible with development consent on land zoned E5 under clause 2.36 of the T&I SEPP.
Other Approvals	*Pipelines Act 1967*	As it is anticipated that the storage pipeline would be wholly within the boundaries of the Project site, no licence is required under the Pipelines Act for the construction and operation of the proposed gas storage pipeline. A licence under the Pipelines Act would be required for the construction and operation of the gas connection pipeline as it would not be situated wholly within the boundaries of the Project site. This pipeline will be developed, constructed and operated by a third party, APA Group,

Statutory Relevance	Legislation	Project Relevance
		however it is anticipated that the Proponent will apply for this pipeline licence as part of the Development Application for the Project and transfer that licence to APA at a future date. Section 4.42(1)(g) of the EP&A Act provides that a licence under the Pipelines Act 1967 (NSW) cannot be refused if it is necessary for carrying out State significant development that is authorised by a development consent under Division 4 of the EP&A Act and is to be substantially consistent with the consent.
Other approvals	*Roads Act 1993*	Under section 138 of the Roads Act, the consent of the appropriate road authority is required before a person can erect a structure, carry out work in, on or over a public road or dig up or disturb the surface of a public road. Construction of the site access, water supply pipeline and electricity transmission routes will likely require works within public roads. Under section 4.42(1)(f) of the EP&A Act, any permit required under section 138 of the Roads Act from the appropriate roads' authority cannot be refused if it is necessary for carrying out approved SSD and is to be substantially consistent with the consent.
Other approvals	*Protection of the Environment Operations Act 1997*	An EPL would be required for the Project as electricity generation is a scheduled activity listed in Schedule 1 of the POEO Act. The Project meets the criteria set out in Column 2 of clause 17(2) of Schedule 1 being general electricity works with the capacity to generate more than 30MW of electrical power. 'General electricity works' is defined as the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power. Section 4.42(1)(e) of the EP&A Act provides that the application for grant of an EPL under Chapter 3 of the POEO Act cannot be refused if it is necessary for carrying out SSD and is to be substantially consistent with the consent under Division 4 of the EP&A Act.
Other approvals	*Water Management Act 2000*	As the Project is SSD a water use approval, water management work approval or activity approval would not be required, however an aquifer interference approval and water access licence may still be required should the Project trigger a requirement for one (or both) under the WM Act. The Project would not involve works within the waterfront area defined under WM Act, therefore a Controlled Activity Approval would not be required under the WM Act.
Considerations under other legislation	*The Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022*	The Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022 (EfW Regulation) regulates facilities in NSW proposing to thermally treat waste or waste derived materials that are not listed as an eligible waste fuel for the recovery of energy. Certain low risk wastes have been categorised under the NSW's Energy from Waste Policy Statement as "eligible waste fuels" due to their origin, low levels of contaminants and consistency over time and these wastes are listed in the EPA's Eligible Waste Fuel Guidelines. A facility proposing to use an eligible waste fuel for the recovery of energy is not regulated under the EfW Regulation. To the extent biofuels are to be used in the

Statutory Relevance	Legislation	Project Relevance
		Project, it is intended that only biofuels produced from eligible waste fuels such as biomass from agriculture and recovered waste oil would be used and therefore the Project would not be captured by the EfW Regulation. The Proponent will continue to work with the EPA to ensure that it meets all relevant criteria with respect to the use of any eligible waste fuels for the Project including satisfying the following criteria: • be able to demonstrate to the EPA that the proposed waste consistently meets the definition of an EPA-approved eligible waste fuel • ensure there are no practical higher order reuse opportunities for the waste • fully characterise the waste and/or undertake proof of performance (where required); and • meet the relevant emission standards as set out in the Clean Air Regulation.
Considerations under other legislation	*National Parks and Wildlife Act 1974*	Although there may be the potential to impact Aboriginal heritage as part of the Project, section 4.41 of the EP&A Act details that a Section 90 Aboriginal heritage impact permit is not required for State Significant Development that is authorised by a development consent. Engagement has been undertaken with the Dubbo Local Aboriginal Land Council, along with eight other registered Aboriginal parties who participated in the Aboriginal Cultural Heritage Assessment Report as part of the EIS for the Project.
COMMONWEALTH		
Other approval	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	Notwithstanding that the Project is unlikely to have a significant impact to any of the MNES listed under the EPBC Act, the Project has been referred to DCCEEW under the EPBC Act.
Considerations under other legislation	*Civil Aviation Safety Regulation 1998*	An application was submitted to CASA pursuant to regulation 139.175(2) of the Civil Aviation Safety Regulation on the basis that the Project will generate an exhaust plume which may create a risk to the safety of aircraft operations.
Considerations under other legislation	*Native Title Act 1993*	A review of the Native Title Vision (NTV) portal of the area in June 2022 did not identify any Native Title claims or determinations for the proposed site of the Project. All works and infrastructure are proposed on freehold land or designated roads and will not affect any Native Title rights or interests.

4.3 Pre-Conditions

Table 4.2 below summarises the pre-conditions to be satisfied.

Table 4.2 – Pre-conditions

Legislation	Comment
Biodiversity Conservation Act 2016	A Biodiversity Development Assessment Report has been prepared for the purposes of this EIS. The results are summarised in Chapter 7 (Biodiversity) and the BDAR is attached in Appendix B.
Resilience and Hazards SEPP – Clause 3.11	Developments that are classified as potentially hazardous under the Resilience and Hazards SEPP are required to have a preliminary hazard analysis (PHA) prepared to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls. A PHA has been prepared for the Project and is attached at Appendix E.

4.4 Mandatory Considerations

Table 4.3 below summarises the mandatory considerations to be satisfied.

Table 4.3 – Mandatory Considerations

Statutory Reference	Mandatory Consideration	Section in EIS
Consideration under the EP&A Act and EP&A Regulation		
Section 1.3	Relevant objects of the EP&A Act	Chapter 17 (Evaluation of Costs And Benefits)
Clause 4.15	Relevant environmental planning instruments: • State Environmental Planning Policy (Planning Systems) 2021 • State Environmental Planning Policy (Resilience and Hazards) 2021 • State Environmental Planning Policy (Transport and Infrastructure) 2021 • Dubbo LEP	Appendices Appendix E, Appendix J and Appendix M

Statutory Reference	Mandatory Consideration	Section in EIS
	The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	Chapters 7 - 16
	The suitability of the site for the development	Chapter 2
	The public interest	Chapter 17
Considerations under EPIs		
Planning Systems SEPP – paragraph 20(a) of Schedule 1	Development for the purpose of electricity generating works (using any energy source including gas) that has a capital investment value of more than $30m.	Chapter 2
Resilience and Hazards SEPP – Clause 3.11	Developments that are classified as potentially hazardous under the Resilience and Hazards SEPP are required to have a preliminary hazard analysis (PHA) prepared to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls.	Chapter 9 (Hazards and Risk) and Appendix E.
Dubbo LEP	Objectives and land uses for E5 Heavy Industry Zone: • To provide areas for industries that need to be separated from other land uses. • To ensure the efficient and viable use of land for industrial uses. • To minimise any adverse effect of heavy industry on other land uses. • To encourage employment opportunities.	Chapter 2, Chapters 7-16

5 STAKEHOLDER CONSULTATION

5.1 Introduction

This chapter provides an overview of the stakeholder and community consultation that has been undertaken for the Project.

Through the scoping and the preparation of the EIS, the Proponent has undertaken engagement in accordance with the NSW *Undertaking Engagement Guidelines for State Significant Projects* (**Engagement Guidelines**).

Through the scoping and request for SEARs, the Proponent:

- identified and undertook early engagement with landowners and stakeholders relevant to the Project to inform and introduce prior to the planning process
- identified key stakeholders for further engagement with an interest in or that are likely to be affected by the Project
- planned how to engage with the community and relevant stakeholders, so that the engagement is proportionate to the scale and nature of the project and the likely level of community interest in the Project.

Through the development of the EIS, the Proponent has:

- Implemented and undertaken engagement in accordance with the SEARs, the Engagement Guidelines and the Project's Scoping Report
- informed the community about the opportunities to engage in relation to the Project
- explained how community feedback will be considered and documented
- provided relevant information in plain English so that potential impacts and implications can be readily understood
- been clear about the level of influence engagement will have by identifying what elements can be changed because of feedback
- given the community the opportunity to voice their concerns or share local knowledge so that this information can be considered early in the planning, design and assessment of the Project
- considered the issues raised by the community and stakeholders when making project refinements and accurately reflected how these issues have been addressed in the EIS; and
- kept the community and stakeholders informed with up-to-date information on the Project.

Consultation and engagement with the community and stakeholders on the Project will continue throughout the planning, construction and operation of the Project.

5.2 The Proponent's Commitment

The Proponent is committed to establishing and maintaining meaningful and positive engagement with all relevant stakeholders and the Dubbo community.

The Proponent has consulted and engaged with landowners and key stakeholders through the scoping and planning of the Project since late 2020, and the wider community since mid-2021. Feedback and comments from these engagements have informed the Project Description and proposed mitigations as part of the EIS.

The outcomes of community consultation to date are considered in the EIS, however, the consultation process will be iterative and continue throughout the exhibition, response to submission and approval process into construction. The Proponent remains committed to an open and transparent process that

maximises public good, while minimising negative impacts and undue burden on certain parts of the community and/or individuals.

Community awareness and community input are fundamental to responsible and sustainable development. The Proponent understands the importance of (and is committed to) effective and genuine engagement with all stakeholders interested in or impacted by the Project. The Proponent is committed to growing a presence in Dubbo and gaining opportunities to interact with the Dubbo community including opening a new office in Dubbo in February 2023, and is implementing several sponsorship and community benefit programs in the Dubbo region, including sponsorship of the Dubbo Mud Run in March 2023 and the Dubbo Stampede in August 2023. There are also wider employment and procurement strategies being implemented by the Proponent across all of its projects in the Dubbo and wider Central West region in consultation with local stakeholders.

5.3 Objectives and Guiding Principles of Engagement

The Project's Scoping Report provided the objectives and principles for consultation and engagement on the Project in accordance with the Engagement Guidelines. The objectives were:

- to increase awareness, understanding and support of the Project, including the process of the design, approvals, construction and operation of the Project
- to minimise impacts to stakeholders by proactively mitigating potential impacts where possible and provide timely responses to enquiries and requests for information via easily accessible communication channels; and
- to facilitate genuine stakeholder input to minimise impacts, maximise benefits and meet commitments made to the community.

These objectives were achieved through undertaking best practice engagement and providing meaningful opportunities to participate in the Project in accordance with the following guiding principles:

- Openness and Transparency: Ensure consultation activities enable open and transparent communication between the Proponent and all stakeholders through the timely distribution of project information that is clear, accurate and relevant.
- Collaboration and Inclusion: Ensure that stakeholders are sufficiently informed about the Project, their rights as stakeholders during the EIS process and to the aspects of the Project to which they can influence.
- Acting with Integrity: Ensure that consultation and engagement is conducted in a manner that fosters mutual respect and trust.

5.4 Stakeholder Identification

In accordance with the Engagement Guidelines, the Proponent identified key stakeholders for further engagement with an interest in or that are likely to be affected by the Project as part of the scoping of the Project. Identified stakeholders included:

Table 5.1 – Stakeholder Identification

Stakeholder Group	Individual/Organisation
Local Government	Dubbo Regional Council
Regulatory Authorities	Department of Climate Change, Energy, the Environment and Water – DCCEEW (Cth) Department of Planning & Environment – DPE (NSW) SafeWork NSW NSW Environment Protection Authority

Stakeholder Group	Individual/Organisation
	Transport for NSW – TfNSW
Elected Representatives	Federal Ministers & MPs State Ministers & MPs Local Government/ Mayor & Councillors
Indigenous and Cultural Heritage	Tubba-Gah Wiradjuri Aboriginal Corporation Dubbo Local Aboriginal Land Council (LALC)
Landowners and Occupiers	Landowners and occupiers Nearby/neighbouring, industry, business and landowners
Business, Industry and Special Interest Groups	Dubbo Chamber of Commerce and Industry Cyclist groups Local Accommodation Providers
Infrastructure and Utilities Providers	APA Group Jemena Essential Energy Dubbo Regional Council Telstra Health and emergency services providers
Media	National, State and Local media

In addition to the identified stakeholders through the scoping of the Project, the Proponent has continued to identify and engage with stakeholders and community members who have an interest in the Project.

Additional stakeholders identified and engaged through the development of the EIS include:

- Regulatory Agencies through development of SEARs:
  - Heritage NSW
- Indigenous stakeholders through the development of the ACHA:
  - Office of the Registrar Aboriginal Land Rights Act 1983
  - National Native Title Tribunal
  - Central West Local Land Services
  - NTSCorp Ltd
  - Registered Participants (in addition to Dubbo LALC and Tubba-Gah Wiradjuri Aboriginal Corporation):
    - Binjang Wellington Wiradjuri Allodial Heritage Survey
    - Yurwang Gundana Cultural Heritage Services
    - Peter Peckham
    - Paul Brydon
    - Tim Stubbs
    - Lewis Burns
    - Edgerton Kwiembal
    - Thomas Dahlstrom
- Local contractors and suppliers interested in offering services to the Project

- Interested community members.

Stakeholder identification will be an ongoing process into construction and operation of the Project.

5.5 Consultation Methods

Consultation and engagement with identified stakeholders and the wider community has been conducted using several methods as considered in the scoping of the Project. These have included:

Table 5.2 – Methods of Consultation

Consultation Methods	
DIGITAL COMMUNICATIONS	
Website	A project specific webpage on the Proponent's existing website contains up to date project information and will be continually updated as the project progresses. Website is: https://www.squadronenergy.com/our-projects/dubbo-firming-power-station
Project email	A designated project email address for enquiries in respect of the Project. Project email is: info@dubbofirmingpowerstation.com.au
Email updates	Email communications and project updates, sent at regular intervals (distribution list of those that register interest). Quarterly Project updates have been issued for the Project in: • October 2022 and • February 2023.
PRINT COMMUNICATIONS	
Website Fact Sheets, FAQs and Brochures	Fact sheets and other written communications have been developed to provide updates on the Project and provide specific information based on stakeholder feedback throughout the consultation period. Fact sheets have been made available in hard copy at key locations in the community (where permitted) and in soft copy on our website and distributed through project distribution lists. Fact sheets and Project Updates have been made available at the Proponent's Dubbo office and at Community Information Sessions. They are also available on the Project's website.
Letter distribution	Letters were used in the initial consultation phase to introduce the Project and to establish appropriate forms of communication to be used (including invitation to join the Project distribution list). Letters have been used to provide formal correspondence and may be used to formally respond to stakeholders in respect of specific issues, concerns or requests. Letters/invitations (via letter box drop) were distributed to neighbouring landowners in October 2022 to invite to the Community Information Sessions and to register their interest in the Project, along with providing Project Fact Sheets. Formal letters have also been used in correspondence with key stakeholders where required.

Consultation Methods	
Media	Media releases and media packs to be utilised at key project milestones. The Project has been promoted in the local media, including: • Use of Dubbo's recycled water as part of the Project (ABC, January 2023) • State government funding announcement for Green Energy Hub (Multiple, media release by Dugald Saunders NSW MP, January 2023) • Promotion of the upcoming Community Information Sessions (Daily Liberal & Dubbo Photo News, October 2022) • ABC Radio interview, September 2022 • Dubbo gas, hydrogen development to cut emissions (News Corp media online, October 2021)
Public displays/ notices	Public notices to be placed in local and state newspapers to promote activities and the Project in accordance with regulatory obligations. The Project promoted the Community Information Sessions through placing posters on public notice boards and in local distributing media in October 2022. DPE will facilitate relevant notices of the exhibition of the EIS.
DIRECT ENGAGEMENT	
In person	Meeting stakeholders face-to-face (in person or virtually) In person and virtual meetings have been held with stakeholders throughout the planning and development of the EIS.
Drop-ins	Drop-in community information session(s) will be targeted at local residents, industry and people from the community. Drop-in sessions will include static displays and Project information on hand. Drop-in sessions will be hosted in an accessible public facility. Drop-in Community Information Sessions were held in Dubbo on 8 and 9 November 2022.
Community events	Attending and participating in local events including supporting, exhibiting and contributing to community events where appropriate. The Proponent, as a proponent of multiple projects in the region, regularly attends and exhibits at events. The Proponent has sponsored the Dubbo Mud Run in March 2023 and is sponsoring the Dubbo Stampede in August 2023 (currently under promotion with the Proponent as the Gold Sponsor)
Landowners	Targeted consultation with directly affected and adjacent landowners based on their communication preferences. Regular communication is maintained with landowners in accordance with their preferred communication method.

5.6 Consultation and Engagement Timelines

5.6.1 Scoping Activities

Consultation and engagement on the Project commenced in October 2020 when approaches were first made with landowners and relevant stakeholders in relation to the Project. Between this time and submission of the initial Scoping Report for the Project to DPE in September 2021, engagement and consultation activities were focussed on landowners and key stakeholders to confirm the location and suitability of the site for the Project, along with informing them of the planning process and anticipated timelines.

In addition to engagement activities, identification of stakeholders and engagement planning was included in the initial Scoping Report in accordance with the Engagement Guidelines.

DPE initially issued SEARs for the Project on 19 October 2021 which included agency advice from six (6) regulatory agencies:

- TfNSW
- Biodiversity, Conservation and Science (DPE)
- EPA NSW
- Dubbo Regional Council
- Water Office (DPE)
- Heritage NSW

Further to the formal agency advice received, a meeting was held with the DPE Hazard Unit to discuss the Hazard and Risk key issues within the SEARs.

In August 2022, an updated Scoping Report was provided to DPE incorporating the following amendments to:

- the Proponent (formerly Energy Transition Solutions Pty Ltd)
- the Project Name (formerly Dubbo Gas Energy Storage System) and
- the Project Description to include storage and use of biofuels.

Only one (1) agency sought additional information on the updated Scoping Report and provided further agency advice. The EPA sought clarification on the application of the new EfW Regulation to the Project and use of eligible waste fuels (see Chapter 4). A meeting was held with the EPA and the Proponent provided a letter response to DPE and EPA, following which, updated SEARs were issued for the Project in November 2022 (see Appendix A).

5.6.2 Engagement through development of the EIS

From July 2022 until now, the Proponent has actively engaged with relevant stakeholders and the wider community in relation to the Project in accordance with the Engagement Guidelines. Stakeholders and the community were provided the opportunity to engage in relation to the Project and to ensure their feedback was appropriately considered and included in the Project design where relevant.

Materials and communications have been in plain English and opportunities/pathways for participation and interaction with the Proponent have ensured that stakeholder knowledge, concerns, or comments have been received and have been incorporated into the planning of the Project where possible.

5.7 Detailed Consultation Summary

5.7.1 Stakeholder Consultation

A detailed list of consultation for each identified stakeholder, is provided in Table 5.3.

Table 5.3 – Engagement with Identified Stakeholders

Stakeholder	Date	Method	Feedback / Outcome
Local Government			
Dubbo Regional Council	June 2021	Phone and Email	Provision of project information and introduction to the Project to Executive Management Team. *No concerns or issues raised due to location in North Dubbo Industrial Area.*
	Oct 2021	Email	Communication with DRC Executive Management Team. Project update and facilitation of Councillor Briefing. Identification of additional land in the area for hydrogen refuelling and interest in DRC support for hydrogen grant application. *Meeting with Councillors organised, support subject to Councillor briefing, land reviewed and determined not feasible.*
	Oct 2021	Letter	Agency Advice– SEARs Letter dated 12/10/2021 provided to DPE by DRC to support preparation of the SEARs. Key issues: • Project name • Plans and Documents to support assessment. • Updated LEP • Council contributions • Water use and its sources • Waste and waste water • Hazards – oxygen gas • Traffic • Stormwater and point of discharge • Electricity connection and need to correct boundary along Yarrandale Road • Gas and water connections outside of Yarrandale Road (in Private Land) *The issues raised have been considered and addressed in the EIS or through updates to the Project description (i.e. name and location of infrastructure outside of Yarrandale Road in private land).* *Traffic consultant engaged directly with DRC in relation to traffic related issues and incorporated into the Traffic Impact Assessment.*
	Nov 2021	Email, Meeting and Letter	Emails and meeting with Executive Management Team in relation to the Project and application for Clean Hydrogen Industrial Hub Grant. *Letter of Support provided by DRC for the Project's application for a Clean Hydrogen Industrial Hub Grant*
	Mar 2022	Face to Face and Email	Meeting in relation to the Project, new Proponent and a coordinated approach to housing and skills development across the Community.

Stakeholder	Date	Method	Feedback / Outcome
			Proponent is preparing a housing and local workforce strategy with DRC input for their projects (including the Project) across the region/REZ.
	Mar 2022	Email	Query in relation to water supply and inputs into Dubbo Drought Resilience Strategy. *Project water usage requirements, likely sources and inclusion of water storage at the Project provided to DRC for strategy. No concerns/issues raised.*
	June 2022	Face to Face / Site Tour	Participation and site tour of Project site with DRC who were hosting a Korean delegation to the region. *No relevant actions or feedback following delegation visit.*
	Aug 2022	Email	DRC provided with request for identification of potential Aboriginal parties to participate in the ACHA for the Project. *No response or participants provided.*
	Aug 2022	Email	Confirmation of applicable rates and contributions associated with the Project. *DRC confirmed rates and contribution requirements.*
	Aug 2022	Virtual Meeting	Meeting with Dubbo Regional Council in relation to water quality and volumes available for the Project. *Water mains and recycled water available, water quality specifications shared with Proponent.*
	Oct 2022	Phone and Email	Provision of Project Fact sheet and Community Information Session flyer to DRC for circulation to relevant interest groups. *DRC would circulate to relevant parties and groups.*
	Feb 2023	Email	Provision of Project Update. *No Project related feedback provided.*
Regulatory Agencies			
DCCEEW	Feb 2023 – Now	E-Mail, Virtual Meetings	Email with Project Information and completed template forms for pre-lodgement. Pre-lodgement meeting for EPBC Referral *Referral background provided and Referral submitted as an action to the meeting via the EPBC/DCCEEW Portal (decision pending).*
DPE - Planning	Aug 2021 – Now	E-Mail, Virtual Meetings	Regular project updates and coordination of queries to regulatory agencies through the preparation of the EIS.
DPE - Water	Sep 2021	Letter	Agency Advice– SEARs

Stakeholder	Date	Method	Feedback / Outcome
			Letter dated 20/09/2021 provided to DPE to support preparation of the SEARs. Key issues: • Water supply and source • Site water balance • Surface and ground water impacts • Proposed surface and ground water monitoring • Consideration of relevant legislation, policies and guidelines, including the NSW Aquifer Interference Policy (2012), the Guidelines for Controlled Activities on Waterfront Land (2018) and the relevant Water Sharing Plans *Specialist report for Land and Water has been prepared in accordance with relevant guidelines and the issues provided – no further engagement required/undertaken.*
DPE - BCS	Sep 2021	Letter	Agency Advice– SEARs Letter dated 20/09/2021 provided to DPE to support preparation of the SEARs. Key issues: • EIS needs to appropriately address: – Biodiversity and offsetting – Water and soils – Flooding • Standard Environmental Assessment Requirements provided. • Guidance Material provided. *Specialist reports for BDAR (Biodiversity and Offsetting) and Land and Water (Water and soils and Flooding) have been prepared in accordance with Assessment Requirements and Guidance Material – no further engagement required/undertaken.*
DPE - Hazard	Sep 2021	Virtual Meeting	Project introduction meeting and discussion on project elements, including hydrogen. Advised the SEARs will be high level with a PHA required to address relevant matters. No formal Agency Advice received for SEARs. *PHA required for the Project and to be included in SEARs.*
	Oct 2022	Email, Virtual Meeting	Queries and clarifications on PHA raised with specialist risk consultant (Arriscar) and within a meeting between Proponent, DPE – Hazard and Consultant. *PHA prepared to address SEARs and DPE – Hazard feedback.*
Heritage NSW	Sep 2021	Letter	Agency Advice– SEARs Letter dated September 2021 provided to DPE to support preparation of the SEARs. Key issues: • Aboriginal Cultural Heritage Assessment (ACHA) required for the Project • Consultation with Aboriginal people must be undertaken and documented in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010) • ACHA must demonstrate attempts to avoid impact upon cultural heritage values

Stakeholder	Date	Method	Feedback / Outcome
			• The assessment of Aboriginal cultural heritage values must include a surface survey undertaken by a qualified archaeologist. • The ACHA must outline procedures to be followed if Aboriginal objects are found • ACHA to include procedures for burial or skeletal material is uncovered by the Project. *ACHA prepared in accordance with relevant guidelines and consultation requirements.*
	Aug 2022	Email	Heritage NSW provided with request for identification of potential Aboriginal parties to participate in the ACHA for the Project. *Heritage NSW; provided details of 30 potential Aboriginal stakeholders*
NSW EPA	Sep 2021	Letter	Agency Advice– SEARs Letter dated 28/09/2021 provided to DPE to support preparation of the SEARs. Key issues: • Proponent would need to apply separately to the EPA for an environment protection licence (if approved) • EIS needs to appropriately address: – Emission of Noise and Noise Mitigation. – Emission of air pollutants and air pollutant mitigation – Protection of Surface and Ground water • Standard Environmental Assessment Requirements provided. • Guidance Material provided. *Need for EPL included in EIS and will be applied for post determination. Specialist reports for Noise, Air Quality/Emissions and Water have been prepared in accordance with Assessment Requirements and Guidance Material – no further engagement required/undertaken in relation to these matters,*
	Oct 2022	Email, Virtual Meeting, Letter	Email correspondence, virtual meeting and letter from Proponent to EPA through the rescoping of the Project to include storage and use of biofuels. Consultation in relation to the application of the *Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022*.
	Oct 2022	Letter	Agency Advice – Amended SEARs Letter dated 14/10/2022 provided by EPA to DPE to support preparation of the Amended SEARs. Key issue relates to the use of biofuels and application of the *Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022* *Use of eligible waste fuels only by the Project in accordance with the Protection of the* *Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022 included in the EIS.*

Stakeholder	Date	Method	Feedback / Outcome
TfNSW	Sep 2021	Letter	Agency Advice– SEARs Letter dated 28/09/2021 provided to DPE to support preparation of the SEARs. Key issues: • Implications on the Newell Highway • Requirement for a Traffic Impact Assessment • Implications associated with Wollar Solar Farm • Project schedule • Traffic volumes and characteristics • Origin and destination and routes for vehicles • Road safety assessment of key haulage routes • Impacts on road networks and need for improvements • Proposed road and intersection treatments • Local climate conditions and road safety • Internal road and parking layouts • Impact on rail corridors and level crossings • Impact on public transport • Impacts on the function and integrity of public roads • Controls for transport and use of any dangerous goods • Details of any infrastructure crossings on classified roads • Adequacy of existing transport infrastructure in the area • ARTC as a potential stakeholder
	Oct 2022	Email & phone	Traffic consultant (Amber Org) engaged with TfNSW in relation to inputs, traffic counts and clarifications on SEARs / Agency Advice. *Feedback incorporated into Traffic Impact Assessment.*
Elected Representatives			
Federal MP for Parkes – Mark Coulter	Oct 2022 and Feb 2023	Email	Project updates and fact sheet provided via email. Oct 2022 included Invitation to Community Information Sessions. *Meeting organised to discuss Project following provision of October information. No response to Feb update.*
	Dec 2022	Virtual presentation	Project introduction and update provided virtually. Discussion on the need for firming and the role of gas in energy market and to support industry. *Supportive of the Project.*
State MP for Dubbo – Dugald Saunders	Oct 2022 and Feb 2023	Email	Project updates and fact sheet provided via email. Oct 2022 included Invitation to Community Information Sessions.
	Oct 2022	Face to Face	Project introduction and update provided. *Supportive of the Project.*

Stakeholder	Date	Method	Feedback / Outcome
	Jan 2023	Media / Site Visit	Media release from MPs office including site visit with Proponent following State funding for Dubbo Green Energy Hub with the Project providing firming and hydrogen to the Hub.
DRC Councillors	Nov 2021	Virtual presentation	Presentation to Councillors introducing the Project. *Feedback on use of local workforce and ability to accommodate workers.*
	Mar 2022	Face to Face	Meeting with Mayor to introduce Project (following election) *Feedback on the conflict of land use for energy developments and agriculture – particular in the Wellington region where solar farms are located. Supportive of the Project.*
	Oct 2022	Presentation (person)	Presentation to Councillors providing update on Project and providing Community Information Session briefing and flyer for circulation as required. *Key feedback relation to the role hydrogen can play in the region.*
Indigenous and Cultural Heritage			
Tubba-Gah Wiradjuri Aboriginal Corporation	Aug 2022	Virtual Meeting	Project introduction via REZ working group and upcoming ACHA for Project.
	Aug 2022	Email	Expression of Interest to participate in ACHA provided to stakeholders. *Participation in ACHA confirmed by stakeholder*
	Sep 2022	Email	ACHA methodology provided for review. *No response received.*
	Oct 2022	Email and Site Visit	Invite to participate in Site Survey for ACHA *Invite accepted and representative participated in site survey*
	Dec 2022	Email / Letter	ACHA provided for review *No feedback received.*
	Oct 2022 and Feb 2023	Email	Project updates and fact sheet provided via email. Oct 2022 included Invitation to Community Information Sessions. *No Project related feedback received to date*
Dubbo Local Aboriginal Land Council	Aug 2022	Virtual Meeting	Project introduction via REZ working group and upcoming ACHA for Project.
	Aug 2022	Email	Dubbo LALC provided with request for identification of potential Aboriginal parties to participate in the ACHA for the Project.

Stakeholder	Date	Method	Feedback / Outcome
			Dubbo LALC provided details of 2 potential Aboriginal stakeholders
	Aug 2022	Email	Expression of Interest to participate in ACHA provided to stakeholders. *Participation in ACHA confirmed by stakeholder*
	Sep 2022	Email	ACHA methodology provided for review. *No response received.*
	Oct 2022	Email and Site Visit	Invite to participate in Site Survey for ACHA *Invite accepted and representative participated in site survey*
	Dec 2022	Email / Letter	ACHA provided for review *No feedback received.*
	Oct 2022 and Feb 2023	Email	Project updates and fact sheet provided via email. Oct 2022 included Invitation to Community Information Sessions. *No Project related feedback received to date*
Office of the Registrar Aboriginal Land Rights Act 1983	Aug 2022	Email	Office provided with request for identification of potential Aboriginal parties to participate in the ACHA for the Project. *Office of the Registrar responded confirming no registered Aboriginal owners for the land*
National Native Title Tribunal	Aug 2022	Email	Tribunal provided with request for identification of potential Aboriginal parties to participate in the ACHA for the Project. *Response received confirming Tribunal doesn't provide details of Aboriginal stakeholders*
Central West Local Land Services	Aug 2022	Email	Provided with request for identification of potential Aboriginal parties to participate in the ACHA for the Project. *No response received*
NTSCorp Ltd	Aug 2022	Email	Provided with request for identification of potential Aboriginal parties to participate in the ACHA for the Project. *No response received*
Registered Aboriginal Stakeholder/Participants for ACHA	Aug 2022	Email / Letter / Public Notice	Expression of Interest to participate in ACHA emailed or posted to 31 potential Aboriginal parties. Expression of Interest also included as a Public Notice in Daily Liberal.

Stakeholder	Date	Method	Feedback / Outcome
			10 responses to participate received.
	Sep 2022	Email	ACHA methodology provided for review. *No response received.*
	Oct 2022	Email and Site Visit	Invite to participate in Site Survey for ACHA *Invite accepted and representative participated in site survey*
	Dec 2022	Email / Letter	ACHA provided for review *No feedback received.*
Landowners and residents			
Landowners/occupiers	Oct 2020 - Now	Phone, Email, Face to Face, letters	Regular engagement with landowner in relation to the siting of the Project, entering into commercial agreements and ongoing land access. Landowner is also a large industrial enterprise, and a large employer in Dubbo. Key items of feedback provided to date include: • Need for reliable energy supply in the area to industry – firming makes sense in the area, particularly with new renewable energy generation • Labour shortages in the region to support their operations • Accommodation shortages in the region for attracting labour to the region and their operations • Water offtake to the Project from their existing industrial water licence/entitlement
Near neighbours	Oct 2022	Letter, Fact Sheet	Letter box drop (125 properties) with invitation to Community Information Sessions and provision of Project fact sheet. *No Project related feedback received to date*
Business, Industry & Special Interest Groups			
Dubbo Chamber of Commerce and Industry	Oct 2022 & Feb 2023	Email	Project updates and fact sheet provided via email. Oct 2022 included Invitation to Community Information Sessions for on passing to members (if appropriate) *No Project related feedback received to date*
Cyclist groups – Dubbo Cycle Club	Dec 2022	Phone, Email	Project information and update provided to Cycling Club. Cycling Club President confirmed Yarrandale Road is part of the town circuit regularly used by cyclists. Indicative volumes, dates and times provided to support the traffic assessment. *Feedback included in traffic assessment.*

Stakeholder	Date	Method	Feedback / Outcome
Infrastructure and Utilities Providers			
APA Group	Oct 2020 – Now	Phone, email, virtual meetings, site visits.	Proponent and APA Group in regular contact in relation to new gas connection and gas volumes. *Commercial agreement in place between parties for gas supply to the Project.*
Jemena	Dec 2021 – June 2022	Phone, email, virtual meetings	Project introduction and estimations of hydrogen blending capable in the Jemena network for planning and design purposes. *Project to engage further with Jemena if hydrogen blending in the network is to be further progressed.*
Essential Energy	Oct 2020 – Now	Phone, email, virtual meetings.	Proponent and Essential Energy in regular contact in relation to grid connection and augmentation requirements. *Commercial agreement in place between parties for electricity connection to the Project.*
Dubbo Regional Council (Water supply)	Aug 2022 – Now	Virtual Meeting, Email	Meeting with Dubbo Regional Council in relation to water quality and volumes available for the Project. *Water mains and recycled water available, water quality specifications shared with Proponent.*
Telstra	Oct 2022	DBYD, Email	Dial before you dig (DBYD) and initial enquiry with Telstra in relation to communications available in Yarrandale Road. *Communication infrastructure in Yarrandale Road available, future connection enquiry to be made.*

5.7.2 Community Consultation

Several channels of communication are available for community members and interested parties to seek information or provide feedback on the Project from the Proponent including consultation via the Project's website, the Project email address or the Project phone number.

Direct opportunities for community members to engage with the Proponent and to provide feedback on the Project and its potential impacts as considered in the EIS was held in Dubbo on 8 and 9 November 2022. Community Information Sessions were held at the Dubbo Zoo on the evening of the 8th and at the Dubbo RSL on the early afternoon of the 9th.

Promotion of the Community Information Sessions was via notices in local distributing newspapers (Daily Liberal and Dubbo Photo News) in the week(s) prior. Further, on 25 and 26 October 2022, the Project completed a letterbox drop of invites to businesses and residents within a 2km radius of the Project Site, as well as delivering fact sheets and information to community spaces.

A Project representative travelled throughout Dubbo and surrounds to ensure that invitations were delivered to as many community members within the 2km radius. For non-business properties (i.e., rural residential properties or properties with dwellings), an invitation and a project fact sheet were hand delivered to the property letterbox (where available). For businesses or industries that did not have a letterbox present or accessible, the invitation and fact sheet was hand delivered to the business reception or an available business representative. During face-to-face hand delivery of invitations to business representatives, there

were two instances where the Project representative was asked for more information, and they were directed to the website or the Project fact sheet.

Approximately 125 residents and businesses were provided with an invitation either face-to-face or via letterbox drop. This number includes residents and businesses within the 2km radius of the Project site and property parcels that may be bordering the edge of the 2km radius.

In addition to the 125 invitations delivered, the Project representative attended Dubbo College (Senior Campus) and provided A4 Project fact sheets, community drop-in session invites and an A3 Project fact sheet for teachers and staff to share with interested students and the school community. Dubbo Charles Sturt University was also provided A4 fact sheets, community drop-in sessions and A3 fact sheets – these were distributed by the Project representative around the University Library and the University notice board for interested students.

Additionally, the Project representative attended local shopping centres in Dubbo (Bultje Street) to distribute A3 fact sheets. One A3 fact sheet was pinned to the Community Notice Board at Dubbo Square Shopping Centre, and one A3 fact sheet was attached to the window of the Woolworths Shopping Centre carpark.

The Community Information Sessions were attended by ten (10) community representatives and their feedback is summarised in Table 5.4 below.

Table 5.4 – Sumary of Feedback from Community Sessions

No	Stakeholder Type	Interest	Feedback / Comments
1	Community Member	Renewable Energy General project understanding Aboriginal heritage interest	Discussion relating to the aboriginal heritage assessment that took place, and how it linked to his understanding of the project area.
2	Community Member	Renewable Energy General project understanding Use/loss of agricultural land	No Project related feedback. General interest in renewable energy projects and climate change. Discussion on solar farms and loss of agricultural land.
3	Community Member	Renewable Energy General project understanding	No Project related feedback. General interest in renewable energy projects and climate change.
4	Community Member	Renewable Energy General project understanding	No Project related feedback. General interest in renewable energy projects, storage and climate change
5	Community Member	General Project understanding Use of methane/biofuels Emissions	No feedback or concerns raised, focus was to understand use of gas/fuel at site and aspirations for zero emissions. Former DRC employee managing waste (including landfill and capture of landfill gas)
6	Federal Government Agency – Local Jobs Program	General Project understanding Jobs and Training - opportunities across Squadron Energy	No concerns raised – interest in training and employment opportunities to maximise local participation and building workforce capability.
7	Local Contractor/Supplier	General Project understanding Contracting opportunities Application of hydrogen	Interested in project, timing of construction, and contracting opportunities. Contractor is also looking at the use of hydrogen blending in their equipment.

No	Stakeholder Type	Interest	Feedback / Comments
8	Local Contractor/Supplier	General Project understanding Contracting opportunities	Interested in project, timing of construction, and contracting opportunities. Discussion focussed on electrical works.
9	Local Contractor/Supplier	General Project understanding Equipment supply opportunities	Interested in project, timing of construction, and equipment supply opportunities.
10	Community Member NSW Agricultural Lands Rep	General Project understanding Use/loss of agricultural lands	Key interest was in relation to project location and its impact to agricultural land uses.

5.8 Issues Raised During Stakeholder Consultation

During consultation activities described in Section 5.7, the key feedback received by the Proponent during consultation activities is described below including how feedback has been incorporated into the Project and the EIS:

Heritage: Comments received regarding the ability to avoid significant cultural heritage values by the Project (i.e., axe grinding groove rock).

Impacts to Cultural Heritage are described in the ACHA prepared in consultation with relevant registered Aboriginal parties. Impacts to significant cultural heritage values (i.e., axe grinding groove rock) have been avoided by the Project through the storage pipeline being confined to the Project site and not traversing to east of Yarrandale Road. See Chapter 8.

Biodiversity Loss: General comments made by stakeholders regarding the biodiversity impacts of the Project.

Impacts to biodiversity are described in the BDAR prepared for the Project. Impacts to biodiversity values (i.e., native vegetation, listed communities and orchids) have been avoided by the Project confining the storage pipeline to the Project site and by not traversing to the east of Yarrandale Road. See Chapter 7.

General Construction Impacts: Requests for further details and mitigation of potential impacts such as blasting, lighting, visual, noise and dust and how this may affect the function and integrity of public roads.

The Project will prepare a Construction Environmental Management Plan prior to the commencement of construction incorporating mitigation measures as committed to in the EIS to ensure impacts through construction are minimised as much as possible. See Chapter 18.

Water supply: Queries about the details of volumes and availability of water required for the Project.

The Proponent has engaged with the Dubbo Regional Council and other large industrial water users in the North Dubbo area in relation to securing suitable water supply for the Project. The Proponent has also engaged with Dubbo Regional Council and participated in their drought resilience strategy. See Chapter 10.

Local workforce availability: Queries around the use of local contractors and workers and the ability to source local labour.

The Project will continue to consult and liaise with large employers in the region and Dubbo Regional Council to minimise impacts to labour force shortages. See Chapter 15.

Local accommodation availability: Queries around the availability of accommodation and the potential impacts to short term rental and tourist accommodation in Dubbo and the region.

The Project will consult and liaise with the local accommodation providers, large employers in the region and Dubbo Regional Council to minimise impacts to short term rental and tourist accommodation having regard to a broader Workforce Accommodation Strategy across Squadron Energy Projects in the Central West Orana REZ. See Chapter 15.

Biofuel sources: the types and sources of biofuel to be used by the Project and application of the EfW Regulation.

The Project will source biofuels that are eligible waste fuels in accordance with relevant regulations and guidelines. See Chapter 3.

Greenhouse gas and air emissions: Queries in relation to greenhouse gas emissions and the ability to remove carbon from the Project.

Greenhouse gas and air emissions have been considered in an Air Quality Impact Assessment. Emissions will be in accordance with relevant regulations and guidelines. The ability to remove carbon from the Project and be fuelled by hydrogen is desired but will be subject to commercial and further technology advances to support.

Use of Fossil Fuels: Queries in relation to the use of natural gas and/or petroleum by the Project.

The Project will utilise hydrogen generated at the site to blend with natural gas to reduce the volumes of natural gas. Higher blends will be progressed once hydrogen and turbine technologies mature. The Project is also seeking to source biomethane derived from agricultural wastes (or other eligible waste fuels) as an alternative to conventional natural gas. See Chapter 18.

Loss of agricultural land: Comparisons were made to solar farms and loss of agricultural land.

The Project is confined to a 13.9 ha site, with the total subject land impacted by the Project being 14.1 ha. The Project is in an industrial zoned area that is currently subject to subdivision and development. The Project represents a small loss of agricultural land (based on current land use) of which would be subject to future industrial development.

Hazards and Risk: Potential hazards or risks in generating a storing hydrogen at the Project site.

A Preliminary Hazard Assessment (PHA) has been undertaken for the Project, including hydrogen generation and storage. The PHA determined that the Project presents little risk to the community. See Chapter 9.

6 ENVIRONMENTAL IMPACTS

6.1 Overview

A preliminary environmental assessment for the Project was undertaken and documented in a Scoping Report (MVC Services, December 2021) and a Revised Scoping Report (MVC Services, November 2022) that supported the application to the Department of Planning and Environment for SEARs.

Final SEARs were issued to the Project on 21 November 2022.

In accordance with the SEARs, specialist assessments have been undertaken in respect of the following environmental factors:

Table 6.1 – Specialist Assessment Index

Specialist Assessment	Where in the EIS
Biodiversity	Appendix B Chapter 7
Aboriginal and Non-Aboriginal Cultural Heritage	Appendix C and Appendix D Chapter 8
Preliminary Hazard Analysis	Appendix E Chapter 9
Bushfire Risk Assessment	Appendix G Chapter 9
Plume Rise Assessment	Appendix F Chapter 9
Land and Water	Appendix H Chapter 10
Air Quality	Appendix I Chapter 11
Noise and Vibration	Appendix J Chapter 12
Transport	Appendix K Chapter 13
Visual Impact	Appendix L Chapter 14
Socio-Economic	Appendix M Chapter 15
Waste	Chapter 16

Each of the following chapters in the EIS has been prepared in response to the SEARs, to address those requirements and to identify and list the recommended measures to avoid or mitigate any environmental impacts that may arise during the Project's construction and operation.

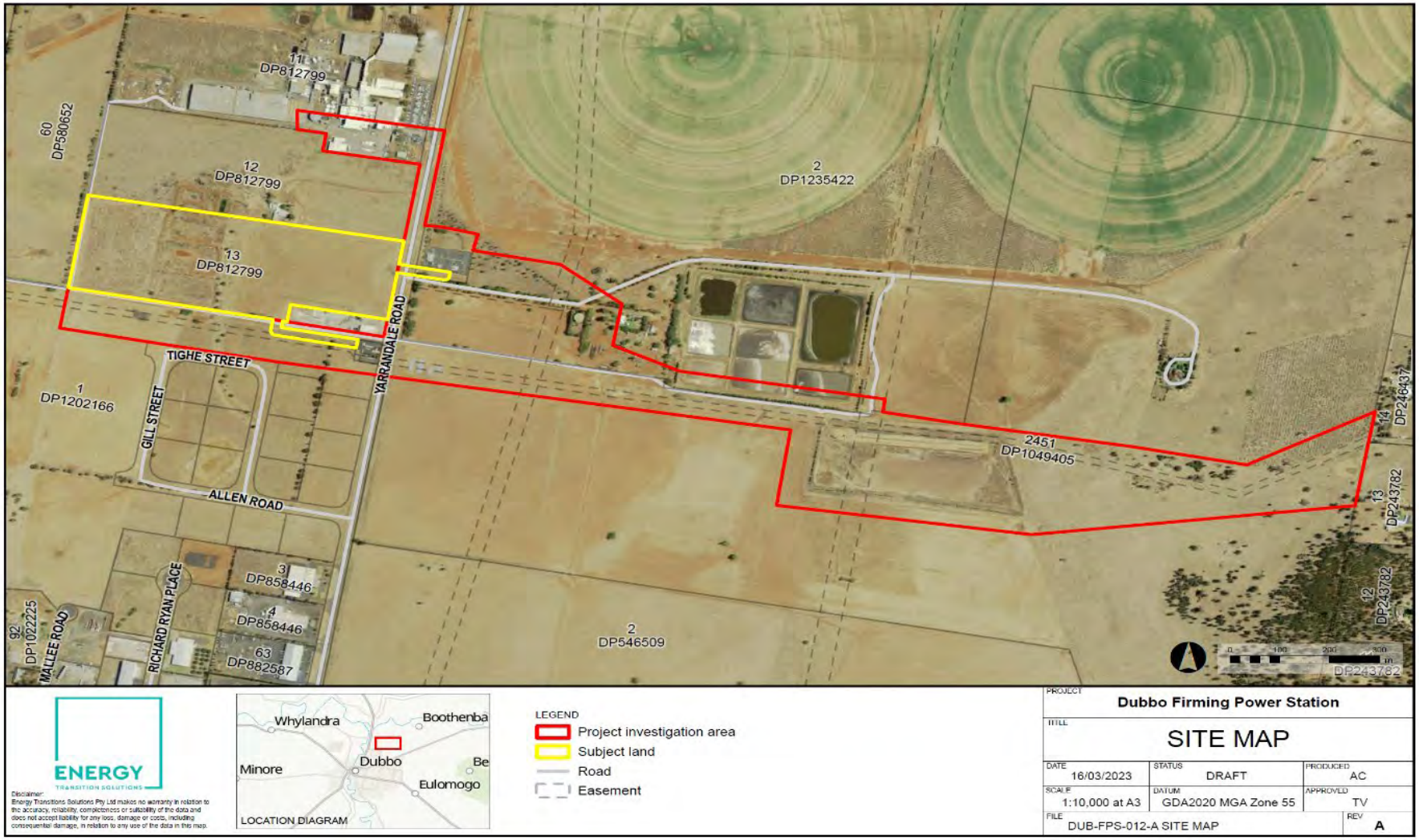
6.2 Study Area and Project Investigation Area

The primary study area for the specialist assessments referred to above comprises 14.1 hectares which includes the Project site at 28L Yarrandale Road Dubbo (Lot 13 DP812799) together with a 10 metre easement either side of the proposed gas and electricity points on immediately adjacent land parcels (partial Lot 208 DP1276395 and Lot 2510 DP876959) (**Subject Land**).

The Subject Land is marked in yellow in Figure 6.1 below.

In addition to the Subject Land, certain specialist impact assessments (such as the biodiversity, land and water and cultural heritage assessments) also considered a broader project investigation area which included an approximately 2.5 km linear storage pipeline corridor to the east of the Project site which was offset from the alignment of the existing CRP. This additional area was earmarked for an alternate pipeline but the preferred option for the storage pipeline is for that pipeline to be located on the Project site. This project investigation area is marked in red in Figure 6.1 below (**PIA**)**.**

Figure 6.1 – Subject Land and Project Investigation Area



7 BIODIVERSITY

7.1 Introduction

This chapter provides a summary of the potential impacts of the Project on biodiversity. A Biodiversity Development Assessment Report (BDAR) was prepared in support of the EIS to assess the Project's potential impacts on biodiversity.

This chapter and the BDAR in Appendix B (Biodiversity Development Assessment Report, Premise Australia, December 2022) address the Project's potential impact on biodiversity in response to the SEARs.

7.1.1 Assessment Methodology

7.1.1.1 Desktop Study

A desktop assessment was initially carried out to understand mapped and historical information at the Project site and surrounding areas.

Desktop studies and literature reviews were undertaken to identify:

- Landscape features
- Plant Community Types
- Threatened Flora
- Threatened Fauna

7.1.1.2 In-field Surveys

A reconnaissance field survey was conducted on 3 August 2022 to map vegetation on site and identify and confirm landscape features. The survey included:

- identifying vegetation types, dominant canopy, mid-storey and groundcover species
- vegetation formation and class in accordance with Keith (2004)
- landform and landscape type
- weed species and high-threat weeds or priority weeds
- soil characteristics
- evidence of previous disturbance
- photographic evidence
- opportunistic observations of fauna species and fauna habitat

Further field surveys were conducted for threatened flora species on 23 September, 11 October and 22 November 2022 in accordance with the requirements set out in:

- BAM 2022
- NSW Surveying Threatened Plants and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method (Threatened Flora Survey Guidelines) (DPIE 2020d)

The Subject Land excludes almost all native vegetation except for a small patch of native grassland and some planted native trees in an area with regenerating ground layer. Due to the absence of remnant woodland and fauna species habitat in the study area, it was unnecessary to conduct field surveys for fauna species.

7.1.1.3 Native Vegetation and Vegetation Integrity

Native vegetation extent in the PIA was mapped using the latest available aerial imagery and digitised using GIS. A landscape buffer of 1500 metres was applied to the edge of the PIA.

The initial vegetation maps were ground-truthed in the field in August, September, October and November 2022.

Native vegetation within the broader 1,500m buffer PIA was identified using Google Satellite imagery and State Vegetation Type Mapping (Central West Lachlan Region) (NSW Government 2022l). The total area of native vegetation in the PIA was calculated using GIS.

7.2 Existing Environment

7.2.1 Native Vegetation Extent and Vegetation Integrity

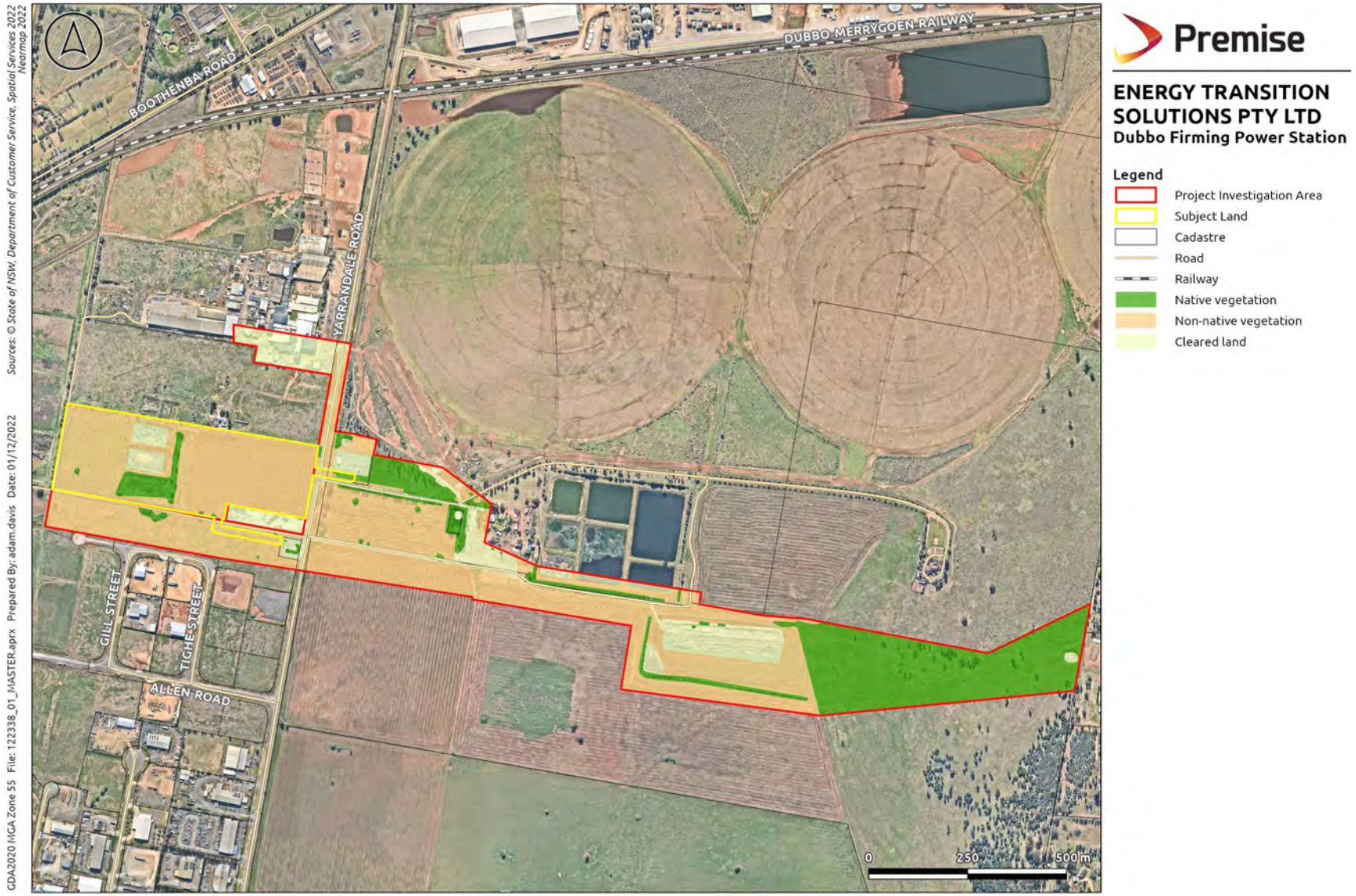
The Subject Land is 14.1 hectares and comprises:

- Native Regeneration (1.02 hectares)
- Native Grassland (0.12 hectares)
- 3 Planted Trees (0.06 hectares)

The remaining 12.9 hectares includes exotic grasslands (11.96 ha), infrastructure such as roads and dams (0.91 ha) and exotic planted vegetation (0.04 ha).

This is set out in Figure 7.1 below.

Figure 7.1 – Native Vegetation Extent



7.2.2 Threatened Flora and Ecological Communities

7.2.2.1 Plant Community Types

Plant Community Types (**PCTs**) on the Subject Land were determined according to BAM Section 4.2 (DPIE 2020a). Two PCTs were identified on the Subject Land through desktop and infield survey work. These are set out in Table 7.1 below.

Table 7.1 – PCTs identified within the Subject Land

PCT ID	PCT name
78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion/Brigalow Belt South Bioregion
267	White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion

PCT 78 is not aligned with any Threatened Ecological Communities (TECs) under the BC Act or with any environmental communities under the EPBC Act.

PCT 267 is aligned with White Box –Yellow Box –Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DNG) Critically Endangered Ecological Community (CEEC) listed on the BC Act (DPE 2022a). The vegetation in PCT 267 is Box Gum Woodland CEEC under the BC Act as the Final Determination for the listing refers to an assemblage of species, which includes White Box trees (TSSC 2011).

PCT 267 is aligned with White Box –Yellow Box –Blakely's Red Gum Grassy Woodland and DNG Critically Endangered Ecological Community listed on the EPBC Act (DPE 2022a). However, the patch of PCT 267 DNG on the Subject Land does not conform to the EPBC Act criteria because it only supports eight non-grass native ground cover species, is less than 2 ha in size and does not contain mature trees or regeneration.

A summary of the PCTs, vegetation zones and TECs identified on the Subject Land is set out in Table 7.2 below.

Table 7.2 – Summary of PCTs and TECs on Subject Land

Vegetation Zone	PCT No	PCT Name	TEC	Condition	Area on Subject Land (ha)
1	78 Planted	River Red Gum Riparian Tall Woodland/Open Forest Wetland	Not applicable	Regenerating	1.02
2	267 Derived Native Grassland	White Box – White Cypress Pine – Western Grey Box shrub/grass/forb woodland	CEEC	Degraded	0.12
3	Exotic Grassland	Non native	Not applicable	Very poor condition	11.96

7.2.2.2 Candidate Threatened Flora Species

Six candidate threatened plant species (species credits) were identified as having potential habitat within the PIA by the Biodiversity Assessment Method Calculator (BAM-C) and a review of databases and the species were targeted by the survey. A summary of these species together with the survey effort is set out in Table 7.3.

Table 7.3 – Summary of Threatened Species Surveys and Presence on Subject Land

Common Name	Scientific Name	Threatened Flora Species Surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey Method	Timing within recommended period? Yes/No	Effort (hours & no. of people)		
Bluegrass	*Dichanthium setosum*	Transects	Yes	3 people, 2 hours each	No	No
Pine Donkey Orchid	*Diuris tricolor*	Transects	Yes	3 people, 2 hours each	No	No
Leafless Indigo	*Indigofera efoliata*	Transects	Yes	3 people, 2 hours each	No	No
Scant Pomaderris	*Pomaderria queenslandica*	Transects	Yes	3 people, 2 hours each	No	No
Slender Darling-pea	*Swainsona murrayana*	Transects	Yes	3 people, 2 hours each	No	No
Small Purpose-pea	*Swainsona recta*	Transects	Yes	3 people, 2 hours each	No	No
Silky Swainson-pea	*Swainsona sericea*	Transects	Yes	3 people, 2 hours each	No	No

7.2.3 Fauna

Habitat assessment surveys were undertaken in August, September and October 2022 to record and analyse fauna habitat features over the Project Investigation Area which included:

- Live and dead paddock trees
- Flowering eucalypts
- Koala feed species
- Trees with hollows ranging from 5cm – 30cm in diameter, greater than 4 metres off the ground
- Water course and dams
- Areas of native speargrass

Further work was not conducted due to the exclusion of remnant woodland and fauna species habitat from the Subject Land.

7.3 Impact Assessment – Construction

7.3.1 Direct Impacts

The potential for direct impacts to biodiversity is limited to clearing of native vegetation and habitat. The Project 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.

The Project infrastructure and preferred storage pipeline has been designed to avoid sensitive native vegetation and potential threatened species habitats in the PIA. The Project has also been designed to make efficient use of the land, to reduce the area to be cleared and to minimise impacts. After avoidance and minimisation of impacts have been implemented in the Project design phase, there would be limited clearing of:

- a small patch of DNG of PCT 267 on the eastern side of the site
- scattered trees (planted) and regenerating groundcover associated with PCT 78

The Project would result in the removal of three planted native trees from the Subject Land. Examples of PCT267 DNG and Scattered Trees are set out below.

7.3.2 Indirect Impacts

Indirect impacts include edge effects, noise and vibration impacts, dust pollution, light pollution, contaminant pollution and the hot exhaust plume. None of these are considered to have more than a negligible localised impact on flora and fauna due to the lack of, or no, habitat features in the vicinity of the Subject Land.

7.3.3 Serious and Irreversible Impacts

The Box-Gum woodland was identified as a candidate species for serious and irreversible impacts (SAII) as per Section 9.1 of the BAM. A detailed assessment was conducted that addressed the criteria in Section 9.1.2 of the BAM. The assessment is provided in Section 9 of the BDAR (see Appendix B of the EIS) and concluded that the Project was unlikely to result in a significant impact on this species.

7.3.4 Prescribed Impacts

There are no prescribed impacts identified for the Project.

There are no karst, caves, crevices, cliffs, rocks or other geological features. There will be no increased incidence of vehicle strike, no human-made structures will be removed, non-native vegetation will not impact any candidate threatened species, the Project will not affect connectivity, and there will be no waterbodies removed, and no wind turbines.

7.3.5 Cumulative Impacts

There is negligible cumulative impacts to biodiversity due to the low biodiversity value of the Subject Land and the fact that the Project will not affect connectivity of vegetation or habitats.

7.4 Impact Assessment – Operation

The operation of the Project is unlikely to impact biodiversity values save for some localised light spill during operation which can be appropriately managed by the use of low intensity lighting which is directed and shielded.

No cumulative impacts are anticipated from the operation of the Project.

7.5 Mitigation Measures

7.5.1 Recommended Mitigation Measures

Once all practicable steps to avoid or minimise impacts have been implemented during the detailed design phase of the Project, mitigation measures would be implemented during construction and operation to further lessen the potential ecological impacts of the Project.

Mitigation measures to manage potential biodiversity impacts of the Project's construction and operation are summarised in Table 7.4 below.

Table 7.4 – Proposed Mitigation Measures

Reference	Mitigation Measure	Timing
BD1	Dust suppression – use of dust barriers around construction area and using dust suppression measures outlined in mitigation measures for Air Quality (Chapter 11) and Land and Water (Chapter 10)	Construction

Reference	Mitigation Measure	Timing
BD2	Noise management – construction to be restricted to recommended standard hours as per EPA Draft Construction Noise Guidelines (NSW EPA 2020)	Construction
BD3	Light spill management – use of warm coloured light bulbs, directional lighting below the horizontal plane, shielding of lights, use of low-reflective materials throughout the Project	Construction and Operation

7.5.2 Biodiversity Offsets

The Biodiversity Offsets Scheme is a framework to avoid, minimise and offset impacts on biodiversity from development and clearing, and to ensure land that is used to offset impacts is secured in-perpetuity. Ecosystem credits are generated from management actions that improve biodiversity values and are used to offset the loss of biodiversity values on development sites.

Table 7.5 sets out the impacts of the Project that require an offset.

Table 7.5 – Impacts the require and offset – ecosystem credits

Vegetation Zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits
Derived Native Grassland	267	Box-Gum Woodland	0.12	2
Scattered Trees	78		0.04	3
Total Credits				5

8 CULTURAL HERITAGE

8.1 Introduction

This chapter provides a summary of the existing cultural heritage values as they relate to the Project and presents the findings from the Aboriginal Cultural Heritage Assessment (**ACHA**) and the Historical Cultural Heritage Assessmentundertaken for the Project.

This chapter, the ACHA in Appendix C (Aboriginal Cultural Heritage Assessment, Landskape, March 2023) and the Historical Cultural Heritage Assessment in Appendix D (Landskape, March 2023) address the Project's impact on Cultural and Historical Heritage.

8.1.1 Assessment Methodology

8.1.1.1 Overview – ACHA

The Aboriginal cultural heritage assessment has been completed in accordance with the following guidance documentation:

- Aboriginal cultural heritage consultation requirements for proponents 2010 (Part 6 National Parks and Wildlife Act 1974) (NSW Department of Environment, Climate Change and Water [DECCW] 2010a) (**Consultation Guidelines**)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b (**Code**))
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (NSW Office of Environment and Heritage [OEH] 2011)
- The Australia International Council on Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 2013)
- NSW National Parks and Wildlife Service Aboriginal Cultural Heritage: Standards and Guidelines Kit (NSW National Parks and Wildlife Service 1997)
- Ask First; A Guide to Respecting Indigenous Heritage Places and Values (Australian Heritage Commission 2002)

The assessment methodology was developed to determine the presence or absence of items of heritage value or places of significance.

Based on the Code and applicable guidelines, assessment involved developing an understanding of landscape and heritage context via:

- literature review
- consultation with members of the local Aboriginal community with connection to country; and
- in-field assessment of the PIA.

8.1.1.2 Infield Survey

The methodology for the in-field assessment undertaken for the Project was developed with the following objectives:

- to define cultural values in the PIA through the engagement with the local Aboriginal community
- to delineate areas of known and predicted cultural heritage potential within the PIA

- to determine the presence/absence of known and predicted aboriginal cultural heritage with representatives of the local Aboriginal Community
- to record any Aboriginal cultural heritage sites present within the PIA
- to identify the nature and extent of any potential impact on Aboriginal Cultural Significance; and
- to develop pragmatic management measures to avoid or minimise impact on identified places, sites or items of Aboriginal cultural heritage in consultation with members of the local Aboriginal Community.

8.1.1.3 Overview – Historical Cultural Heritage

The historical cultural heritage assessment has been completed in accordance with the following guidance documentation:

- Historical Archaeology Code of Practice (NSW Heritage Office 2006)
- NSW Heritage Manual (NSW Heritage Office, 1996)
- Assessing Significance for Historical Archaeological Sites and 'Relics' (NSW Heritage Branch 2009)
- The Australia International Council on Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 2013)

8.1.1.4 In-Field Survey

The archaeological field survey was based on the sampling strategy developed in accordance with the Historical Archaeology Code of Practice (NSW Heritage Office 2006) and NSW Heritage Manual (NSW Heritage Office 1996) and outlined in Section 6.2.2 of the Historical Cultural Heritage Assessment.

The objective of the field survey was to identify sites of historical cultural significance within the PIA.

8.1.2 Consultation and Engagement

8.1.2.1 Overview

Consultation with Aboriginal people and stakeholder organisations has been undertaken and documented in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010) and Ask First; A Guide to Respecting Indigenous Heritage Places and Values (Australian Heritage Commission 2002).

8.1.2.2 Registered Aboriginal Parties

The Proponent and the Project consultants have undertaken extensive consultation with interested Aboriginal Parties in relation to the planning and development of the Project.

In accordance with Section 4.1.2 of the Consultation Guidelines, notifications regarding the Project were sent to relevant statutory agencies on 8 August 2022.

Responses to the Project notifications were received from the following organisations:

- Heritage NSW - 12 August 2022
- Dubbo Local Aboriginal Land Council (LALC) - 10 August 2022; and
- Office of the Registrar, Aboriginal Land Rights Act 1983 - 12 August 2022.

In accordance with Sections 4.1 and 4.2 of the Consultation Guidelines, all individuals and organisations identified through the initial correspondence were contacted in writing on 24 August 2022 and were invited to register an interest in the Project and participation in the ACHA.

An advertisement inviting the registration of Aboriginal persons or groups who hold cultural knowledge relevant to, or who have a right or interest in, determining the cultural heritage significance of Aboriginal object(s) and/or place(s) in the PIA was published in the Dubbo Daily Liberal newspaper on 24 August 2022.

Ten organisations and individuals nominated as registered Aboriginal parties for the Project.

A copy of the list of the registered Aboriginal parties for the Project was provided to Heritage NSW and Dubbo LALC on 27 September 2022 in accordance with Section 4.1.6 of the Consultation Guidelines.

8.1.2.3 Presentation of Information

Information regarding the Project was provided in writing to the registered Aboriginal parties on 9 September 2022. The correspondence included a copy of the Proposed Methodology provided for review and comment. It also included an invitation to attend the field survey for the Project and input was sought regarding the following aspects:

- the nature of the Proposed Methodology
- any Aboriginal objects or places of cultural value within the PIA, or issues of cultural significance
- any restrictions or protocols considered necessary in relation to any information of sensitivity that may be provided; and
- any other factors considered to be relevant to the heritage assessment.

The period for commenting on the Proposed Methodology was open between 9 September 2022 and 7 October 2022. No comments to change or improve the Proposed Methodology were received and the in-field survey was completed as outlined in the Proposed Methodology.

8.1.2.4 Field Survey

All registered Aboriginal parties were invited to provide a representative for involvement in the field survey for the Project.

Eight representatives responded and participated in the survey on 18 October 2022.

8.1.2.5 Aboriginal Community Information about Cultural Significance

As part of the review of the Proposed Methodology and during the field survey, the registered Aboriginal parties were asked to contribute their knowledge on the Project area and surrounds.

This information contributed to the assessment of the cultural heritage significance of the Project.

8.1.2.6 Review of the draft ACHA

A draft of the ACHA was provided to all registered Aboriginal parties for their review and comment on 29 November 2022 in accordance with Sections 4.3 and 4.4 of the Consultation Guidelines.

No comments were received by the closing date of 10 January 2023.

8.2 Existing Environment

8.2.1 Environmental Context

8.2.1.1 Geology, Landforms and Vegetation

The PIA is in the central western slopes of the Murray-Darling Basin (Brown and Stephenson 1991). It lies within an area bounded to the west by the floodplain of the Macquarie River and low hills of Jurassic Pilliga Sandstone to the east. It is approximately 1500m east of the stream course of the Macquarie River. The

surface geology of the PIA is weathered Tertiary basalt, with the Option 2A pipeline area extending east into Pilliga Sandstone.

The PIA is located on a gently undulating plain of Tertiary basalt, part of the Wongarbon soil landscape (Murphy and Lawrie 1998). The Wongarbon soil landscape typically comprises gently undulating rises and low hills with some stony hillocks. Soils are Red and Brown Cracking Clays (Murphy and Lawrie 1998). The original eucalypt woodland vegetation has been cleared from the PIA, which now comprises exotic pasture and weed species in the western portion and a broad acre cereal crop in the west.

The Option 2A pipeline rises east onto low bedrock hills of Pillaga Sandstone, part of the Goonoo soil landscape (Murphy and Lawrie 1998). The Goonoo soil landscape comprises undulating to stepped low hills at general elevations 300 to 500m. Soils are Stony Yellow Earths with sandstone outcrop on ridgelines to Yellow Harsh Texture-Contrast soils in shallow valleys. The Option 2A pipeline is cleared with a broad acre cereal crop in the west and native grassland vegetation in the east.

8.2.1.2 Land Use History

The environments of the PIA have been extensively modified by past European land use practices. The entire area has been previously cleared of the original vegetation and used for sheep and cattle grazing and agricultural cropping following European settlement in the second half of the nineteenth century. Extensive earthworks have occurred in the western parts of the PIA during past soil stripping and excavations to previously construct existing dams. Broad acre cereal crops are cultivated over the remainder of the PIA and the Option 2A pipeline corridor. Grazing pasture occurs at the eastern end of the Option 2A pipeline corridor.

8.2.2 Cultural Heritage Context

Aboriginal people of the Wiradjuri language group occupied the central western slopes of NSW at the time of first contact with Europeans (Sturt 1833; Hovell and Hume 1837; Mitchell 1839; Tindale 1974). The Wiradjuri were traditionally associated with the region encompassing the Macquarie, Lachlan and Murrumbidgee Rivers and bounded in the south by the Murray River.

The Wiradjuri were hunter-fisher-gatherers and appear to have had a semi-sedentary lifestyle. They caught fish including eels, freshwater crayfish, yabbies, tortoises and freshwater mussels in the Lachlan, Macquarie, Murrumbidgee and Murray Rivers and other streams and wetlands in the region (Howitt 1904). Watercraft were manufactured from large slabs of bark cut from River Red Gum trees. Fish were caught using fishing lines and nets made from reed fibre.

Within a decade of the first contact with Europeans, many of the Wiradjuri around Dubbo were living adjacent to pastoral homesteads, often working as shepherds or engaged in other labouring activities (Günther, 1837-1842; Potts 1984). Those Aboriginal people who resided on pastoral holdings on the central western slopes including Dubbo Station continued to live a semi-traditional existence into the second half of the nineteenth century (Günther, 1837-1842). This included collecting plant and animal foods to supplement station rations. Historical sources record a rapid decline in Wiradjuri numbers, caused by the dispossession of land and the consequent destruction of habitat and social networks (Günther, 1837-1842; Pearson 1984). Diseases including smallpox and malnutrition also took their toll (Günther, 1837-1842; Pearson 1984). Traditional social networks collapsed. Other social structures, such as marriage laws, were also abandoned.

Further detail is contained in Appendix C (Aboriginal Cultural Heritage Assessment).

8.2.3 Significance Assessment

Aboriginal cultural heritage significance indicates the importance of a site or feature to Aboriginal communities. Under the Burra Charter (Australia ICOMOS 1988 1999 2013), cultural significance means aesthetic, historic, scientific, or social value for past, present or future generations. Cultural significance is a concept that helps in estimating the value of places. The places that are likely to be of significance are those that help an understanding of the past, enrich the present, and may be of value to future generations. Cultural significance is embodied in the place itself, its “fabric, setting, use, associations, meanings, records,

related places and related objects" (Australia ICOMOS 1999). The components of significance are based upon the following four values:

- aesthetic
- historic
- scientific
- social and spiritual

The significance assessment set out in Table 8.1 is based on the scientific or research value and is not based on the insight of Aboriginal people for their cultural significance assessment of these sites. The registered Aboriginal parties were requested to provide comment on the cultural significance of the PIA and the recorded sites throughout the consultation process.

The PIA has limited potential to provide archaeological information as it contains few isolated stone artefacts. The overall PIA is assessed as containing low significance due to the paucity of sites present and the way in which this information contributes to the nature of Aboriginal land use in the region.

Table 8.1 provides significance ratings for the known Aboriginal sites within the PIA.

Table 8.1 – Significance Ratings for Aboriginal objects

AHIMS Site Number	Site Name	Significance Rating for Individual Criterion				Overall Archaeological Significance Rating
		Scientific	Aesthetic	Social	Historical	
36-1-0288	Artefact Scatter Yarrandale 1	Low	Low	Low	Low	Low
36-1-0298	Axe Grinding Groove Yarrandale 2	Moderate	Moderate	Moderate	Moderate	Moderate
36-1-0788	Isolated Artefact Yarrandale Road Artefact 1	Low	Low	Low	Low	Low

8.2.4 Desktop Review

There are two previously recorded Aboriginal cultural heritage sites recorded within the Option 2A pipeline corridor on the NSW OEH Aboriginal Heritage Information Management System (**AHIMS**) database (AHIMS search 723254, 17 October 2022).

These are a single axe grinding groove (AHIMS site number 36-1-0298) and a scattered assemblage of five stone artefacts (AHIMS site number 36-1-0288).

8.2.5 Review of previous archaeological reports

An understanding of the Aboriginal archaeology of southwestern NSW has begun to emerge from several studies including some undertaken in the Dubbo area. A study by McDonald (1998) is among the most relevant and provides a summary of the regional archaeological record. McDonald (1998) documented the distribution of Aboriginal archaeological sites along the existing gas pipeline to the immediate south of the Project area and made predictions about site distribution based on observations of the landforms of the region.

McDonald's investigation involved a ground surface survey of the existing gas pipeline corridor. Her assessment identified a single axe grinding groove (AHIMS site number 36-1-0298) in the Goonoo soil landscape and a scattered assemblage of five stone artefacts (AHIMS site number 36-1-0288) in the Wongarbon soil landscape.

8.2.6 Predictive Modelling

Previous archaeological investigations were used to inform a predictive model for assessment of the PIA which is presented in Table 8.2 below.

Based on the observations of archaeological site types and their distribution and landscape setting, the following predictive model of site types and locations within the PIA was developed prior to the survey:

- Stone artefact scatters and isolated finds of stone artefacts or hearthstones have the potential to occur within the PIA. The density of these types of sites was predicted to be low, given the absence of nearby permanent sources of water. Open occupation sites are typically found within 500 metres of water sources, so such sites are most likely to be encountered on level ground adjacent in dune swales that may intermittently retain surface water following rain.
- Stone quarry sites are unlikely to occur in the PIA, as there are no rock outcrops suitable for knapping. Axe grinding grooves may occur on Pilliga Sandstone outcrops in eastern extent of the Option 2A pipeline corridor, but there are no sizeable outcrops for rock shelters or rock art sites.
- Scars made by Aboriginal people may occur on any mature trees that grow in the PIA, although these are restricted to black cypress pine that persist at the eastern extent of the Option 2A pipeline corridor.
- The chance of encountering shell middens was predicted to be negligible, as they are usually found near permanent water sources, as are burial sites. Source-bordering dunes adjacent to waterways are the landforms most likely to contain human skeletal remains.
- Although stone arrangements have been recorded in the central western slopes, they are not common and were considered unlikely to be encountered in the study Project area. Stone arrangements tend to occur on level ground, often on elevated landforms.

Table 8.2 – Summary of Predictive model for Cultural Heritage assessment of the PIA.

Site Type	Stone Artifact Scatters	Isolated finds of stone artefacts or hearth-stones	Stone quarry sites	Axe grinding grooves	Rock shelters or Rock Art Sites	Scars made by Aboriginal People	Shell Middens	Burial sites	Stone arrangements
Likely									
May Occur									
Unlikely									

Whilst the predictive model relates to physical site types, it is not possible to predict places associated with spiritual aspects of traditional Aboriginal society which underlines the importance of engaging and consulting with the local Indigenous community to identify any locally significant spiritual places or sites.

8.2.7 Field Survey – Aboriginal Cultural Heritage

The archaeological field survey was based on the sampling strategy developed in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011) and Requirement 5a of the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b).

The survey was conducted on foot by the project archaeologist and Aboriginal parties who had registered for involvement. The team members walked abreast across the surveyed areas in a series of closely spaced transects. These were evenly distributed over the areas of proposed disturbance and approximately 10 metres apart.

Of the two previously identified sites, the axe-grinding groove (AHIMS site number 36-1-0298) was re-identified whilst the five stone artefacts (AHIMS site number 36-1-0288) could not be re-identified.

One Aboriginal cultural heritage site was newly identified in the PIA. This is an isolated find of stone artefacts and comprises:

> *Yarrandale Road Artefact 1 (AHIMS site number 46-3-0788) – a quartzite flaked piece in cropped broad-acre cereal paddock in the centre of the Dubbo Firming Power Station Project area.*

No additional Aboriginal cultural heritage sites beyond those described above were identified across the remainder of the PIA, despite the intensive nature of the survey.

8.2.8 Field Survey – Historical Cultural Heritage

The archaeological field survey was based on the sampling strategy developed in accordance with the Historical Archaeology Code of Practice (NSW Heritage Office 2006) and NSW Heritage Manual (NSW Heritage Office 1996). The objective of the field survey was to identify sites of historical cultural significance within the PIA.

The survey was conducted over a period of one day on 18 October 2022. The field survey was completed by project archaeologist Dr Matt Cupper of Landskape.

The Project area was inspected on foot by the project archaeologist with an examination of the ground surface for any archaeological traces such as ruined foundations of structures, ceramic, glass and metal refuse and discarded farm machinery. All mature trees in the areas of proposed disturbance were inspected for historical survey blaze marks. Particular attention was paid to areas with high ground surface visibility such as along stock and vehicle tracks and in scalds, gullies and other eroded areas.

No historical cultural heritage sites were identified in the Project area. This is despite the intensive nature of the survey, the moderate conditions of surface visibility and high survey coverage. The absence of historical cultural heritage is attributable to the landscape setting of the Project area, which is largely featureless agricultural cropping paddocks. These are not near past pastoral homesteads or rural outbuildings, which were the focus for past human activities and historical cultural sites and items.

8.3 Impact Assessment – Construction

This section describes the impacts that have the potential to result in adverse effects on Aboriginal and historical cultural heritage assets, values and uses from the construction of the Project.

The greatest risk to Aboriginal cultural heritage relates to the potential impacts to previously registered and unregistered Aboriginal places during the construction phase of the Project.

8.3.1 Potential Direct Impacts

The Project would disturb the current land surface and would directly impact archaeological material associated with the affected landforms and their landscape context.

Such impacts on archaeological values typically fall into three categories:

1. the loss of information which could otherwise be gained by conducting research today
2. the loss of the archaeological resource for future research using methods and addressing questions not available today; and
3. the permanent loss of the physical record.

These impacts can usually be mitigated to various degrees, depending on the nature and significance of the cultural heritage. Where sites are of low significance, their destruction (without salvage) may have little consequence. This could be due to the lack of useful information that could be gained from research, or the availability of many equivalent and alternative sites for study.

Sites with greater significance may be the subject of archaeological investigation prior to their disturbance. This allows for the salvage of information, and the recovery of a sample of artefactual materials according to current methods and research priorities. Sites and site groupings that are common elsewhere may not require the same degree of salvage attention as those which are rare, of high significance, and subject to active deterioration.

Salvage investigations can provide for the discovery of new knowledge about the Aboriginal occupation of an area. Despite the loss of physical evidence involved, the information gained can in turn aid the interpretation and better management of the remaining archaeological resource.

8.3.2 Potential Indirect Impacts

In areas where the proposed works for the Project would not involve significant earthmoving, impacts may be limited to minor surface disturbance, limited disturbance of the associated substrates or landforms and no significant alteration of the landscape context.

Potential indirect impacts to archaeological sites could include the following:

- deposition of dust generated by earthworks and vehicular traffic
- accidental disturbance by peripheral activities; and
- inappropriate visitation including the unauthorised removal of Aboriginal and historical objects.

8.3.3 Cultural Heritage Potential Impacts

Three Aboriginal cultural heritage sites comprising a small assemblage and isolated find of stone artefacts and an axe grinding groove have been identified during the assessment of the PIA.

The impact of the Project on these sites is determined by the construction of the Project and the degree of harm this would cause.

The axe grinding groove is outside the direct disturbance area for the Project.

Harm can be avoided for this Aboriginal cultural heritage site and therefore the consequence of harm is no loss in value which is reflected in Table 8.3.

One isolated find of a stone artefact (AHIMS site number 36-1-0788) would be harmed by the construction of the Project without implementing active management.

The stone artefacts of AHIMS site number 36-1-0288 may be harmed by the installation of the Option 2A pipeline.

Table 8.3 – Impacts on Aboriginal Objects

AHIMS Site Number	Site Name	Type of Harm	Degree and Consequence of Harm
36-1-0288	Yarrandale 1	Direct	Total loss of value[2]
36-1-0298	Yarrandale 2	None	No loss of value
36-1-0788	Yarrandale Road Artefact 1	Direct	Total loss of value

8.3.4 Potential Impacts on Previously Unidentified Aboriginal Cultural Heritage

The PIA was inspected for cultural heritage sites during the field survey. It is possible that some archaeology was obscured by grass, leaf-litter or soil. Such previously unidentified features, should they occur, would probably be additional isolated finds of stone artefacts (based on the predictive model and informed by the results of the in-field survey.

Further sites of a type or significance not previously encountered in the PIA are improbable. This is partly attributable to the degree of land surface modification that has occurred since European settlement, as such past disturbance associated with pastoralism and agriculture may have obliterated many archaeological features, had they occurred previously. For example, previous tree clearing and land levelling could have destroyed scarred trees and earthen features such as mounds and hearths and stone arrangements including ceremonial rings. Shell middens were not encountered because most occur within 100 m of sources of permanent freshwater, absent from the PIA. None of the old growth trees present in the areas of proposed disturbance bore any evidence of having had bark or wood removed or carved by Aboriginal people.

The shallow soils of the gently undulating sandplains that comprise the PIA, coupled with the degree of past disturbance from land clearing and soil cultivation for pastoralism and agriculture, means that significant in situ subsurface cultural deposits are improbable. The isolated artefact in the PIA forms a lag deposit on an eroded land surface, which is still degrading. The PIA does not contain culturally sensitive landforms such as lunettes or source-bordering sand dunes where subsurface Aboriginal cultural deposits (e.g., burials) have been recorded previously.

A strategy for managing any newly identified Aboriginal objects during the life of the Project is outlined in Section 6 of the Aboriginal Cultural Heritage Assessment.

8.3.5 Potential Impacts to Previously Unidentified Historical Cultural Heritage

The Project area was inspected for cultural heritage sites during the field survey. It is remotely possible that some historical archaeology was obscured by grass, leaf-litter or soil. Such previously unidentified features, should they occur, would probably be isolated finds of historical cultural heritage items such as domestic refuse of low to negligible cultural heritage significance (based on the predictive model outlined in Section 6 and informed by the results of the current survey, summarised in Section 7 of the Historical Cultural Heritage Assessment).

A strategy for managing any newly identified historical cultural heritage items during the life of the Project is outlined in Section 9.2 of the Historical Cultural Heritage Assessment.

[2] If Option 2A was pursued.

8.4 Impact Assessment – Operation

The operation of the Project is unlikely to impact Aboriginal and historical cultural heritage places and values, as any impacts would result principally from the construction phase of the Project.

8.5 Cumulative Impacts

Considering the nature and scale of previous and ongoing land disturbance processes in the region (predominately due to past pastoral and agricultural activities), the nature and extent of identified Aboriginal heritage sites and archaeological potential in the PIA and the nature and scale of impacts associated with the Project, it is considered that the Project would not substantially increase cumulative impacts to Aboriginal heritage in the region. Notably, harm would be avoided to the axe grinding grooves. In addition, as there is no impact to historical heritage as a result of the Project, there is no cumulative impact.

8.6 Mitigation Measures

Mitigation measures to manage potential cultural heritage impacts of the Project's construction and operation are summarised in Table 8.4 below.

Table 8.4 – Proposed Mitigation Measures

Reference	Mitigation Measure	Timing
CH1	A Heritage Management Plan (to include cultural heritage and historical heritage) to be prepared for the Project to: • define the tasks, scope and conduct of all cultural heritage management activities • cover all relevant actions and requirements to be conducted during construction and operation of the Project in respect of cultural and historical heritage • include ongoing consultation with the Aboriginal community; and • remain active for the Project life.	Construction and Operation
CH2	A suitably qualified archaeologist is engaged to collect all surface stone artefacts at AHIMS site number 36-1-0788 as necessary to avoid harm with the objects to be appropriately recorded, curated and stored at a Keeping Place to be agreed in consultation with the registered Aboriginal stakeholders and Heritage NSW.	Construction
CH3	In the unlikely event that human skeletal remains are encountered during construction, all work with the potential to impact the remains must cease. Remains must not be handled or otherwise disturbed except to prevent further disturbance. If the remains are thought to be less than 100 years old the Police or the State Coroner's Office (tel: 02 9552 4066) must be notified. If there is reason to suspect that the skeletal remains are more than 100 years old and Aboriginal, the Proponent should contact the Environmental Line (tel: 131 555) for advice. In the unlikely event that an Aboriginal burial is encountered, strategies for its management would need to be developed with the involvement of the local Aboriginal community.	Construction
CH4	If any previously unidentified Aboriginal or historical cultural heritage places or objects are encountered during construction of the works, all activities likely to affect the places or objects must cease immediately and Heritage NSW and the registered Aboriginal parties consulted about an appropriate course of action prior to recommencement of work.	Construction
CH5	The proponent to provide training to all on-site personnel regarding the historical and Aboriginal cultural heritage management strategies relevant to their employment tasks.	Construction and Operation

9 HAZARDS AND RISK

9.1 Introduction

This chapter provides a summary of the hazards and risks associated with the Project that may pose a threat to the public and is predicated on three primary risk scenarios:

- risk of Project plant operational failure (Section 9.2)
- risk to aviation from plume rise during the Project's operation (Section 9.3)
- risk of fire or bush fire impacting plant operation (Section 9.4)

This Chapter and the Preliminary Hazard Analysis (Appendix E) (Preliminary Hazard Analysis, Arriscar Pty Ltd, December 2022), the Plume Rise Assessment (Appendix F) and the Bushfire Risk Assessment (Appendix G) (Bushfire Risk Assessment, Bushfire Consulting Services, February 2023) address the Project's potential for impact for each of the primary risk scenarios.

9.2 Preliminary Hazard Analysis

A Preliminary Hazard Analysis (PHA) for the Project was undertaken which involved:

- gaining familiarisation with proposed plant and ancillary facilities
- a review of the dangerous goods to be stored and handled at the facility in accordance with the Resilience and Hazards SEPP and "*Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines*" to determine the applicability of the SEPP to classify the proposed development as a "potentially hazardous industry"
- preparation of a preliminary hazard analysis in accordance with HIPAP No.6, with demonstration of compliance with the risk criteria in HIPAP No.4.

The PHA was completed in accordance with the following guidance documentation:

- Resilience and Hazards SEPP
- Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines – NSW Department of Planning 2011
- HIPAP No 4
- HIPAP No 6
- Assessment Guideline – Multi-level Risk Assessment – NSW Department of Planning and Environment 2011

9.2.1 PHA Study Area

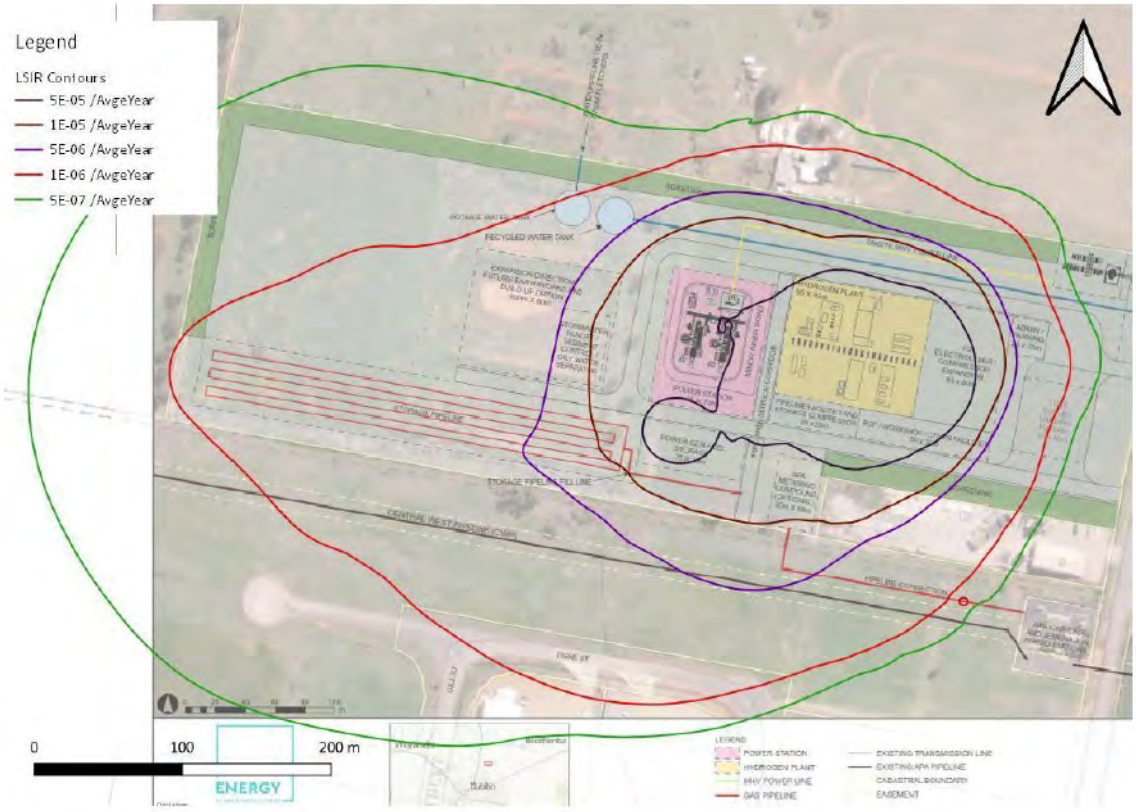
The study area for the PHA was the Project site situated at 28L Yarrandale Road, Dubbo NSW (Lot 13 of DP812799) and the surrounding land. Consideration was given to location specific individual risk of fatality contours as presented in Figure 9.1.

It is noted that:

- All contours are contained within land zoned for industrial use. There are no hospitals, schools, child-care facilities, old age housing, residential, hotels, motels or tourist resorts for which the risk is greater than 5E-05 per year.
- The contours do not encroach on any commercial developments, such as offices, retail centres, warehouses with showrooms, restaurants, and entertainment centres.
- The contours do not encroach any sporting complexes and active open space

- The 5E-05 per year contour is contained within the boundary of the Project.

Figure 9.1 – Location Specific Individual Risk of Fatality Contours for the Project



9.2.2 PHS Existing Environment

The site is centrally located within the Heavy Industrial Zone (E5) of the Dubbo LEP. Surrounding land uses include:

North: Fletcher International Exports (Light industrial), and Western District Memorial Park (Zoned Private Recreation – RE2), which is the nearest non-industrial land approximately 900m to the north along Boothenba Road.

South: Hanson Australia (Concrete batching plant), Auswide Transport Solutions (Warehousing and transport company), DND Welding and Real Pet food Company.

West: Dubbo Livestock Markets, Newell Highway, and Dubbo Railway Line. The Macquarie River is the closest waterway, approximately 1km from the site to the west of Newell Highway.

East: Commercial and agricultural land to the east of Yarrandale Road (Owned by Fletcher International Exports).

9.2.3 PHA – Impact Assessment

9.2.3.1 Determination of Hazardous Industry

The Project's potential to be hazardous is determined following the screening assessment detailed in the NSW DP&E publication "*Applying SEPP 33*". This process involves assessing the amount of dangerous goods, and in some cases the separation distance to differing land uses, against the threshold levels in the document. Table 9.1 summarises the dangerous goods that would be stored on site during the Project's operation.

Table 9.1 – Dangerous Goods Stored for the Project

Material	DG Class and PG	Quantity (tonnes)	Approximate Distance from Boundary (m)	Triggers SEPP?
Hydrogen	2.1	7.5	80	No
Natural Gas	2.1	90	<20	Yes
Ethanol (E100)	3 PG II	275	27	Yes
HVO100/B100	N/A	N/A	N/A	No

The Project has been assessed to be a potential hazardous industry due to proposed storage volumes and proximity to boundary of:

- Class 2.1 (Hydrogen and Natural Gas)
- Class 3, PG II (Ethanol)
- Transport of Ethanol – potentially hazardous assessment

Screening of proposed movements of ethanol with a delivery schedule based on 12 hour 'charging' campaigns for 6% of the year would equate to an average of 5.33 truck movements per week or just over 350 truck movements per annum. As this falls below the SEPP application guideline thresholds, it can be concluded that transportation of ethanol to the Project is not considered 'potentially hazardous' and is not subject to assessment under the PHA.

9.2.3.2 PHA Risk Results

The risk results are conservative for the following reasons:

- the Project is a firming power station, designed to provide electricity when there is insufficient generation from intermittent renewable sources such as wind and solar. The Project would operate for approximately 1,000 hours per year. The risk results, however, have assumed 100% utilisation (running 24 hours per day, seven days per week)
- the Project would produce hydrogen at times when renewable energy generation exceeds demand. The risk analysis, however, has assumed hydrogen production occurs 100% of the time (24 hours per day, seven days per week)
- the PHA considered a range of fuel options:
  - natural gas only;
  - natural gas blended with hydrogen;
  - sustainably produced ethanol, and
  - bio-diesel.

  To accommodate these options, the analysis assumed 100% loading of each fuel option with the natural gas / hydrogen blend option up to 25% hydrogen content. This is a conservative basis for analysis given the Project would not operate on 100% loading and utilisation.
- the Project has yet to confirm the type of storage for liquid biofuel. The risk analysis is based on both vertical storage tank options and self-bunded horizontal storage tank options for both E100 and Biodiesel fuel types. This is essentially 400% of the actual storage capacity that will be in place. Further refinement of utilisation and fuel types would be made later in the Project design phase; however, all modes of operation were included at all times to demonstrate the proposed Project could meet the risk-based criteria without imposing any operational limitations.

The PHA has demonstrated the Project complies with all quantitative and qualitative risk criteria documented in HIPAP 4. The basis of the analysis has been extremely conservative, considering a range of operations simultaneously with different fuels, some of which are mutually exclusive.

9.2.3.3 Assessment of Fatality, Injury and Property Damage

Location Specific Individual Risk of Fatality

Following assessment of risks and hazards, location specific individual risk of fatality contours were developed to measure the likelihood of death because of a plant failure scenario (i.e., flash fire, jet fire, VCE/ hydrogen free jet explosion).

The outcome of this analysis is summarised in Table 9.2.

Table 9.2 – Location specific injury risk criteria anaysis

Land Use Criteria	Risk Criteria (risk per million per year)	PHA Finding
Hospital, school, child-care facilities, old age housing	0.5	Criteria satisfied. 5E-05 per year contour is contained within the site.
Residential, hotels, motels, tourist resorts	1	Criteria satisfied. 5E-05 per year contour is contained within the site.
Commercial developments such as offices, retail centres warehouses with showrooms, restaurants and entertainment centres	5	Criteria satisfied. 5E-05 per year contour is contained within the site.
Sporting complexes and active open space	10	Criteria satisfied. 5E-05 per year contour is contained within the site.
Industrial	50	Criteria satisfied. 5E-05 per year contour is contained within the site.

Location Specific Injury Risk Criteria

Analysis was also undertaken to measure the risk or likelihood of injury in a plant failure scenario (i.e., flash fire, jet fire, VCE/ Hydrogen free jet explosion).

The outcome of this analysis is summarised in Table 9.3.

Table 9.3 – Location specific injury risk criteria analysis

Injury Risk Scenario	Risk Criteria (risk per million per year)	PHA Finding
7kPa overpressure	50	Contained within site. Does not extend to land zoned for residential or sensitive uses. Contour line extends beyond administration building and into the car park indicating potential for injuries at these locations.
4.7 kW/m^2 radiated head flux	50	Contained within site. Does not extend to land zoned for residential or sensitive uses.

Injury Risk Scenario	Risk Criteria (risk per million per year)	PHA Finding
		Contour line extends beyond administration building and into the car park indicating potential for injuries at these locations.

Location Specific Property Damage Risk Criteria

Analysis was also undertaken to measure the risk or likelihood of property damage in a plant failure scenario (i.e., flash fire, jet fire, VCE/ Hydrogen free jet explosion).

The outcome of this analysis is summarised in Table 9.4.

Table 9.4 – Location specific property damage risk criteria analysis

Property Damage Risk Scenario	Risk Criteria (risk per million per year)	PHA Finding
14kPa overpressure	50	Contained within site. Does not extend to land zoned for residential or sensitive uses. Contour line approaches the administration building.
4.7 kW/m^2 radiated head flux	50	Contained within site. Does not extend to land zoned for residential or sensitive uses.

Consideration was given to a range of operations including:

- Hydrogen generation and storage
- Storage of natural gas on-site
- Firing gas turbine generators with natural gas only, a blend of natural gas and hydrogen up to 25% hydrogen, and firing the generators with liquid biofuel of either combustible liquids or flammable ethanol
- Several alternative storage arrangements for liquid fuel

The study concluded that there should be no reason to restrict the operation of the Project based on hazards and risk.

9.2.4 Preliminary Hazard Analysis – Mitigation Measures

Measures to manage the impact to hazards and risks associated with the operation of the Project are provided in Table 9.5.

Table 9.5 – Proposed Mitigation Measures Actions – Hazards

Reference	Mitigation Measure	Timing
PHA1	The location and design of the administration building will be in accordance with the recommendations in the PHA.	Design
PHA2	The PHA will be used as a reference document for design specification and future risk analysis relating	Design

Reference	Mitigation Measure	Timing
	to equipment selection and site layout during detailed design. This will include Hazard Identification, Hazard and Operability Workshop(s) and Failure Modes and Effects Criticality Analysis.	Construction Operation

9.3 Aviation Risk Assessment

9.3.1 Overview

An Operational Assessment of a proposed plume rise notification 1247 was submitted to the Civil Aviation Safety Authority in November 2022 on the basis that the Project will generate an exhaust plume which may create risk to the safety of aircraft operations. A copy of the application is in Appendix F.

9.3.2 Study Area

The closest airport and landing area is at Dubbo City Regional Airport. The threshold of Runway 23 at the Dubbo City Regional Airport is approximately 4.5 kilometres from the Project site.

9.3.3 Impact Assessment

Based on the information contained in the application, CASA has conducted a preliminary assessment on the extent of the infringement of the inner horizontal surface for the Dubbo Airport and has made the recommendation referred to in section 9.3.4 below. A copy of CASA's preliminary assessment is in Appendix F.

9.3.4 Proposed Mitigation Measures

Table 9.6 – Proposed Mitigation Measures – Plume Rise

Reference	Mitigation Measure	Timing
PLU1	The installation and operation of a low intensity steady red obstacle light on the central or single exhaust stack in accordance with Australian Standards.	Construction and Operation

9.4 Bush Fire Assessment

9.4.1 Introduction

This section of the chapter provides a summary of the hazards and risks associated with the risk of fire or bush fire impacting plant operation. This section and the Bushfire Risk Assessment (Appendix G) address the Project's potential for impact for bush fire.

The Project Site is "bushfire prone land" as per the local Council bushfire prone land map and therefore the requirements stipulated by legislation apply to any new development on the site.

9.4.2 Assessment Methodology

The assessment was developed in accordance with *Planning for Bush Fire Protection*, NSW Rural Fire Service NSW RFS 2019 and has considered *Australian Standard AS 3969-2018 'Construction of Buildings in Bushfire Prone Areas*' Standards Australia. The assessment included a site assessment on 12 February 2023.

9.4.3 Existing Environment

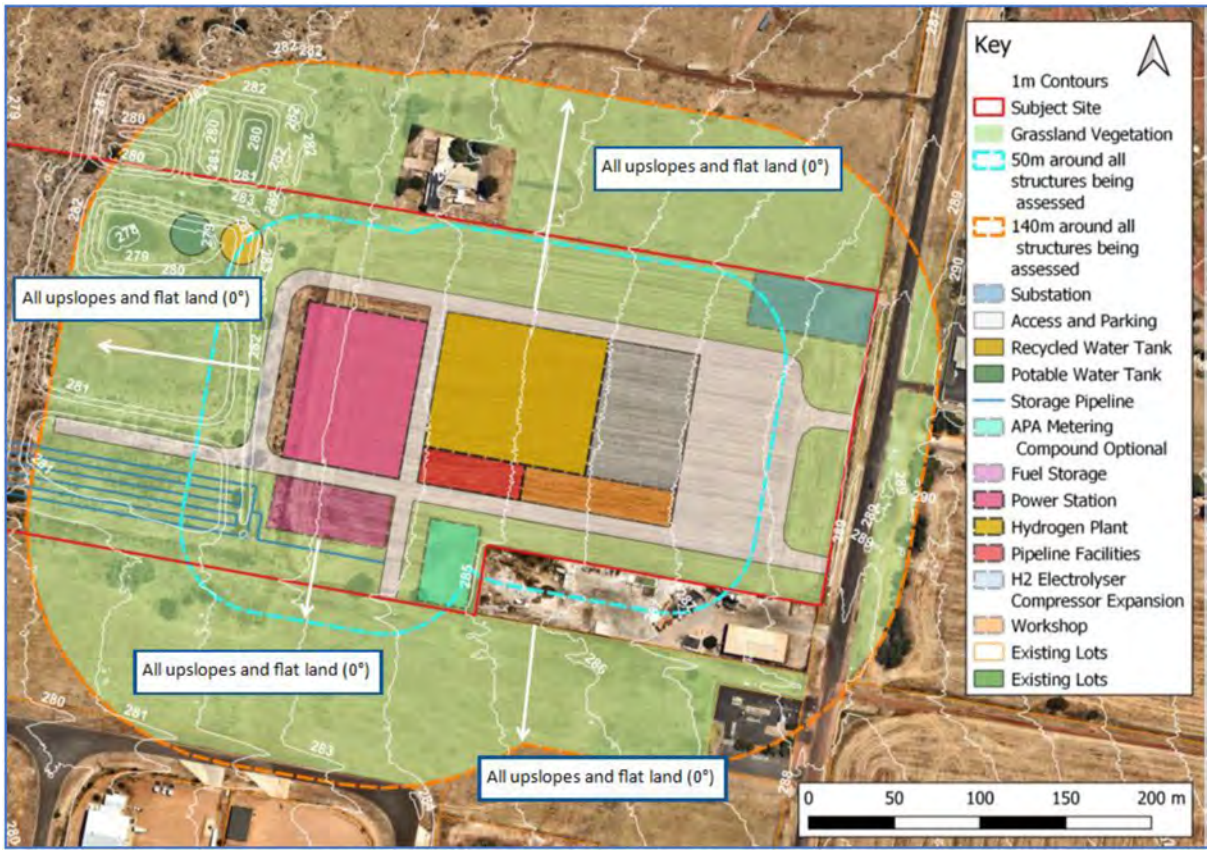
9.4.3.1 Vegetation and Slope

Based on the site visit, the primary bushland vegetation having the potential to affect the Project site is most representative of grassland in all directions.

The Property site is flat and mostly cleared of vegetation. As set out in Figure 9.2 below, the gradient of the slope of the Project site is assessed as flat or upslope.

Figure 9.2 – Slope Diagram

Source: NearMap (2021) and LiDAR (NSW Government 2023a) with overlays by BFCS Pty Ltd



9.4.3.2 Weather Conditions

The Project is in the Dubbo Regional Council area, a part of the Lower Central Plains Region with a Fire Danger Index of 80.

9.4.4 Impact Assessment – Construction and Operation

Consideration was given to the objectives for buildings as outlined in Chapter 1 and 8 of the PBP and these considerations are set out in Table 9.7 below.

Table 9.7 – Impact Assessment against PBP aim and objectives

Objective	Comment
Provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation	Can comply – the Property site has direct vehicular access to Yarrandale Road which is a public road. Suitable access for fire-fighting vehicles and evacuation is available.
Provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development	Can comply - an emergency evacuation plan will be formulated.
Provide adequate services of water for the protection of buildings during and after the passage of bush fire and to locate gas and electricity so as not to contribute to the risk of fire to a building.	Can comply - the development includes provision of two rainwater tanks with a minimum of 20,000L, which meets PBP requirements for a firefighting water supply. The tank is to be located on a hardened ground surface for truck access, within a 4m access hole. The tank is to be concrete or metal and all exposed water pipes external to the building are metal including any fittings, above ground water storage tanks shall be of concrete or metal. Hydrants are to be provided in accordance with the relevant clauses of AS 2419.1:2005 – Fire hydrant installations system design, installation and commissioning.
Provide for the storage of hazardous materials away from the hazard wherever possible	Can comply – as wherever possible, the storage of hazardous materials will be located >20 metres from the hazard.
Afford buildings and their occupants protection from exposure to a bush fire	The amenities building is separated from the hazard by >50 m to the grassland vegetation to the north, east and west and 28 m to the south. This building is separated from the hazard by sufficient distance of 10 m in all directions which afford buildings and their occupants protection from exposure to a bush fire.
Provide for a defendable space to be located around buildings	A defendable space of >10 m is proposed around the building which meets the requirements of PBP.
Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings.	The relevant Fire Danger Index, vegetation formation and effective slope have been matched using Table A1.12.3 of PBP and the available separation distance between the building and the hazard of >50 m of grassland to the north, east and west and 28 m to the south exceeds the minimum distance for APZs of 10 m indicating that direct flame contact on the building is not anticipated.
Ensure that operational access and egress for emergency service personnel and occupants is available	Can comply with road widths, curvatures and grades and swept paths enable appropriate operational egress for emergency service personnel and occupants.
Provide for ongoing management and maintenance of Bushfire Protection Measures (BPM) and ensure that utility services are adequate to meet the needs of firefights.	Normal property maintenance will ensure that BPMs are maintained and project is in compliance with ensuring that utility services are adequate (as detailed above).

9.4.5 Bushfire Risk – Mitigation Measures

Measures to manage impact associated with bush fires during the construction and operation of the Project are provided in Table 9.8.

Table 9.8 – Proposed Mitigation Measures Actions – Bush Fire

Reference	Mitigation Measure	Timing
BF1	Asset Protection Zones – at the commencement of the Project and in perpetuity an Inner Protection Area Asset Protection Zone is provided between the buildings and any storage of hazardous materials and the boundary to the north, east and south and for 50 m to the west as outlined in PBP 2019 Appendix 4.	Design, Construction and Operation
BF2	A 20,000L static water supply is to be available for firefighting purposes and suitable fittings to enable firefighting and to be marked accordingly in a prominent position.	Construction Operation
BF3	Formulate an emergency response plan in accordance with NSW RFS guidelines	Construction Operation
BF4	Comply with sections 3 and 5 of AS3959-2018 *'Construction of buildings in bush fire-prone areas'*	Construction
BF5	Where applicable, reticulated or bottled gas to be installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of the relevant authorities and metal piping is used. Polymer-sheathed flexible gas supply lines are not used and above-ground gas service pipes are metal including and up to any outlets.	Construction Operation

10 LAND AND WATER

10.1 Introduction

This chapter provides a summary of the potential impacts on, or influences of, the Project to land and water values.

For the purposes of this chapter and the Land and Water Assessment Report in Appendix H, land and water has been characterised as:

- Surface Water Quality (**SW**)
- Hydrology and Flooding (**HF**)
- Groundwater (**G**)
- Soil and Contaminated Land (**S** and **CL**)

This chapter and the Land and Water Assessment Report in Appendix H (Land and Water Assessment Report, Premise Australia, March 2023), address the Project's impact on each of the above elements and provides nominated mitigation measures to minimise impact.

10.1.1 Land and Water Assessment Methodology

The land and water assessment included a field visit and laboratory analysis together with a desktop review and analysis of available data including aerial photography, topography, database searches, relevant literature and applicable legislation, policy and guidelines.

The assessment of land and water has been completed in accordance with the following guidance documentation:

- NSW Water Quality and River Flow Objectives (DECCW, 2006)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)
- ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006); and
- Dubbo Development Control Plan (DCP) 2013.

An in-field survey was undertaken of the PIA in November 2022 to assess soil characteristics and to test for any evidence of contaminated land following previous land use for water storage and agricultural production in accordance with the *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, April 2020).

Consideration was also given to *National Environment Protection (Assessment of Site Contamination) Measure* 1999 (NEPM 2013) and *Environmental Guidelines: Use and Disposal of Biosolid Products* (NSW EPA 2000).

10.2 Existing Environment

10.2.1 Surface Water

As there are no defined watercourses in proximity to the study area, there is no existing water quality data available at or in the immediate vicinity of the site.

The closest watercourse to the Project is the Macquarie River which is located approximately 1 km west of the Project site boundary. Section 2.1 of the Land and Water Assessment Report in Appendix H contains an overview of the existing water quality associated with the receiving environment and the Macquarie River.

The *NSW Water Quality and River Flow Objectives* set out targets for ensuring that surface waters in NSW are effectively managed and maintained. As the Project is located within the Macquarie-Bogan Catchment,

consideration was given to the *Macquarie River Water Quality Objectives* and the *Macquarie River Flow Objectives*. Consideration was also given to:

- the Dubbo Development Control Plan 2013 which provides development controls for ensuring that erosion, sedimentation and stormwater are effectively managed; and
- the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018)

10.2.2 Hydrology and Flooding

A review of spatial data initially identified a small watercourse that commenced on the Project site and flowed to an outflow point approximately 400 m south of the Project site, just north of Allen Road. The outflow has been filled as part of the ongoing industrial development in the area. There are no other defined drainage lines or watercourses on the Project site.

The site is outside of the Macquarie River 1 in 200 year flood event extent[3]. The Project site is 11m higher than the 1 in 200 year flood level with the closest point being 740m west of the south western corner of site. The Project site is not identified within a Flood Planning Area under the Dubbo LEP (Dubbo Regional Council 2022). The land and water assessment details that the Project site is situated at an elevation approximately 11 metres higher than the closest extent of a 0.5% AEP. The 0.5% AEP is a larger flooding event than a 1% AEP. While the occurrence of a probably maximum flood level (**PMF**) event is unlikely, the worst case PMF, which includes a failure of the Burrendong Dam, increases the flood level of a 1% AEP by approximately 10.3m. As the elevation along the western boundary of the project site is approximately 11 metres greater than the closest extent of a 0.5% event, flooding from a PMF event is considered unlikely to impact the proposed development.

10.2.3 Groundwater

The entirety of the Project is situated within groundwater vulnerability land mapped via NSW ePlanning Spatial Viewer.

Most of the PIA is mapped as Dubbo Basalts Hydrogeological Landscape Systems (HGLS) with the Option 2A pipeline transecting a portion of the Piliga HGLS. The water table depth of the Dubbo Basalts HLGS typically ranges from 5 to 30 m and the water table depth of the Piliga HGLS typically ranges from 50m to 100m.

A search of Groundwater Dependent Ecosystem (**GDE**) mapping did not identify any Aquatic, Terrestrial or Subterranean GDEs in proximity of the study area.

There are three registered bores within the PIA with varying levels of data. Bore use is primarily for stock and domestic supply. The depth of the uppermost water bearing zone is 64m at the only recorded bore with this data.

10.2.4 Soil

There are no mapped areas of acid sulphate soil, mine subsidence, landslide risk or naturally occurring asbestos within the PIA.

Soil mapping identified the Project site as containing Chromosols of the Eulomogo soil landscapes with soils deriving from colluvial-alluvial materials from a broad range of parent rock.

[3] It is understood that a 1 in 100 ARI (1%) is commonly used to assess the potential impacts of flooding. The 1 in 200 ARI (0.5%), as a larger flooding event, was used to stress the unlikelihood of the site being impacted. If the site is not impacted by a 1 in 200 ARI event there is even less potential for it to be impacted by a 1 in 100 ARI event.

10.2.5 Contaminated Land

No contaminated land notices were recorded to have been held at the time of impact assessment by the NSW EPA relating to the Project site or properties within 500m of the PIA and no properties have been recorded as having been notified to the NSW EPA as potentially contaminated.

The Project site may hold a residual agricultural chemical residue from many years of spraying for weed and pest control however this is expected to be negligible.

On 16 and 22 November 2022, in field surveys of the PIA were undertaken. Seventeen soil samples were collected in a combined systematic/judgemental sampling pattern across the PIA. Samples were placed in clean, laboratory supplied acid washed solvent rinsed glass jars and stored on ice whilst on site and in transit to the laboratory.

Soil descriptions were logged as Brown Chromosols as the major soil type for the Project site and Grey Orthic Tenosol for the area of the Option 2A pipeline. No evidence of buried waste or stained material was apparent during collection of the soil samples.

Samples were analysed for TPH and TRH, PAH, OCP, OPP, Phenoxy Acid Herbicides and asbestos. The samples did not record concentrations of these analytes above the respective limits of reporting.

10.3 Impact Assessment – Construction and Operation

10.3.1 Surface Water

As there are no watercourses in the near vicinity of the Project site, it is not anticipated that there would be significant impacts to surface water arising during the construction or operation of the Project.

Potential impacts to surface water associated with the construction of the Project are likely to arise from vegetation clearing, earthworks and excavation, stockpiling, concreting and waste and spills. To minimise potential runoff to adjacent properties and to manage any potential impacts, a Soil and Water Management Plan and an Erosion and Sediment Control Plan for the Project would be implemented.

The Project's Stormwater and Drainage Philosophy (Enscope, November 2022) provides for the installation of a surface stormwater drainage system to drain water from east to west and collect in a retarding basin that will in turn discharge via a level spreader within the site boundary. This design would complement the natural slope of the site, enabling site drainage to be gravity fed. The retarding basin will be designed to meet volume requirements for a 100-year design ARI.

A separate contaminated drains system would also be installed to capture any surface contamination such as oils, fuel or grease and directed through an oily water separation system. Clean water from the separator would be directed to the retarding basin.

Sizing and location of the stormwater and drainage system will be undertaken during detailed design.

Closed drains would be used to manage any process waste streams, segregating process wastewater from the stormwater and contaminated drainage system.

The water demand during construction and operation of the Project may impact surface water and would be managed through the sourcing of water through multiple sources including the mains system, the Dubbo recycled water pipeline in Yarrandale Road and/or from FIE abattoir commercial operations.

10.3.2 Hydrology and Flooding

A review of the existing environment for the Project determined that there are unlikely to be any potential impacts associated with hydrology and flooding from the construction or operation of the Project.

The hydrology and flooding impact assessment:

- determined that there is no significant impact to key operational plant, equipment or personnel expected to result from flooding events as:

  - the Project site is sufficiently distanced from surrounding watercourses and the Macquarie River (1km west of site boundary)
  - the Project site is sufficiently distanced from the closest flood planning area approximately 540 m northwest of the Project site and the maximum extent of 1 in 200-year flood event located approximately 740 m west of the southwestern corner of the Project site
  - the Project site is sufficiently elevated, approximately 11 m above the maximum extent of the recorded 0.5% AEP flood event
- determined that there are no significant impacts associated with flooding events resulting from the Project as:
  - Adjustments to drainage networks have been prepared to segregate, contain and treat stormwater according to its contamination.
  - An assessment of the drainage philosophy details that a retarding basin with a volume of 2,685m3, can achieve post development discharge flows less than those of the pre-development case, during a 1% AEP (1 in 100 year) flood event
- provided a site water balance that describes water demands and identifies water supply sources for the life of the Project
- reviewed the applicability of Water Approval Requirements under the WM Act and confirmed no approval requirements under the WM Act are anticipated to apply to the Project; and
- provided details of water treatment and discharge arrangements.

10.3.3 Groundwater

It is not expected that the establishment of the Project site will directly interfere or disturb any groundwater or aquifer.

Water supply for the Project will be sourced from one or more sources which may include the mains system, the Dubbo recycled water pipeline in Yarrandale Road, from FIE abattoir commercial operations and/or the Yarrandale Water Storage. It is not anticipated that the Project would impact existing water users.

Groundwater quality will remain unaffected by the Project's construction and operation.

It is anticipated that domestic sewage generated from on-site amenities would be directed via an appropriately designed connection to the Dubbo sewerage system. The Council sewerage network in this location is a pressure sewer system. Connection to this system would therefore require an appropriately sized boundary kit and installation of a small diameter rising main to the closet connection point in Yarrandale Road.

Sewer infrastructure will be designed and constructed in accordance with relevant Council standards to minimise the potential for contamination. No material risk to aquifers is anticipated. Significant impacts to GDEs resulting from the Project are unlikely given the distance between mapped GDEs and the study area.

The release of potentially harmful chemicals, substances or contaminated stormwater may occur accidentally during construction and has the potential to contaminate groundwater resources. Fuels and chemicals for the Project would be stored appropriately within bunds designed in accordance with Australian Standards. Spill kits would be available for any accidental spills. The contaminated drains system would also trap any oils, fuels or greases via the oily water separator.

10.3.4 Soil and Contaminated Land

Soil disturbance during construction has the potential to result in the following impacts:

- Reduced soil stability and increased susceptibility to erosion due to loss of vegetative cover and topsoils during excavation
- Erosion of soil due to subsoil exposure and concentration of water flow

- Soil compaction due to heavy machinery and construction processes
- Risk of excess soil damage due to bogging of heavy machinery
- Loss or degradation of topsoil
- Risk of exposing contaminants during soil movement (pesticides and hydrocarbons); and
- Risk of introducing contaminants into soil material (eg. hydrocarbons from machinery).

Impacts to soils during operation of the Project are considered to be minimal but legacy issues could include:

- Erosion of soil due to concentrated water run off
- Long term soil compaction from mechanical compaction
- Reduced soil fertility due long-term reduction in permeated oxygen, water and organic matter through impermeable surfaces; and
- Risk of introducing contaminants into soil material (e.g. Hydrocarbons from machinery).

These potential impacts would be managed under a Soil and Water Management Plan for the Project.

Based on the findings of the infield site investigation, any residual contaminated land impacts are likely to be aesthetic in nature, and the potential risk to construction workers associated with the Project would be low and negligible. Aesthetic impacts (if identified) could be managed by industry-standard waste management practices.

Concentrations of Contaminates of Potential Concern (COPC) were below guideline criteria for commercial/industrial land uses. Concentrations of COPC were generally not recorded above the laboratory limits of detection, except for heavy metals which were considered to be representative of background concentrations. Difficulties may be encountered when establishing vegetation, however associated potential impacts to human health are considered to be negligible.

10.4 Cumulative Impacts

The Project is unlikely to contribute to cumulative impacts on contaminated land, flood risk, groundwater dependent ecosystems or aquifer interference.

The wastewater generated by the Project is negligible and can be incorporated into Dubbo's established wastewater processing facilities.

Whilst the Project would result in the loss of agriculturally viable land, the land is zoned as Industrial under the Dubbo LEP and is therefore consistent with the intended development and future use of the land.

10.5 Mitigation Measures

Measures to manage impact to Land and Water are provided in Table 10.1.

Table 10.1 – Proposed Mitigation Measures

Reference	Mitigation Measure	Timing
SW1 and S1	A construction Soil and Water Management Plan (SWMP) will be required and prepared as part of a CEMP to manage potential risks to soils and downstream water quality. The construction SWMP is to be prepared with reference to relevant development controls within the Dubbo DCP. Recommended measures for the construction SWMP include but are not limited to:	Construction and operation

Reference	Mitigation Measure	Timing
	• Measures to minimise and manage the potential for erosion and sediment transport within and from the project area. • Measures to manage accidental spills and waste storage • Measures to manage stormwater and the potential for contaminated runoff from the Project site. • Measures to ensure that excavation activities and any stockpiling are managed to minimise the potential for downstream contamination. • Measures to ensure that areas of exposed soil and the time in which they are exposed are minimised as far as practicable	
SW2 and S2	An ESCP will be required and prepared to detail erosion and sediment control measures during construction. The ESCP shall be prepared with reference to the principles and requirements of Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004).	Construction and operation
SW3 and S3	The construction of the development shall be managed in compliance with measures specified within the construction SWMP and ESCP to ensure impacts to water quality are appropriately managed. Measures shall be implemented to ensure that areas of exposed soil and the time in which they are exposed, are minimised as far as practicable during construction.	Construction and operation
SW4	Stockpiling of excavated material shall be managed to minimise the mobilisation and transport of dust, sediment and leachate into downstream environments. Recommended measures to manage stockpiling include but are not limited to: • Ensuring stockpiles are located away from drainage lines, waterways, and areas susceptible to erosion. • Minimising the number, size and duration of stockpiles used. • Ensuring stockpiles are stabilised and implementing dust suppression methods as required. • Ongoing review and inspection of the use of heavy vehicles and/or machinery, including transport tracks used, for erosion risk. • Ensuring that vehicles transporting waste and/or excavated material are appropriately covered to reduce the potential for dust.	Construction and operation
SW5	The construction SWMP prepared as part of the CEMP shall contain procedures to ensure that any waste from concreting activities is captured, contained and appropriately disposed.	Construction and operation
SW6 and S4	The construction SWMP shall include procedures to reduce and manage the risk of emergency events and the potential for wastes and spills to contaminate soil. Recommended measures to manage the potential for contaminated discharge include:	Construction

Reference	Mitigation Measure	Timing
	• The storage of all fuel chemicals and liquids in sealed bunded areas on level ground away from stormwater drainage lines and waterways • Ensuring refuelling and maintenance activities are restricted to designated areas with appropriate bunding and spill capture controls • Implementing controls as part of the construction SWMP that provide procedures to respond to emergencies and spills. • Ensuring visual inspections of drainage lines and disturbed areas are undertaken during construction to assess any potential soil or surface water issues. • The installation and maintenance of stormwater control measures including drainage networks that segregate stormwater runoff according to its contamination.	
	During operation procedures shall be developed to reduce the potential contamination of soil and surface water resulting from wastes, spills and/or emergency incidents. Suggested measures to control the potential for contamination during operation include: • The appropriate storage of equipment and hazardous substances during operation. • Ensuring that plant and stormwater control measures are maintained to prevent contamination of soil. • Preparation of appropriate procedures to respond to emergency incidents, spills and leaks from the Project site, including operational equipment and maintenance activities.	Operation
SW7	The increase in stormwater runoff resulting from additional impervious areas shall be managed through: • Designing and implementing a permanent drainage and water management network that adequately controls and minimises the potential for downstream surface water contamination. • Inspection and maintenance of stormwater control measures, including drainage networks that segregate stormwater runoff according to its contamination	Operation
HF1	Ensure compliance with the SWMP and ESCP to manage potential risks to soils and downstream water quality.	Construction
	Ensure compliance and maintenance of the stormwater drainage network as detailed in the drainage philosophy	Operation
GW1	Ensure compliance with the SWMP and the ESCP to manage potential risks to groundwater resources	Construction
	Ensure compliance and maintenance of the stormwater drainage network as detailed in the drainage philosophy	Operation
S5	As part of the SWMP for the Project, soil management measures should include:	Construction and operation

Reference	Mitigation Measure	Timing
	• Assessment of topsoil depth prior to stripping to minimise mixing of topsoil and subsoil • Topsoil and subsoil should be stripped and stockpiled separately for rehabilitation works following excavation • Avoid stripping and stockpiling soil following heavy rain periods • Avoid compaction of topsoil during stripping and stockpiling operations • If required, amelioration of topsoil and/or subsoil during stripping in accordance with a soil scientist's recommendations. • Prevent erosion of stockpiles using soil stabilising biopolymers, cover crops or other forms of stabilisation • Test stockpiled soils to determine amelioration requirements prior to reinstatement	
S6	As part of the SWMP for the Project, soil compaction management measures should include: • Development of controlled traffic practices for plant machinery movements • Avoid excavation and plant machinery movements on wet soils following heavy rain periods • Prevent long term storage of plant machinery on clay or wet soils • Avoid long term exposure of subsoils which are more susceptible to compaction • Progressively stabilise and rehabilitate soil as soon as practically possible after excavation • Ensure soil is replaced in correct subsoil/topsoil orders • Ensure vegetative cover is re-established after soil rehabilitation	Construction and operation
CL1	Any land disturbance that identifies the presence of building rubble should be assessed for the presence of asbestos in accordance with applicable SafeWork NSW guidelines and codes of practice and managed accordingly.	Construction
CL2	Avoiding skin contact with soil that is discoloured, malodourous, containing foreign matter and/or generally inconsistent with virgin soil.	Construction and operation
CL3	No unauthorised entry into the Project site, including confined spaces and excavations is permitted.	Construction and operation

11 AIR QUALITY

11.1 Introduction

This chapter provides a summary of the Project's likely air quality impacts of the construction and operation of the Project. The information in this chapter is based on the impact assessment presented in Appendix I (Air Quality Assessment) (Air Quality Impact Assessment, Benbow, March 2023).

This chapter and the Air Quality Impact Assessment in Appendix I addresses the Project's specific air quality related matters.

11.1.1 Objectives of Chapter

Air quality is characterised by concentrations of substances in the ambient air (that is, atmospheric air in its natural state), including gases and particles. Air pollution can affect people's health, lifestyles, and their enjoyment of outdoor spaces.

Air emissions produced during the construction, operation and decommissioning of large infrastructure projects have the potential to impact nearby sensitive receptors if not adequately understood and subsequently managed in accordance with relevant legislation and guidelines.

11.1.2 Assessment Methodology

11.1.2.1 Guidelines and Process

The methodology for the impact assessment was informed by the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2022) (**Approved Methods Guidelines**) and the Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, Australia.

The potential air quality impacts of the Project were determined from results of computer-based dispersion modelling. The assessment was based on the above guidelines and involved:

- Reviewing the proposed site operation
- Identifying sensitive receptor locations
- Modelling of the proposed development and operations to determine the worst-case potential dust, NO_x and Carbon Monoxide impacts at the nearest potentially affected sensitive receptors
- Assessing the predicted levels of dust, NO_x and Carbon Monoxide against NSW EPA guidelines
- Assessing the proposed development against reporting thresholds under the *National Greenhouse and Energy Reporting Act* 2007 (Cth)
- Describing the direct and indirect GHG emissions
- Recommending mitigation measures (where required)

11.1.3 Air Quality Context

The primary pollutants of concern from the exhaust emissions of the power station are Nitrogen dioxide (**NO_2**), Carbon monoxide (**CO**) and dust (**$PM_{2.5}$**).

No further assessment was considered warranted in respect of hydrocarbons (**VOCs**).

11.1.3.1 Air pollution indicators relevant to the Project

Nitrogen dioxide (NO_2) is a brownish gas that exists in the atmosphere with nitric oxide. The mixture of these two gases is referred to as nitrogen oxides (NO_x). Nitrogen oxides are a product of combustion processes. Nitrogen oxides are primary ingredients in the reactions that lead to photochemical smog formation. NO_2 can cause damage to the human respiratory tract and plant health.

Carbon Monoxide (CO) is a colourless, odourless gas produced by the incomplete combustion of fuels containing carbon. Exposure to CO can cause carbon monoxide poisoning, and chronic exposure can cause memory loss, confusion and depression.

Six scenarios were modelled for assessment assuming the operation of two or three generator units with emissions assessed at various stack heights to a maximum of 19 m. Three types of turbines were assessed.

These 6 scenarios are broadly defined as follows:

- **Scenario 1:** Biofuels B100 operating at 100% of the time (worst case) for three generator units at highest emissions levels
- **Scenario 2:** Natural gas operating at 100% of the time (typical operations) for three generator units at highest emissions levels
- **Scenario 3:** Biofuels B100 operating at 100% of the time (worst case) for two generator units at Clean Air Regulation compliant emissions levels
- **Scenario 4:** Natural gas operating at 100% of the time (typical operations) for two generator units at Clean Air Regulation compliant emissions levels
- **Scenario 5:** Biofuels B100 operating at 100% of the time (worst case) for two generator units at lowest emission levels
- **Scenario 6:** Natural gas operating at 100% of the time (typical operations) for two generator units at lowest emission levels

Scenarios 1, 3 and 5 are the worst-case scenarios where each of the three different types of turbines were modelled operating on biofuels for 100% of the time.

Scenarios 2, 4 and 6 assume the operation of each of the three different types of turbines running on natural gas for 100% of the time.

These are conservative scenarios having regard to the fact that it is anticipated that the generators would operate for up to 6% (for biofuels) and up to 12% (for natural gas) of the time. The exact power generation configurations and fuel sources for the Project have not yet been decided as the selection is subject to further commercial and detailed design assessment. Alternative equipment configurations (1 or 2 unit options) and alternate biofuels such as E100 are also being considered. These alternate configurations or fuels have not been modelled because they are not the most conservative case and if selected will comply with the impact assessment results defined within this air quality report.

11.2 Existing Environment

11.2.1 Project Location

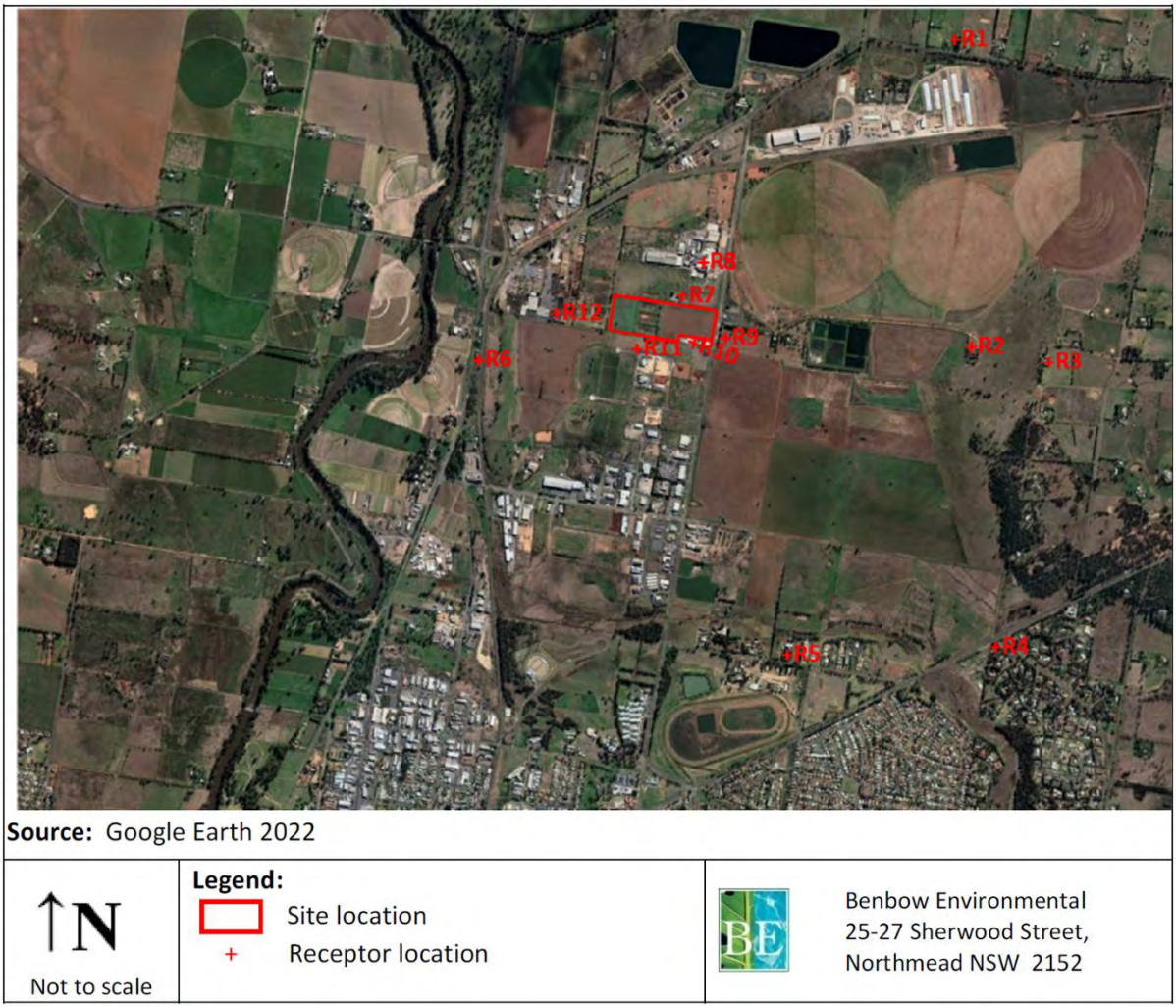
The Project site and associated network connections are wholly within the Dubbo Regional Council LGA.

The Project site is in the heavy industrial area of North Dubbo. Surrounding the proposed site includes Fletcher International Export Abattoir (the largest employer in Dubbo), the Dubbo Livestock Markets, the Dubbo Sewage Treatment Plant and commercial agricultural enterprises including pivot irrigation. To the south of the proposed site, is a concrete batching plant and the Fletchers Industrial Estate which is currently undergoing subdivision for further industrial development.

The Project site is located along Yarrandale Road, which links to Boothenba Road to the north and Purvis Lane to the south, both of which are arterial roads connecting north Dubbo to the Newell Highway. Yarrandale Road also extends to connect with the Golden Highway further south.

Figure 11.1 shows the location of the Project together with the 12 potentially affected receptors.

Figure 11.1 – Project Location and Potentially Affected Receivers



11.2.2 Potentially Affected Receivers

Twelve (12) potentially affected receivers were considered to assess the air quality impacts of the Project. The locations of these 12 sites are listed below in Table 11.1 and identified in Figure 11.1.

Table 11.1 – Nearest Potential Receptors

Receptor ID	Address	Industry	Receptor Type	Approximate Distance to Boundary of Site (m)
R1	32L Boothenba Rd Dubbo	-	Residential	2150(NW)
R2	31R Yarrandale Rd Dubbo	Gas pipeline storage	Residential/Industrial	1550I
R3	16L Mayfield Rd Dubbo	-	Residential	2000(SE)

Receptor ID	Address	Industry	Receptor Type	Approximate Distance to Boundary of Site (m)
R4	5 Kentucky Court Dubbo	-	Residential	2500(SE)
R5	35 Merrilea Rd Dubbo	-	Residential	1840(S)
R6	16R Newell Hwy Dubbo	-	Residential	790(W)
R7	33L Yarrandale Rd Dubbo	FIE Abattoir connection	Industrial	Adjacent(N)
R8	34L Yarrandale Rd Dubbo	Fletcher International Exports	Industrial	180(N)
R9	31R Yarrandale Rd Dubbo	Yarrandale Water Supply Connection	Industrial/Rural	20(E)
R10	29L Yarrandale Rd Dubbo	Hanson Australia	Industrial	Adjacent(S)
R11	28L Yarrandale Rd Dubbo	Central West Pipeline	Industrial	Adjacent(S)
R12	4R Boothenba Rd Dubbo	Dubbo Regional Livestock Market	Commercial	Adjacent(W)

11.2.3 Local Air Quality

Given that there is no site-specific air quality monitoring data available for the Dubbo area, ambient air quality data was sourced from the NSW Gunnedah air quality monitoring station located approximately 206 kilometres north-east of the Project site. The use of the Gunnedah monitoring data is appropriate for the purposes of this assessment in demonstrating compliance with regulatory criteria as it is sufficiently site-representative and the closest station with data for NO_2. The relevant data is summarised in Table 11.2.

Data for SO_2 and CO were not available from weather stations surrounding the site and are not represented in the local air quality study. The background levels were selected from 2019 local air quality data for consistency with the weather data (discussed at section 2.4 of Appendix I).

Table 11.2 – Summary of 2019 Data for Local Air Quality from Gunnedah Monitoring Station

24 hour rank	Concentration PM10 (µg/m3)	Concentration PM2.5 (µg/m3)	NO (pphm)	NO2 (pphm)	O3 (pphm)
1st	205.2 (26/11/2019)	94.1 (18/11/2019)	2.3 (18/03/2019)	1.2 (19/03/2019)	5.7 (20/12/2019)
2nd	154.1 (06/09/2019)	89.4 (09/12/2019)	1.5 (26/10/2019)	1.1 (02/07/2019)	4.7 (08/12/2019)
3rd	148.5	85.4	1	1.1	4.6

24 hour rank	Concentration PM10 (µg/m3)	Concentration PM2.5 (µg/m3)	NO (pphm)	NO2 (pphm)	O3 (pphm)
	(02/12/2019)	(21/11/2019)	(17/06/2019)	(26/06/2019)	(21/12/2019)
Annual Average for 2019	24.8	11.2	0.2	0.5	2.4

11.2.4 Meteorology and climate

Understanding the local meteorology informs modelling of air pollutant dispersion from the Project site during its operation and potential dust impacts during construction of the Project. Rainfall acts as a natural dust suppressant, with construction dust impacts more likely during drier periods. Local wind speed and direction influences the dispersion of dust and pollutants. Topography and natural barriers may reduce airborne concentrations.

An understanding of local terrain is important for dispersion modelling. The terrain in the Project area is mostly flat. Terrain influence on wind direction and speed is not expected to be significant in the area. The highest elevation in the domain is approximately 260 metres.

The closest BoM station to the Project is located at Dubbo Airport AWS (065070), approximately 5.85 kilometres from the Project site. The Dubbo Airport station is an adequate representation of the site meteorology. The five most recent years of available data for temperatures and wind runs were compared to long term averages and 2019 was found to be the most representative.

Climate data available from the Australian Bureau of Meteorology for the Dubbo Airport is summarised in Table 11.3 below representing the average monthly statistics for minimum and maximum temperatures for the period 2008 – 2022, the average monthly statistics for daily wind run for the period 2003- 2022 and mean rainfall for the period 1994 – 2022.

Table 11.3 – Climate data from Dubbo Airport AWS

Source: BoM

Month	Mean Maximum Temperature (°C)	Mean Minimum Temperature (°C)	Daily Wind Run (km)	Mean Rainfall (mm)	Mean Number of Days of Rain >1mm
January	33.6	18.4	392	58.7	7.1
February	32	17.6	373	45	6.5
March	29	14.8	357	68	7.1
April	24.9	10.4	308	36.4	4.3
May	20.1	6.5	289	39.5	6.9
June	16.4	4.4	296	48.6	10.2
July	15.7	3.0	287	43.9	11
August	17.5	3.2	298	37.1	7.5
September	21.3	6.1	333	43.8	7.1
October	25.2	9.5	354	45.8	7.1
November	28.7	13.5	373	61.8	7.9
December	31.5	16.0	382	61.7	6.9

Month	Mean Maximum Temperature (°C)	Mean Minimum Temperature (°C)	Daily Wind Run (km)	Mean Rainfall (mm)	Mean Number of Days of Rain >1mm
Annual	24.7	10.3	337	569.6	89.6

Note: Numbers in red and blue denote the highest and lowest average measurements.

11.2.5 Local Wind Trends

Annual average wind speeds are 4.10 m/s and there is a calms frequency of 0.55%. Annual winds from the east were found to be the most frequent and were present at a frequency of 27%.

Summer winds are more frequent from the east. Autumn winds are more commonly from the east and winter winds are equally as frequent from the east, south and south-east. Spring winds are more frequent from the east and north-east.

11.2.6 Air Quality Criteria

11.2.6.1 Protection of the Environment Operations (Clean Air) Regulation 2021

The relevant 'Group 6' scheduled premises thresholds as defined in Schedule 3 of the Clean Air Regulation are set out in Table 11.4.

Table 11.4 – Relevant 'Group 6' Standards of Concentration for Scheduled Premises of Electricity Generation

Air impurity	Activity or plant	Standard of Concentration
Solid Particles (Total)	Any activity or plant using a liquid or solid fuel or a non-standard fuel.	50 mg/m3
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	Any turbine operating on gas, being a turbine used in connection with an electricity generating system with a capacity of 30 MW or more	70 mg/m3 (34 ppm)
	Any turbine operating on a fuel other than gas, being a turbine used in connection with an electricity generating system with a capacity of 30 MW or more	90 mg/m3 (44 ppm)

11.2.6.2 Approved Methods Guidelines

Impacts from pollutants and particulates are governed by the Approved Methods Guidelines. The prescribed concentration levels for impact assessment for the air pollutants of concern for the Project are set out in Table 11.5.

Table 11.5 – Concentration Levels of Air Pollutants of Concern for Project

Pollutant	Averaging Period	Concentration	
Nitrogen dioxide (NO_2)	1 hour	164 µg/m3	8 pphm
	Annual	31 µg/m3	1.5 pphm
$PM_{2.5}$	24 hours	25 µg/m3	-
	Annual	8 µg/m3	-

Pollutant	Averaging Period	Concentration	
Carbon monoxide (CO)	15 minutes	100,000 µg/m3	87 ppm
	1 hour	30,000 µg/m3	25 ppm
	8 hours	10,000 µg/m3	9 ppm
PM_{10}	24 hours	50 µg/m3	-
	Annual	25 µg/m3	-
Sulfur dioxide (SO_2)	10 minutes	286 µg/m3	10 pphm
	1 hour	215 µg/m3	7.5 pphm
	24 hours	57 µg/m3	2 pphm
Polycylic Aromatic Hydrocarbons (PAH)	1 hour	0.4 µg/m3	-
Benzene	1 hour	29 µg/m3	0.009 ppm
Formaldehyde	1 hour	200 µg/m3	0.018 ppm
Toulene	24 hours		1.0 ppm
	Annual		0.1 ppm
Xylenes (as a total of other meta and para isomers)	24 hours		0.25 ppm
	Annual		0.2 ppm

11.3 Impact Assessment – Construction

The major air emissions of interest for the construction phase of the Project are expected to be primarily related to:

- dust generation from vehicle movements (vehicle track out), bulk earthworks, excavations and materials handling.
- emissions generated by combustion of fuel from construction plant including small volumes of particulates, carbon monoxide, carbon dioxide, hydrocarbons and nitrogen oxides.

Generation of dust during construction can be effectively controlled through environmental management measures. The volumes and types of emissions that are likely to be generated from the construction activities associated with the Project are considered to be relatively minor and would have a negligible impact on the local air quality.

Air quality impacts due to construction of the Project are expected to be insignificant and temporary. No odour impacts are anticipated. Commonly used dust control measures will be used to minimise air pollutant emissions. The Project site has good separation from sensitive receivers such as residences and as such this would have negligible impact during the construction phase.

Measures to manage dust generation and construction plant emissions would be defined in the CEMP for the Project.

11.4 Impact Assessment – Operation

11.4.1 Key Pollutants

The key air pollutants associated with the operation of the Project are:

- carbon monoxide (CO)
- nitrogen dioxide (NO_2)

- particulate matter as $PM_{2.5}$ and PM_{10}
- sulfur dioxide (SO_2); and
- VOCs associated with combustion of natural gas and biodiesel in the dual fuel turbines.

11.4.2 Modelling Scenarios

Modelled scenarios assume continuous operation of the generators. Worst case scenarios, when two or three generators are operating at 100 per cent load on biofuels (Scenarios 1, 3 and 5) and where two or three generators are operating on natural gas (Scenarios 2, 4 and 6) have been modelled. These are conservative scenarios having regard to the fact that it is anticipated that the generators would operate for 6% (for biofuels) and 12% (for natural gas) of the time.

Background levels were combined with predicted incremental impacts from modelling to assess the cumulative impact for compliance with the criteria. The incremental impact is reported for a defined averaging period and as the 100th percentile prediction.

A summary of the emissions characteristics is set out in Table 11.6 below.

Table 11.6 – Summary of emissions characteristics under the six scenarios

Characteristic	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Number of Units	3	3	2	2	2	2
Fuel Type	Biofuels (B100)	Natural Gas	Biofuels (B100)	Natural Gas	Biofuels (B100)	Natural Gas
Load	100%	100%	100%	100%	100%	100%
Stack Height (m)	19	19	19	19	17	17
Exhaust Stack Diameter (m)	3.5	3.5	3.5	3.5	3.00	3.00
Exhaust Velocity (m/s)	12.98	15.85	12.98	15.85	41.00	40.00
Wet exhaust Gas flow rate (Am3/hr)	448,331	547,726	448,331	547,726	1,416,606	1,382,055
Dry exhaust Gas flow rate (Nm3/hr)	170,250	207,303	170,250	207,303	537,945	524,824
Exhaust temperatI (C)	457	457	457	457	530	530
NO_x, mg/Nm 3	564.5	150.5	90.00	70.00	79.04	47.05
NO_x, g/s	26.70	8.70	4.26	4.03	11.81	6.86
CO, mg/Nm 3	57.28	57.28				
CO, g/s	2.71	3.31				
$PM_{2.5}$ kg/PJ	$1.2x10^4$	$2.7x10^3$				
$PM_{2.5}$ g/s	0.256	0.0576				

A summary of the maximum predicted pollutant concentrations from operation of the generators modelled at sensitive receptor locations is set out in Table 11.7.

Table 11.7 – Summary of the maximum predicted pollutant concentrations from operation of the generators modelled at sensitive receptor locations

Pollutant	Criteria (µg/m^3)	Averaging Period	Highest Increment		Highest total Incl background (Method 1)		Highest total incl back-ground	Method 2 (Percent of criteria (%))
			(Concentration µg/m^3)	Per cent of criteria (%)	(Concentration µg/m^3)	(Percent of criteria (%))	Concentration µg/m^3	
SCENARIO 1 (100% BIOFUEL)								
NO_2	164 µg/m^3	1 hour	503.6	307%	505.4	308%	162.8	99%
CO	30,000 µg/m^3	1 hour	51.1	0.17%	Not available	-	Not applicable	-
	10,000 µg/m^3	8 hours	24.6	0.25%	Not available	-	Not applicable	-
$PM_{2.5}$	25 µg/m^3	24 hours	1.16	4.6%	95.26	376%	Not applicable	
SCENARIO 2 (100% NATURAL GAS)								
NO_2	164 µg/m^3	1 hour	164.1	100%	173.4	106%	128.9	79%
CO	30,000 µg/m^3	1 hour	62.4	0.21%	Not available	-	Not applicable	-
	10,000 µg/m^3	8 hours	30.1	3%	Not available	-	Not applicable	-
$PM_{2.5}$	25 µg/m^3	24 hours	0.26	1.04%	94.36	377%	Not applicable	-
SCENARIO 3 (100% BIOFUEL)								
NO_2	164 µg/m^3	1 hour	53.24	32%	73.46	45%	73.46	45%
SCENARIO 4 (100% NATURAL GAS)								
NO_2	164 µg/m^3	1 hour	44.16	27%	73.46	45%	73.46	45%
SCENARIO 5 (100% BIOFUEL)								
NO_2	164 µg/m^3	1 hour	79.07	48%	80.91	49%	80.91	49%
SCENARIO 6 (100% NATURAL GAS)								
NO_2	164 µg/m^3	1 hour	79.07	48%	80.91	49%	80.91	49%

11.4.3 Nitrogen Dioxide (NO_2)

Six scenarios were modelled. Scenarios 1 and 2 are modelled for the operation of 3 generators. Scenarios 3 – 6 are modelled for the operation of 2 generators. Scenarios 1, 3 and 5 have been modelled running on biofuels (B100) 100% of the time, and scenarios 2, 4 and 6 have been modelled running on natural gas 100% of the time. B100 represents the most conservative of biofuels being considered. A summary of this modelling is set out in Table 11.7 above.

NO_2 impacts were modelled in the impact assessment using Method 1 and Method 2 in accordance with the Approved Methods Guidelines. Method 1 assumes all incremental NO_x is NO_2, combining this with background NO_2 to derive cumulative NO_2. Method 2 utilises background ozone (O_3) levels for conversion of NO_x to NO_2.

Subject to the final technology selection, the Project may require the application of emissions control technology to ensure that the NO_2 emissions can be managed in accordance with the Clean Air Regulation in the highly unlikely scenario of 100% load capacity (the Project anticipates operating at a capacity factor of up to 12% only).

Operational emissions to air from the Project would be managed within limits prescribed by the NSW EPA and subject to detailed assessments. Operation of the Project would be managed using attenuation measures for air quality within the Project design.

11.4.4 Carbon Monoxide (CO)

Background concentrations for CO were not available at air quality monitoring stations that appropriately represented the Project site and as such cumulative impacts combining incremental and background emissions were not generated for any of the scenarios.

However, incremental CO emissions recorded at all receptors were considerably below the criteria of 30,000 µg/m^3 (S1 range: 1.9-24.4 µg/m^3; S2 range: 7.1-62.4 µg/m^3) and it is unlikely background emissions would lead to cumulative impacts exceeding established criteria.

As such, there is no significant risk of air quality impacts due to CO emissions from the Project when operating at maximum load whether fuelled by natural gas or biofuels.

11.4.5 Particulate Matter ($PM_{2.5}$)

Due to the high background dust levels of $PM_{2.5}$ at the site (which relates to the bushfires of 2019-2020), the Approved Methods Guidelines requires a demonstration that no additional exceedances of the impact assessment criteria would occur because of the proposed Project activities.

All emitted particulates were conservatively assumed to be $PM_{2.5}$ for the purposes of the impact assessment. This is standard practice for assessing impacts from combustion emissions as it is standard for suppliers to only provide total particulate data in their specifications, and because the fraction of combustion emission is predominantly $PM_{2.5}$ it is best to assume all emissions are $PM_{2.5}$. This pollutant type has the more stringent criteria, therefore if total particulates comply with the $PM_{2.5}$ criteria then PM_{10} is not a risk.

When observing the highest background emissions at sensitive receptor R11, 24 days a year were found to exceed the cumulative threshold of 25 µg/m^3. Comparatively when observing the highest incremental impact emissions, only 4 days a year exceed the cumulative threshold – with the top three highest background emissions not contributing to this. These findings are expected to be even less due to the readings assuming 365 days of operation, where realistically the facility will only be in operation ~12% (1051 hours) of the year.

No exceedances of the impact assessment criteria are expected to occur because of the emissions from the proposed Project activities, with exceedances almost entirely attributed to background $PM_{2.5}$ emissions.

11.4.6 Odour

An assessment of the potential off-site odour impacts was conducted for the Project and there was found to be no potential odour impacts during either the construction or operation of the Project.

11.5 Greenhouse Gas Assessment

11.5.1 Introduction

The *National Greenhouse and Energy Reporting Act* 2007 (Cth) (**NGER Act**) outlines the national reporting framework for facilities required to report their energy use and greenhouse gas emissions.

The NGER Act requires reporting of six greenhouse gas emissions: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Under the NGER Act if a facility consumes more than one hundred terajoules (TJ) of energy annually or emits over 25,000 tonnes of carbon dioxide equivalence (CO_2-e) annually, the controlling corporation is required to report.

The Project would produce greenhouse gas emissions through various activities, including the consumption of natural gas or biofuel in the power generation packages, burning fossil fuels in vehicles and vessels, plant and equipment, vegetation clearance and manufacturing and transporting of materials used in construction.

11.5.2 Assessment Methodology

The impact assessment included the following:

- Assessment of the Project against reporting thresholds under the NGER Act
- Description and identification of direct and indirect GHG emissions
- Estimation of annual GHG emissions using approved equations and emission factors
- Calculation of the variation in GHG emissions that would result from Scope 1 and Scope 2 emissions, including transportation of raw materials and waste, loading and unloading practices, fuel and electricity consumption; and
- Recommended measures to reduce GHG emissions.

11.6 GHG Emissions

According to the *Greenhouse Gas Protocol 2003 by the World Business Council for Sustainable Development* and the *World Resources Institute* (**GHG Protocol**), greenhouse gas emissions are split into three categories, known as ‘Scopes’.

Scope 1 and Scope 2 are defined by the GHG Protocol as:

Scope 1 – Direct emissions of greenhouse gas from sources that are owned or operated by a reporting organisation (examples include combustion of diesel in company-owned vehicles or used in on-site plant and equipment)

Scope 2 – Indirect emissions associated with the import of energy from another source (examples include import of electricity from the grid, or heat)

Table 11.8 sets out the greenhouse gas emissions factors for the impact assessment.

Table 11.8 – Greenhouse Gas Emissions Factors

Source		Energy Content Factor	Emission Factor kg CO_2-e/GJ		
			CO_2	CH_4	N_2O
Scope 1	Natural Gas (distributed in a pipeline)	38.8GJ/kL	51.4	0.1	0.03
Scope 1	Biofuels (B100)	23.4 GJ/kL	Option A[1]:0.0	Option A[1]:0.08	Option A[1]:0.2
			Option B[2]: 73.6	Option B[2]:0.04	Option B[2]: 0.2
Scope 1	E100	23.4 GJ/kL	Option A[1]: 0.0	Option A[1]: 0.08	Option A[1]: 0.2
			Option B[2]: 64*	Option B[2]: 0.08	Option B[2]: 0.2
Scope 2	Electricity (NSW)		0.79 kg CO_2-e/kWh		

Note 1: Biofuels CO2 emission factors assume emissions and removals due to the harvesting and regrowth of biomass are reported in the relevant land use category of the land sectors where the biomass originates and are in balance.

Note 2: Assuming biofuels are not “in balance” fuel oil is used as an estimate.

There are three fuel consumption scenarios for the Project as follows:

Scenario 1 – 12% duty – Natural gas 651,744 GJ/year

Scenario 2 – 6% duty Natural gas 325,872 GJ/year + 6% biodiesel 10,500,000 L/year

Scenario 3 - Natural gas 325,872 GJ/year + E100 15,800,000 L/year

All scenarios use Scope 2 – 5,072,040 kWh/year (not including renewable electricity used in the electrolyser) and ancillary – 46,857,240 kWh/year.

Table 11.9 sets out a summary of the calculated GHG emissions for the Project.

Table 11.9 – Summary of Calculated GHG Emissions

Scope	Scenario	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	Total (kT)
1	Natural Gas	33,499,642	65,174	19,552	33.6
	Natural Gas + Biodiesel	Option A: 0	Option A: 19,656	Option A: 49,140	Option A: 34.9
		Option B: 18,083,520	Option B: 9828	Option B: 49,140	Option B: 34.9
	Natural Gas + E100	Option A: 0	Option A: 29,578	Option A 73,944	Option A: 16.9
		Option B: 23,662,080	Option B: 29,578	Option B: 73,944	Option B: 40.6
2	Electricity	4,006,912			4.0

11.7 Cumulative Impacts

Significant cumulative impacts to air quality and greenhouse gas are not expected during the construction or operation of the Project.

11.8 Mitigation Measures

Mitigation measures to manage potential air quality and greenhouse gas impacts of the Project's construction and operation are summarised in Table 11.10 below.

Table 11.10 – Proposed Mitigation Measures

Reference	Mitigation Measure	Timing
AQ1	A CEMP be prepared which includes an Air Quality Control Procedure to manage and monitor air emissions during construction and will include the following control measures: • Monitor local weather conditions and minimise dust generating operations when conditions result in visible dust emissions, and implement mitigation measures or until weather conditions improve; • Daily dust inspection on-site and on access route. • Erection of wind breaks such as fences at the relevant parts of the site boundary; • Locate stockpiled materials away from drainage paths, easement, kerb, or road surface, and near existing wind breaks such as trees and fences; • Dust suppression/wind breaks on stockpiles; • Limit stockpile height to 5 m (maximum); • Measures to be implemented to determine whether any vehicles leaving the site to be cleaned of dirt and other materials to avoid tracking onto public roads; • Enforce appropriate speed limits for vehicle on site. Recommended speed limit is <15 km/hr; • Cover all loads entering and leaving the site; and	Construction
AQ2	Provision in design for future NO_2 emission control technology in the event that there is non-compliance with limits prescribed by the NSW EPA and subject to detailed assessment.	Design, construction and operation

Reference	Mitigation Measure	Timing
GG1	Environmental Standards and performance will be included in the selection criteria (and cost benefit analysis) for the tendering and award of key packages associated with equipment, plant and machinery to reduce greenhouse gas emissions in operation	Operation

12 NOISE AND VIBRATION

12.1 Introduction

Noise produced during the construction and operation of large infrastructure projects has the potential to impact nearby noise sensitive receptors if not adequately understood and subsequently managed in accordance with relevant legislation and guidelines.

This chapter provides a summary of the Project's likely noise and vibration impacts of the construction and operation of the Project. The information in this chapter is based on the impact assessment presented in Appendix J (Noise and Vibration Impact Assessment) (Noise Impact Assessment, Benbow, March 2023).

This chapter and the Noise Impact Assessment in Appendix J address the Project's specific noise and vibration related matters.

12.1.1 Assessment Methodology

The methodology for the impact assessment was informed by the following guidelines and documents:

- NSW Noise Policy for Industry (NSW EPA, 2017) (**Noise Policy for Industry**)
- NSW Road Noise Policy (DECCW, 2011)
- NSW Interim Constructive Noise Guideline (DECCW, 2009)
- Review of alternatives to 'beeper' alarms for construction equipment (DECCW, 2011)
- British Standard BS 7385-Part 2:1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150-Part 3:1999 'Structural Vibration Part 3 – effects of vibration on structures'
- Assessing Vibration – A Technical Guideline (DEC, 2006)

Assessment based on these guidelines involved:

- Detailed description of the Project Site, receiver locations and noise monitoring locations
- Assessment of noise emissions associated with construction and operational scenarios and off site road traffic for the Project
- A qualitative vibration assessment
- Recommendations for noise control measures (where required)

12.1.2 Study Area

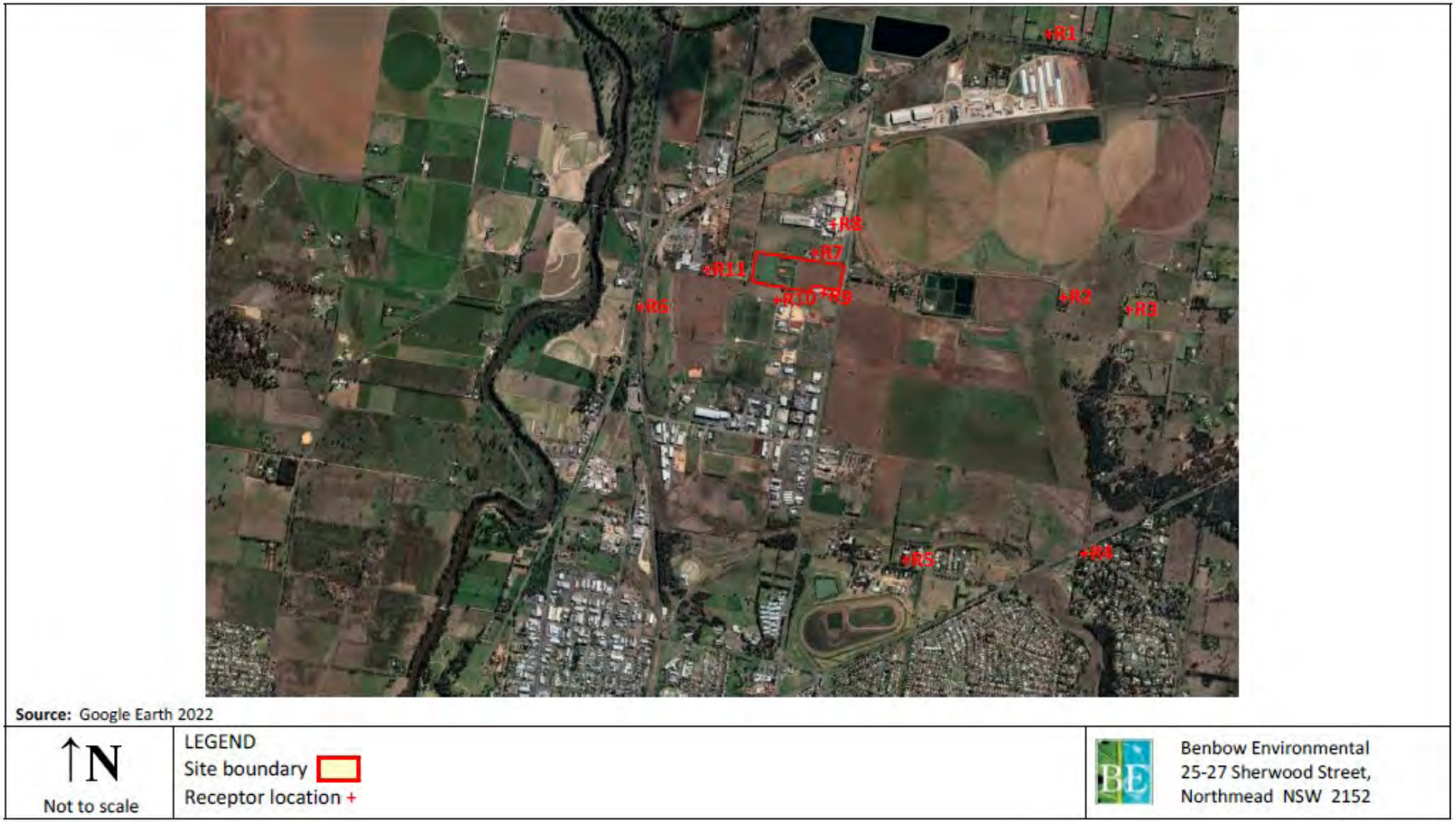
The study area includes the Project Site together with twelve (12) potentially affected receivers. The receptors were considered to assess the noise impacts of the Project. The locations of these 12 sites are listed below in Table 12.1 and shown in Figure 12.1.

Table 12.1 – Nearest Potential Receptors

ID	Address	Industry	Receptor Type	Approx Distance to Boundary of Site (m)
R1	32L Boothenba Rd Dubbo	-	Residential	2150
R2	31R Yarrandale Rd Dubbo	Gas pipeline storage	Residential/Industrial	1550
R3	16L Mayfield Rd Dubbo	-	Residential	2000

ID	Address	Industry	Receptor Type	Approx Distance to Boundary of Site (m)
R4	5 Kentucky Court Dubbo	-	Residential	2500
R5	35 Merrilea Rd Dubbo	-	Residential	1840
R6	16R Newell Hwy Dubbo	-	Residential	790
R7	33L Yarrandale Rd Dubbo	FIE Abattoir connection	Industrial	Adjacent
R8	34L Yarrandale Rd Dubbo	Fletcher International Exports	Industrial	180
R9	31R Yarrandale Rd Dubbo	Yarrandale Water Supply Connection	Industrial/Rural	20
R10	29L Yarrandale Rd Dubbo	Hanson Australia	Industrial	Adjacent
R11	28L Yarrandale Rd Dubbo	Central West Pipeline	Industrial	Adjacent
R12	4R Boothenba Rd Dubbo	Dubbo Regional Livestock Market	Commercial	Adjacent

Figure 12.1 – Map of Nearest Receptors



12.2 Existing Environment

12.2.1 Background Noise Levels

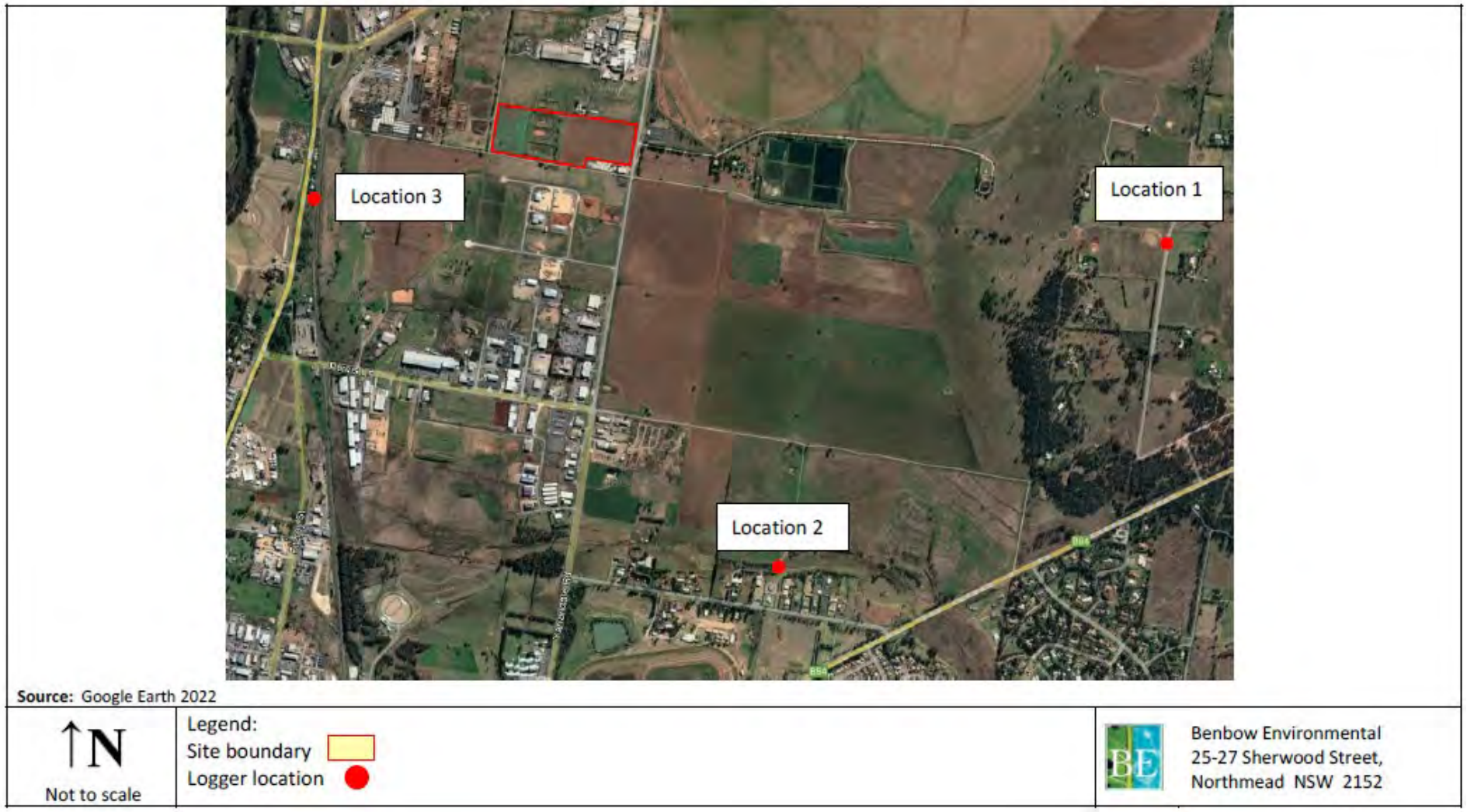
Unattended long term existing ambient and background noise monitoring was undertaken from 16 September 2022 to 4 October 2022 at three locations representative of the nearest residential areas.

Attended noise monitoring was undertaken on 16 September 2022 at two of the three locations during the day, on 19 September 2022 at one location in the daytime and evening periods and on 4 October 2022 at all three locations during the night period.

Location 1 was situated at 16L Mayfield Road Dubbo, Location 2 was at 29 Merrilea Road Dubbo and Location 3 was at 16R Newell Highway Dubbo.

These locations are shown in Figure 12.2 below.

Figure 12.2 – Logger Locations



A summary of the results of this monitoring is set out in Table 12.2 (Unattended) and Table 12.3 (Attended).

Table 12.2 – Summary of Results from Unattended Noise Monitoring

Location and Dates	Measurement	Day 7:00am – 6:00pm	Evening 6:00pm – 10:00pm	Night 10:00pm – 7:00am
Location 1 **16 September – 30 September 2022**	Rating Background Level[1]	35	43	38
Location 2 **16 September – 30 September 2022**	Rating Background Level	30	40	34

Table 12.3 – Summary of Results from Attended Noise Monitoring

Location and Date/Time	L_{Aeq}	L_{A90}	L_{A10}	L_{A1}	Comments
Location 1 **16 September 2022** **17:15** **Daytime Period**	42	35	41	52	Birds < 38-66 dB(A) Cows < 37-42 dB(A) Distant traffic < 37-39 dB(A) Car < 51 -57 dB(A) Dog < 53 dB(A) Dominant noise was birds and cows.
Location 2 **16 September 2022** **17:58** **Daytime Period**	45	43	47	50	Industrial hum, birds, ducks <44-48 dB(A) (constant) When dog barking also <49-51 dB(A) When car was passing also <48-53 dB(A) Clang < 58 dB(A) Car Engine < 52 dB(A) Dominant noise was an industrial hum, ducks and other birds.
Location 3 **19 September 2022** **07:35** **Daytime Period**	73	51	77	82	Cars < 76-82 dB(A) Trucks < 82-84 dB(A) Birds < 47-57 dB(A) Distant traffic < 60-68 dB(A) Truck horn < 94 dB(A) Dominant noise was traffic
Location 1 **4 October 2022** **22:48** **Night time Period**	47	39	45	47	Frogs <44-48 dB(A) Distant horn < 48 dB(A) Audible distant dog barking Audible insects
Location 2	47	33	45	54	Dogs < 44 dB(A)

Location and Date/Time	L_{Aeq}	L_{A90}	L_{A10}	L_{A1}	Comments
4 October 2022 22:25 Night time Period					Insects and frogs < 38 dB(A) Distant traffic < 35 dB(A) Traffic < 53 dB(A) Truck < 57 dB(A) Car passing (1) < 73 dB(A) Noise dominated by insects, frogs and traffic.
Location 3 4 October 2022 22:01 Night time Period	67	43	65	82	Car passing <85 dB(A) Farm animal noises <43 dB(A) Tonal noise fluctuating source distant traffic <47 dB(A) Truck < 87 dB(A) Aeroplane < 51 dB(A) Cows < 53 dB(A)

12.2.2 Assessment Criteria

12.2.2.1 Construction Noise Management Levels

The Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change [DECC], 2009) provides guidance for assessing noise from construction activities in NSW.

12.2.2.2 Construction Traffic Noise

Existing road traffic noise levels at 16R Newell Highway Dubbo (approximately 790 m from the Project site) were obtained on 19 September 2022 and 4 October 2022 during the daytime and night period. Based on the results of the noise logging undertaken, the road traffic noise levels measured on Newell Highway were 73 dB(A) during the daytime and 67 dB(A) during the night.

12.2.2.3 Sleep Disturbance

In accordance with the Noise Policy for Industry, the potential for noise levels to lead to sleep disturbance should be considered for any night construction or operation.

Where noise levels from a construction (or industrial) source at a residential receptor at night exceeds the following, a maximum noise level event assessment should be undertaken:

- $L_{Aeq,15min}$ 40 dB(A) or the RBL + 5 dB(A), whichever is greater, and/or
- L_{AFMax} 52 dB(A) or the RBL +15 dB(A), whichever is greater.

Based on this guidance, Table 12.4 presents sleep disturbance screening criteria for the study area surrounding the Project.

Table 12.4 – Sleep Disturbance Screening Criteria

Receptor	Project Criteria $L_{Aeq,\ 15\ minutes}$ dB(A)
R1	52
R2	52

Receptor	Project Criteria $L_{Aeq, 15\ minutes}$ dB(A)
R3	52
R4	58
R5	52
R6	58

12.2.2.4 Operational Noise

The Noise Policy for Industry recommends that potential site related noise impacts are assessed having regard to the intrusiveness noise level aimed at controlled intrusive noise impacts in the short term for residences and the amenity noise level aimed at maintaining a suitable amenity for particular land uses in the long term.

Table 12.5 below sets out the rating background level, project intrusive noise level, recommended amenity noise level and project amenity noise level at each of the 12 sensitive receptors.

Table 12.5 – Project Noise Trigger Levels PNTL – Operational Activities db(A)

Receptor	Type of Receptor	Time of day	Rating back-ground noise level	Project intrusiveness noise level LAeq, 15 mins	Recommended amenity noise level LAeq period	Project amenity noise level LAeq, 15 minutes	PNtL LAeq, 15 minutes	Sleep Disturbance LAmax
R1-R3, R5	Residential – Suburban	Day	35	40	55	53	40	52
		Evening	30	35	45	43	35	
		Night	30	35	40	38	35	
R4, R6	Residential - Urban	Day	52	57	60	55	57	58
		Evening	48	53	50	48	48	
		Night	43	48	45	43	43	
R7-R12	Industrial	When in Use	-	-	70	68	68	-

12.3 Impact Assessment – Construction

12.3.1 Construction Noise Emissions

Noise generated by Project construction activities has the potential to temporarily change the existing noise environment and/or exceed adopted criteria.

Two worst case scenarios were considered – one for earthworks and one for building works. In each scenario, it was assumed that the equipment would operate for 100% of the time over the 15 minute assessment period. Table 12.6 sets out the equipment used in the assessment.

Table 12.6 – Modelled Noise Source Scenarios for Proposed Construction Works

Scenario	Time of Day	Noise Sources for Worst 15 Minute Period
Earthworks	Standard hours and outside standard hours	• Excavator • Backhoe • Truck manoeuvring • Hand tools
Building Works	Standard hours and outside standard hours	• Concrete mixer truck • Concrete pump • Truck manoeuvring • Hand tools

The impact assessment considered proposed construction hours of 12 hours per day. 7 days a week from 6:00am – 6:00pm. The noise criterion for construction noise is presented in Table 12.7.

Table 12.7 – Construction Noise Criterion dB(A)

Receiver	Land Use	Period	RBL L_{A90}	Management Level $L_{Aeq,\ 15\ minutes}$
R1-R3, R5	Residential	Standard Hours	35	45
R4 and R6	Residential	Standard Hours	43	53
R1-R3, R5	Residential	Outside recommended standard hours	35	40
R4 and R6	Residential	Outside recommended standard hours	43	48

Predictive noise modelling was undertaken for both earthworks (**Scenario 1**) and building works (**Scenario 2**) with the noise levels predicted to be below the management levels and the highly noise affected criteria of 75 dB(A). A summary of the noise modelling results associated with construction activities is provided in Table 12.8.

Table 12.8 – Summary of Noise Modelling Results – Construction

✓ **Complies X Non-compliance**

Receiver	Noise Management Levels ($L_{eq,15\ minutes}$ dB (A) (Standard Hours)	Scenario 1 (Standard Hours) (L_{eq},dB(A))	Scenario 2 (Standard Hours) (L_{eq},dB(A))
R1	45	22 ✓	24 ✓
R2	45	22 ✓	25 ✓
R3	45	<20 ✓	22 ✓
R4	53	<20 ✓	<20 ✓
R5	45	21 ✓	23 ✓
R6	53	25 ✓	29 ✓
R7	75	56 ✓	57 ✓
R8	75	54 ✓	56 ✓
R9	75	55 ✓	58 ✓

Receiver	Noise Management Levels ($L_{eq,15\ minutes}$ dB (A) (Standard Hours)	Scenario 1 (Standard Hours) (L_{eq},dB(A))	Scenario 2 (Standard Hours) (L_{eq},dB(A))
R10	75	58 ✓	62 ✓
R11	75	51 ✓	57 ✓
R12	75	40 ✓	43 ✓

The noise levels for the construction phase of the Project comply with the noise management levels and no additional noise mitigation measures are required during the construction phase of the Project.

12.3.2 Noise from Construction Road Traffic

The calculation of road traffic noise contribution was undertaken using SoundPLAN and based on a worst-case scenario of one truck per 15 minutes, 4 per hour during both the day and night period. The closest residential receptor to the road at 16R Newell Highway was assessed. The predicted day time and nighttime road traffic noise levels associated with the Project comply with the noise criteria established in the Road Noise Policy and no additional road noise mitigation strategies are recommended.

12.4 Impact Assessment - Operation

12.4.1 Noise Emissions from Power Generation Facility

Noise generated by the Project's operation would include continuous noise from the power generation facility. The basis for this assessment is assumed to be three turbines located beside each other. The exact turbine configurations for the Project have not yet been decided as the selection is subject to further commercial and detailed design assessment. The main noise associated with the hydrogen plant is venting from the mixing skid. It is not anticipated that the hydrogen plant would be operating at the same time as the power generation facility because hydrogen would only be produced when there is excess electricity in the grid.

Alternative equipment configurations (1 or 2 turbine options) are also being considered. These alternate configurations have not been modelled because they are not the most conservative case and if selected will comply with the impact assessment results defined within this noise report.

Noise modelling was undertaken using SoundPLAN to predict the noise levels during operation of the power generation turbines at 100% load (24 hours a day) (Scenario 1) at the potentially most affected receivers to determine the noise impact against the project specific noise levels and other relevant noise criteria in accordance with the Noise Policy for Industry. These noise sources are presented in Table 12.9 below.

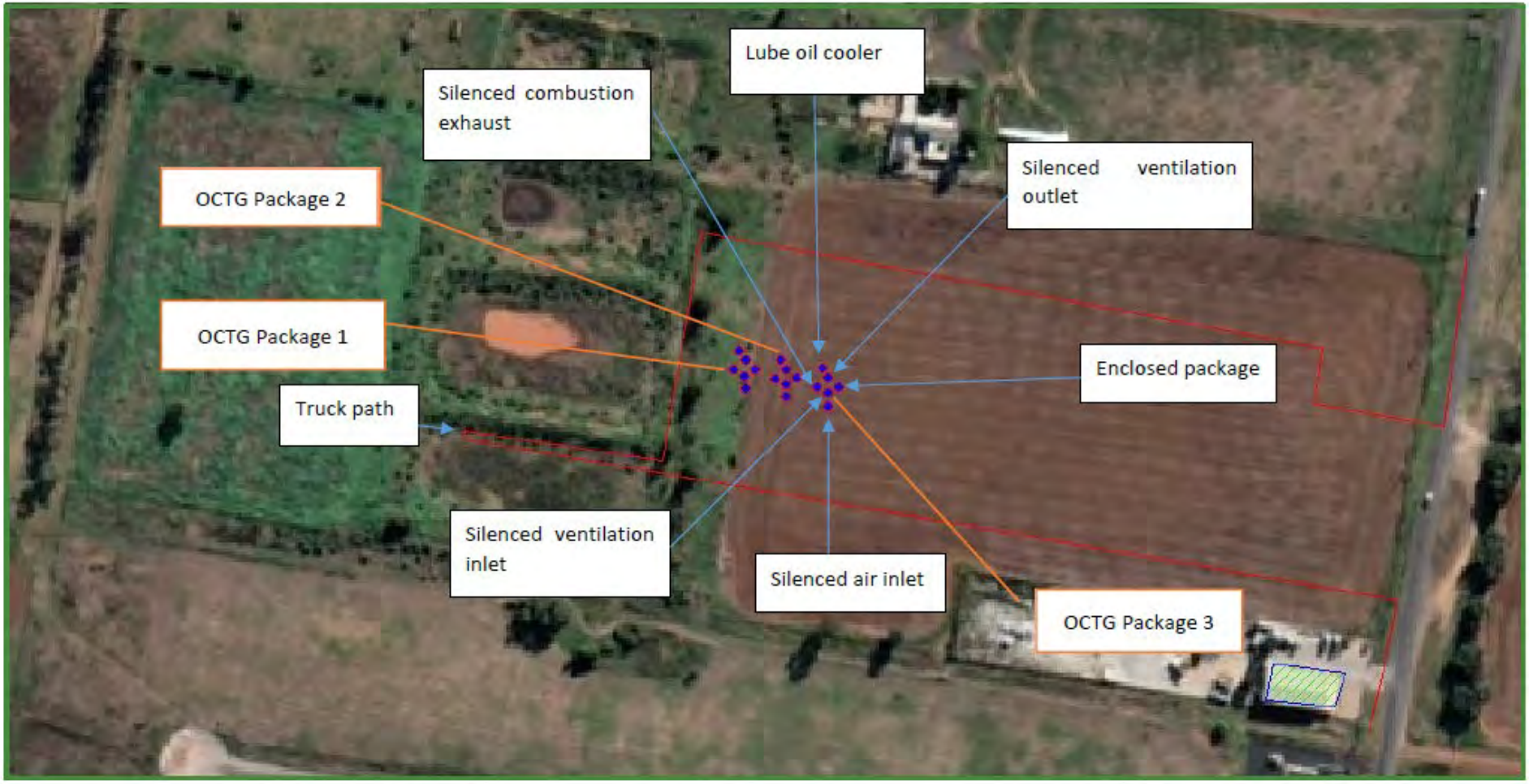
Table 12.9 - A-weighted Sound Power Levels Associated with Operational Activities, dB(A)

Noise Source	Height	Overall	Third Octave Band Centre Frequency (Hz)									
			25	31	40	50	63	80	100	125	160	200
			250	315	400	500	630	800	1000	1250	1600	2000
			2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
Silenced air inlet	9 m	105	63	68	72	80	82	84	88	86	86	88
			90	89	96	97	101	106	104	104	105	104
			105	103	100	63	60	105	-	-	-	-

Noise Source	Height	Overall	Third Octave Band Centre Frequency (Hz)									
			25	31	40	50	63	80	100	125	160	200
			250	315	400	500	630	800	1000	1250	1600	2000
			2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
Silenced combustion exhaust	19 m	104	72	78	82	89	81	92	92	92	93	91
			92	93	94	94	92	90	89	88	87	85
			83	82	80	78	76	75	-	-	-	-
Enclosed package	2 m	106	64	69	73	77	80	84	87	89	91	91
			92	93	94	95	95	94	94	94	91	91
			92	95	93	90	86	85	-	-	-	-
Lube oil cooler	1 m	99	51	59	66	77	80	82	86	87	86	87
			87	87	87	88	88	88	88	87	86	85
			84	83	81	78	77	76	-	-	-	-
Silenced ventilation inlet	4 m	82	-	-	-	57	60	64	67	69	72	76
			74	73	72	70	68	66	64	62	57	56
			55	50	52	54	59	58	-	-	-	-
Silenced ventilation outlet	4 m	83	-	-	-	65	67	68	69	90	71	72
			72	72	72	72	71	70	69	68	65	64
			64	62	62	63	64	63	-	-	-	-
Truck exhaust	3 m	103	44	48	57	65	70	73	78	78	80	82
			87	85	94	98	94	96	89	88	82	87
			85	84	82	83	83	82	78	-	-	-
Truck engine	1 m	101	44	48	57	65	70	73	78	78	80	82
			87	85	94	98	94	96	89	88	82	87
			85	84	82	83	83	82	78	-	-	-

Figure 12.3 shows the locations of the noise sources in an operational scenario.

Figure 12.3 – Location of Noise Sources – Proposed Operation



It is anticipated that the predicted noise levels of operational activities for the Project will comply with the criteria at all receivers. The highest noise levels were predicted at receiver R9 (31R Yarrandale Road Dubbo, 20 metres from the Project site and as marked on Figure 12.1 above) with the largest noise contribution being from the silenced air inlet. A summary of the predicted noise levels during operational activities is set out in Table 12.10 below.

Table 12.10 – Summary of Noise Modelling Results – Operation

Receptor	Project Criteria			Scenario 1 Proposed Operations
	Day	Evening	Night	Day Evening Night
R1	40	35	35	31 ✓
R2	40	35	35	33 ✓
R3	40	35	35	31 ✓
R4	57	48	43	29 ✓
R5	40	35	35	32 ✓
R6	57	48	43	36 ✓
R7	68	68	68	63 ✓
R8	68	68	68	57 ✓
R9	68	68	68	67 ✓
R10	68	68	68	62 ✓
R11	68	68	68	63 ✓
R12	68	68	68	49 ✓

✓ Complies X Non-compliance

Sleep disturbance was also assessed in accordance with the criteria referred to in section 12.2.2.3 and was determined to be below the sleep disturbance criteria.

12.4.2 Start-Up and Shut Down – Operation

12.4.2.1 Power Generation Facility

Noise emissions during the start-up and shut down of the operation and operational activities were also assessed and were determined to comply with the criteria for all receivers during all assessable periods. It is recommended that all start-up and shutdown vents are designed such that silencers can be installed as a contingency measure.

12.4.2.1 Hydrogen Generation Facility

Noise sources from the operation of the hydrogen generation facility are considered to be negligible in comparison to the operation of the power generation plant and vehicle movements. The main noise associated with the hydrogen facility is venting from the mixing skid. It is not anticipated that the hydrogen facility would be operating at the same time as the power generation facility because hydrogen would only be produced when there is excess electricity in the grid.

12.5 Vibration Impact Assessment

The TfNSW Construction Noise Strategy document and *Assessing Vibration – Technical Guideline* provides guidance for safe working distances to achieve human comfort (*Assessing Vibration: a technical guideline* (DECC, 2006) and cosmetic building damage (BS7385-2:1993) criteria for a range of different plant and equipment. This guidance was considered as part of the noise impact assessment.

The guidelines list certain construction equipment that may cause vibration impacts including, but not limited to, hydraulic hammers, vibratory pile drivers, pile boring, jackhammers, wacker packers, concrete vibrators, and pavement breakers. As the nearest off site building is approximately 30 metres away from the Project site, there is no prospect of either cosmetic damage or human response from the proposed construction activities.

No vibration impacts are expected from the proposed construction or operational activities and a detailed vibration assessment is not considered to be warranted.

12.6 Cumulative Impacts

Significant cumulative impacts associated with noise or vibration are not expected during the construction or operation of the Project.

12.7 Mitigation Measures

Mitigation measures to manage potential noise impacts of the Project's construction and operation are summarised in Table 12.11 below.

Table 12.11 – Proposed Mitigation Measures

Reference	Mitigation Measure	Timing
NV1	Noise Compliance Assessment once in operation to verify the predicted noise levels at the relevant receivers and to confirm the noise attenuation achieves compliance.	Operation

13 TRAFFIC AND TRANSPORT

13.1 Introduction

This chapter assesses the traffic, roads and transport aspects of the construction and operation of the Project. The information in this chapter is based on the impact assessment presented in Appendix K (Traffic Impact Assessment, Amber, March 2023).

This chapter and the Traffic Impact Assessment in Appendix K addresses the Project's specific traffic and transport related matters.

13.1.1 Traffic, Roads and Transport Assessment Methodology

A summary of the methodology used to assess the impact to traffic, roads and transport is provided in Table 13.1.

Table 13.1 – Summary of Traffic, Roads and Transport Assessment Methodology

Element of Transport and Traffic Assessment	Assessment Approach
State Road Network and Local Road Network	Desktop analysis and count surveys
Site Accessibility	Desktop analysis including a swept path assessment
Site Layout and Parking	Desktop analysis
Other Road Users	Desktop analysis
Safety Analysis	Desktop analysis
Oversize and/or Overmass Vehicle Movement	Desktop analysis

13.1.2 Study Area

The study area for the traffic, roads and transport impact assessment comprised the state and local road network that would provide the likely access routes to be used by construction and operational vehicles to and from the Project site.

The assessment included the likely freight and materials routes from the Project's preferred port, Port of Newcastle to the site.

13.2 Existing Environment

13.2.1 Existing State Road Network and Local Road Network

The Project site has excellent connectivity to the main transport routes of the Newell Highway and the Golden Highway. The Newell Highway is approximately 2.6km to the west from site whilst the Golden Highway is approximately 2.9km to the south from site.

The Newell Highway and Golden Highway provide access to Narromine Road (main road west) and to the Mitchell Highway (main road to the southeast).

The Golden Hwy is a State road running eastwards from Dubbo towards Newcastle on the coast (which is the preferred Port for the Project). At the intersection with Yarrandale Road is a two-lane roundabout intersection with 2 approach lanes and 2 departure lanes on each of its 4 legs. The roundabout is designed for B-double movement with a central semi-mountable island with a radius of 25 metres.

The Newell Hwy is a State road running north-south between the Victorian border and the border with Queensland. It is an established inland heavy haulage route. At the intersection with Purvis Lane, the Newell Hwy has a sealed carriageway width of 7.5m which accommodates one lane of traffic in each direction and is widened to support intersection and turn treatments where required.

Yarrandale Road is a municipal local road that runs in a north-south direction adjacent to the Project site. At the Project site, the road has a sealed carriageway width of 8m, with one lane of traffic in each direction and swale drains on both sides.

Purvis Lane is a municipal local road running generally east west and provides a connection between the Newell Hwy and Yarrandale Road. This section of road has an 11 metre wide sealed carriageway that accommodates one lane of traffic in each direction and a central right-turn lane throughout which supports heavy vehicle access into the adjacent industrial land.

Boothenba Road is a municipal local road that runs east-west between the Newell Highway and Golden Highway intersecting with Yarrandale Road and providing an accessible connection to both highways to the north of site. The road has a sealed carriageway width of approximately 7m accommodating one lane of traffic in each direction.

All municipal local roads (Boothenba Road, Yarrandale Road and Purvis Lane) are approved by TfNSW as B-double routes and are used by heavy goods vehicles to access neighbouring businesses and industries from the wider State network.

Figure 13.1 is a Map of Designated Transport Routes to and from site.

Figure 13.1 – Map of Designated Routes to Project site

Local road condition is excellent and capacity and suitability are reflected by all municipal local roads proposed to be used for gaining access and egress to and from the Project site being classified as suitable for B-double vehicles as detailed on the TfNSW Restricted Access Vehicle Map.

13.2.2 Site Accessibility

Existing site access is reduced to agricultural gates at two locations – one next to the adjacent batching plant and another diagonally opposite the Yarrandale Road substation.

13.2.3 Parking

The Project site is currently in an undeveloped state and used for agricultural purposes.

13.2.4 Other Road Users

There are other road users of the municipal local roads surrounding the Project site who may be impacted during construction and operation of the Project including adjacent businesses, Council and utilities, public transport providers and users and cyclists.

13.2.4.1 Adjacent Businesses

Yarrandale Road has several existing road users with the Fletcher Grain and Intermodal Freight Terminal approximately 1km north of the proposed Project site and the abattoir operated by Fletcher International Exports approximately 450m to the north of the proposed Project site. These businesses are accessed via Yarrandale Road to the south and Boothenba Road to the north.

There is a small-scale concrete batching plant approximately 25m to the south of the proposed Project site and a number of transport and light industry-focussed businesses that access their premises from Allen Road and Purvis Lane which are approximately 480m and 1.1km south of the proposed Project site respectively.

The Project site backs on to the Dubbo Regional Livestock Markets accessed from Boothenba Road.

13.2.4.2 Council and Utilities

Dubbo Regional Council operate a potable water reservoir off Yarrandale Road with access directly across the road from the Project site.

Essential Energy operate the Yarrandale Road substation which is directly across the road from the Project site.

APA Group operates gas transmission infrastructure to the south of the Project site along Yarrandale Road, with Jemena's Dubbo gas networks co-located at this site.

These operational facilities account for a very low volume of traffic.

13.2.4.3 Public Transport

No public transport services operate in the vicinity of the Project site. Dubbo College Senior Campus and Charles Sturt University are located 2.4km south of the Project site and are accessed from the Golden Highway.

One school bus uses Yarrandale Road but does not stop in the vicinity of the Project site due to a lack of residential housing in the area.

13.2.4.4 Cyclist Use

There are no formal off-road cycling facilities provided on Yarrandale Road although it does form part of the 'town loop' which is used mostly during early morning periods on the weekends by cyclists. Engagement with the Dubbo Cycling Group in December 2022 has indicated that Yarrandale Road forms part of a loop regularly used by Dubbo cyclists. The Dubbo Cycling Group has advised that the loop is frequently used by Dubbo Social cycling on Mondays, Wednesdays, Fridays and Saturdays seeing riders pass through near the Project location at approximately 6.30am Monday - Friday with groups of 10 - 15 riders and groups of up to

20 on Saturdays at approximately 7am along with a few individuals scattered through the day on Saturday and Sunday at various times. The Group also indicated that it may be likely that occasional rider/s may also use the loop on weekdays in the afternoons from 5pm.

13.2.4.5 Pedestrian Use

Yarrandale Road has no formalised footpath on either side.

13.2.5 Safety Analysis

Dubbo is the meeting point of three State highways, with the Newell Highway being the main inland transport corridor between Victoria and Queensland. As a result, there is a greater volume of heavy goods vehicles transiting through Dubbo. There is also a greater number of light vehicle movement with drivers who are transiting through Dubbo who are unfamiliar with the road layout.

When evaluating road accident causation, the increased frequency of heavy goods vehicles coupled with a higher proportion of drivers who are unfamiliar with the local road network would indicate that accidents would have a higher likelihood to occur within Dubbo compared to other regional towns in New South Wales.

In terms of safety factors already ingrained within the existing road network, reduced speed limits are in place throughout the road network in proximity of site. Routes are well sign posted and turning lanes are in place to assist with traffic segregation and safety.

A search of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for all injury crashes in the vicinity of site as part of the Traffic Impact Assessment revealed a concentration of accidents on intersections of the Newell Hwy through Dubbo.

The key intersections surrounding the Project site are summarised below:

- The intersection of the Newell Hwy and Boothenba Road recorded 16 crashes from 2017 to 2021, 15 of which resulted in injury (10 serious, 4 moderate and 1 minor).
- The intersection of the Newell Hwy and Purvis Lane recorded 3 crashes, all resulting in moderate injury.
- The intersection of the Golden Hwy and Yarrandale Road recorded 4 crashes, of which 2 resulted in moderate injury and 2 were non-injury crashes.

13.2.6 Oversize and/or Overmass Vehicle Movement

Each of the Golden Highway, Newell Highway, Purvis Lane, Yarrandale Road and Boothenba Road are rated to accommodate B-double vehicles up to 4.6 m high and are all listed by TfNSW as Oversize Overmass Load Carrying Vehicles Approved Roads.

13.3 Impact Assessment – Construction

13.3.1 State Road Network and Local Road Network

Construction traffic generated by the Project can be broadly split into the following categories:

- Light vehicles associated with workforce accessing the site, including shuttle buses that may be used to transport the workforce to/from the site reducing the need for private vehicle use
- Heavy vehicles which include the following:
  - Medium and Heavy Rigid Trucks (MRV and HRV as defined within AS2890.2:2018) to deliver materials and smaller plant
  - Truck and Dog vehicles to transport earthwork material to/from the site; and

- Articulated Vehicles and 26-metre-long B-doubles to transport larger plant and equipment.

Some oversized and over mass (**OSOM**) vehicles would be required for the delivery of larger components such as the transformer, site office buildings, power generation packages and electrolyser packages, and earthmoving machinery. No additional controls are recommended for OSOM loads for the Project because the proposed transport routes are OSOM load carrying approved roads.

During construction, it is estimated that the Project would generate up to 120 heavy and 76 light vehicle movements per day. The site is expected to generate approximately 44 vehicle movements during the morning and evening peak hours of the peak construction period, which would reduce to 13 vehicle movements over the typical construction periods.

During construction, it is expected that most vehicles would access the Project site via Yarrandale Road from Golden Highway and any vehicles travelling from the north are expected to use Newell Highway to access the Project site via Purvis Lane. Materials and equipment are expected to be transported from the east or Newcastle direction. The access route utilises roads that are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map. The roads along the access route can accommodate the loads and type of vehicle movement to be generated during construction of the Project.

No impacts to road access are expected and no public roads are proposed to be closed during construction of the Project. No impacts are expected to the condition of the roads as the roads are designated for B-Double vehicles and are regularly used by heavy vehicles servicing the surrounding industrial and agricultural land use. No road upgrades are proposed as part of the Project.

13.3.2 Traffic Assessment

To determine the ability of the existing road networks to accommodate the traffic expected by the Project, a modelling exercise was undertaken for the intersections of the Golden Highway and Yarrandale Road and the Newell Highway and Purvis Lane. The capacity of the road network can primarily be determined by the operation of the associated intersections. To assess the operation of the surrounding road network, intersection counts are required as traffic counts do not provide the turn volumes at the intersections.

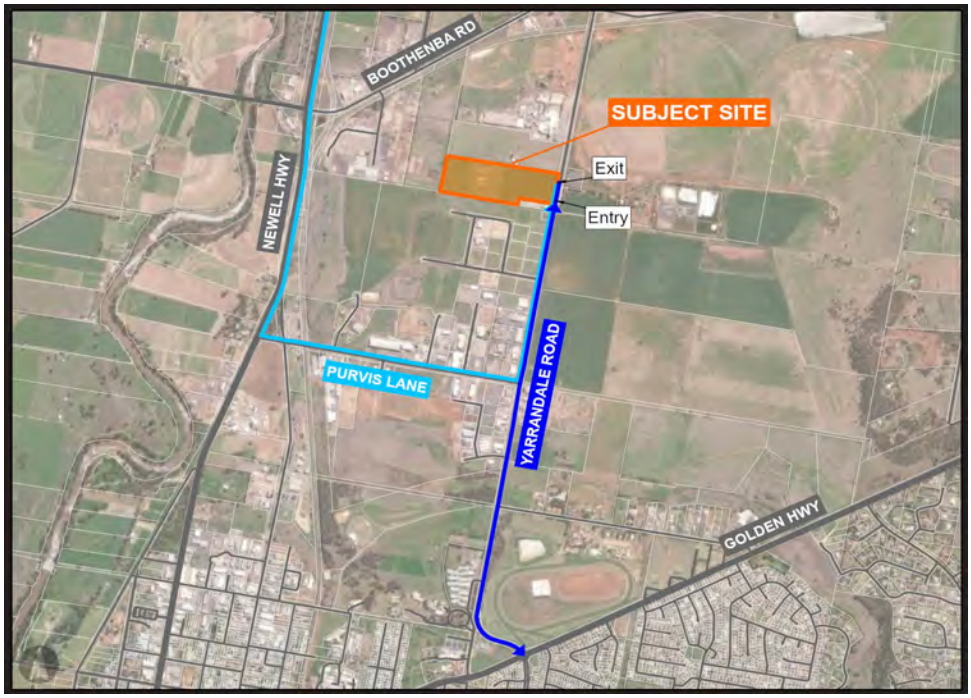
The modelling was conducted during the morning and evening peak hours given the location of the site on the outskirts of the Dubbo township. These times represent the peak hour for the construction traffic when staff arrive and depart the site. As such, the morning and evening peak hour on the road network is typically used as the assessment for these types of projects. The traffic volumes through the middle of the day are much lower and even if the volumes are higher on the surrounding road network the level of traffic is still expected to be able to be accommodated on the road network.

The road network is expected to continue to operate with a Level of Service of A, representing good operation of the intersection with less than an average 14 second delay per vehicle.

13.3.3 Site Accessibility and Site Layout

Access to the Project site is proposed via separate entry and exit crossovers to Yarrandale Road. Internal access roads are provided around the perimeter of the site which have a minimum width of 4.0 metres. Additional width is provided on corners to accommodate B-Double movements. The proposed accesses and circulation are designed in accordance with AS/NZS 2890.2 and exceed the minimum design dimensions for an accessway. The proposed Project site access (entry and exit) are provided in Figure 13.2.

Figure 13.2 – Site Access



No impacts to the road network are expected as the site access, circulation and loading areas are considered to be suitably designed.

13.3.4 Parking

It is anticipated that construction parking would be accommodated on site and parking on Yarrandale Road would not be warranted. No impacts on parking are expected on the surrounding road network due to the Project.

13.3.5 Other Road Users

The Project would not result in any change or impact to other road users.

13.3.6 Safety Analysis

During construction of the Project, additional construction traffic has the potential to impact road safety on roads along construction vehicle access routes. This includes construction personnel commuting to and from the Project site as well as heavy vehicles transporting materials and equipment.

Whilst a high number of crashes were recorded at the intersection of Boothenba Road and Newell Highway, existing crash rates on the remaining roads forming part of the proposed construction vehicle routes were low. To minimise impacts on road safety, vehicles would be advised to use Purvis Lane to access the site when travelling via Newell Highway which has suitable turn facilities to allow vehicles to exit the State Road network as an alternative to Boothenba Road.

13.3.7 Oversize and/or Overmass Vehicle Movement

The following equipment would require OSOM transportation to the Project site:

- Demineralised water treatment package
- O_2 gas coolers x 2
- LP reciprocating compressor

- LP aftercooler
- HP diaphragm compressor
- Gas storage compressor
- Cooling water surge tank
- Condensed water surge tank
- Electrolyser array modules x 6
- Electrical and control room building
- HV transformers x 2
- HV control room
- Earthmoving equipment x 4

Due to the low expected number of OSOM vehicle movements required and the fact that the access route utilises roads that are designated for B-Double vehicles, it is expected that the traffic impact of OSOM vehicles on the road network would be negligible.

13.4 Impact Assessment - Operation

During operation, the Project is expected to generate a minimal level of traffic associated with maintenance and operation services. The Project is expected to be operated by 4 – 6 people resulting in an average traffic generation of 4 - 6 light vehicle movements per day and deliveries comprising 8 semi-trailer movements per day which would result in a negligible change to the traffic environment. Operational traffic is not expected to impact on the operation, condition, or capacity of the surrounding road network.

During operation, access to and from the Project would be via Yarrandale Road.

Car parking is proposed to be provided on site to adequately support the proposed parking demand of 6 spaces. The parking spaces are proposed to have a width of 2.5 metres and a length of 5.4 metres and comply with the design requirements of AS/NZS 2890.1:2004. It is considered that the car park area and circulation road suitably meet the expected car parking requirements.

Operational impacts of the Project on road safety are expected to be negligible.

13.5 Cumulative Impacts

Consideration of potential cumulative impacts to traffic and transport has been given particularly having regard to other developments in the region including:

- Dubbo Hospital upgrade (Stages 3 & 4 Complete)
- Localised industrial land development (ongoing block by block)
- Forest Glen Solar Farm 75km east of site (not yet approved)
- Spicers Creek Wind Farm 55km east of site (not yet approved)
- Dunedoo Solar Farm 75km east of site (not yet approved)
- Orana BESS 45km southeast of site (not yet approved)
- Wellington South BESS 45km southeast of site (not yet approved)
- Aspley BESS 55km southeast of site (not yet approved)
- Uungula Wind Farm 60m southeast of sites (construction to commence in 2023)
- Wellington North Solar Farm 40km southeast of site (construction commenced July 2022)
- Wellington Solar Farm 45km southeast (construction complete)

If the Project construction coincides with the construction of multiple projects, none of the projects are anticipated to affect the local road network around the Project site.

Construction heavy vehicle movements would have a minimal cumulative impact locally in consideration of existing heavy vehicle movement associated with existing adjacent businesses including the abattoir operated by Fletchers International Exports and the grain store/rail siding.

The combined increase in traffic generated by the Project and other major project construction in the region is expected to have a minimal cumulative impact on both the state road network and municipal local road network in the study area.

13.6 Mitigation Measures

Mitigation measures to manage potential traffic, roads and transport impacts of the Project's construction and operation are summarised in Table 13.2 below.

Table 13.2 – Proposed Mitigation Measures – Transport

Reference	Mitigation Measure	Timing
TRT1	A Construction Traffic Management Plan (CTMP) will be prepared and implemented by the construction contractor. The CTMP will include: • the workforce be advised of the crash history at the intersection of Boothenba Road and Newell Highway and advised to use Purvis Lane to access the site • neighbours of the Project be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access • loading and unloading is proposed to occur within the work area. No street or roads would be used for material storage at any time • all vehicles would enter and exit the site in a forward direction • signage to be installed for entry and exist points from site to warn of cyclists • management of vehicular access to and from the site is essential to maintain the safety of the general public as well as the labour force. • The following code is to be implemented as a measure to maintain safety within the site once the Project is operational: – Utilisation of only the designated transport routes. – Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities. – implementation of a site drainage plan for on-site roads, hardstands and laydown area – installation of signage for entry and exit points from site to warn cyclists – all permits for working within the road reserve must be received from the relevant authority prior to works commencing. – a map of the primary haulage routes highlighting critical locations – an induction process for vehicle operators and regular toolbox meetings – preparation of a complaints management process for construction and operation of the Project – inclusion of provision for inclement weather in safety procedure for driving and operation of machinery	Construction
TRT2	An Operational Traffic Management Plan be implemented to include a driver code of conduct for all employees and contractors accessing the Project site.	Operation

14 VISUAL AMENITY

14.1 Introduction

This chapter provides a summary of the Project's likely landscape and visual impacts. The information in this chapter is based on the impact assessment presented in Appendix L (Landscape and Visual Assessment, deWitt Consulting, June 2023).

This chapter and the Landscape and Visual Assessment in Appendix L addresses the Project's specific landscape and visual related matters.

14.1.1 Assessment Methodology

The methodology for this assessment was based on the Guidelines for Landscape and Visual Impact Assessment, Third Edition (Landscape Institute and Institute of Environmental Management and Assessment (EMIA 2013) (**Guidelines**).

Fieldwork was undertaken at the Project site to conduct assessments and collect photographs as part of the impact assessment.

Assessment based on these guidelines involved:

- establishing a study area
- describing the baseline conditions for the existing landscape from which to assess the potential impacts of the Project
- assessing the potential impacts of the Project including a Zone of Theoretical Visibility analysis
- developing appropriate and justified responses (e.g., avoidance, mitigation and enhancement measures) to potential impacts; and
- proposing arrangements, where necessary, to mitigate any potential impacts.

14.1.2 Study Area

The study area was determined by:

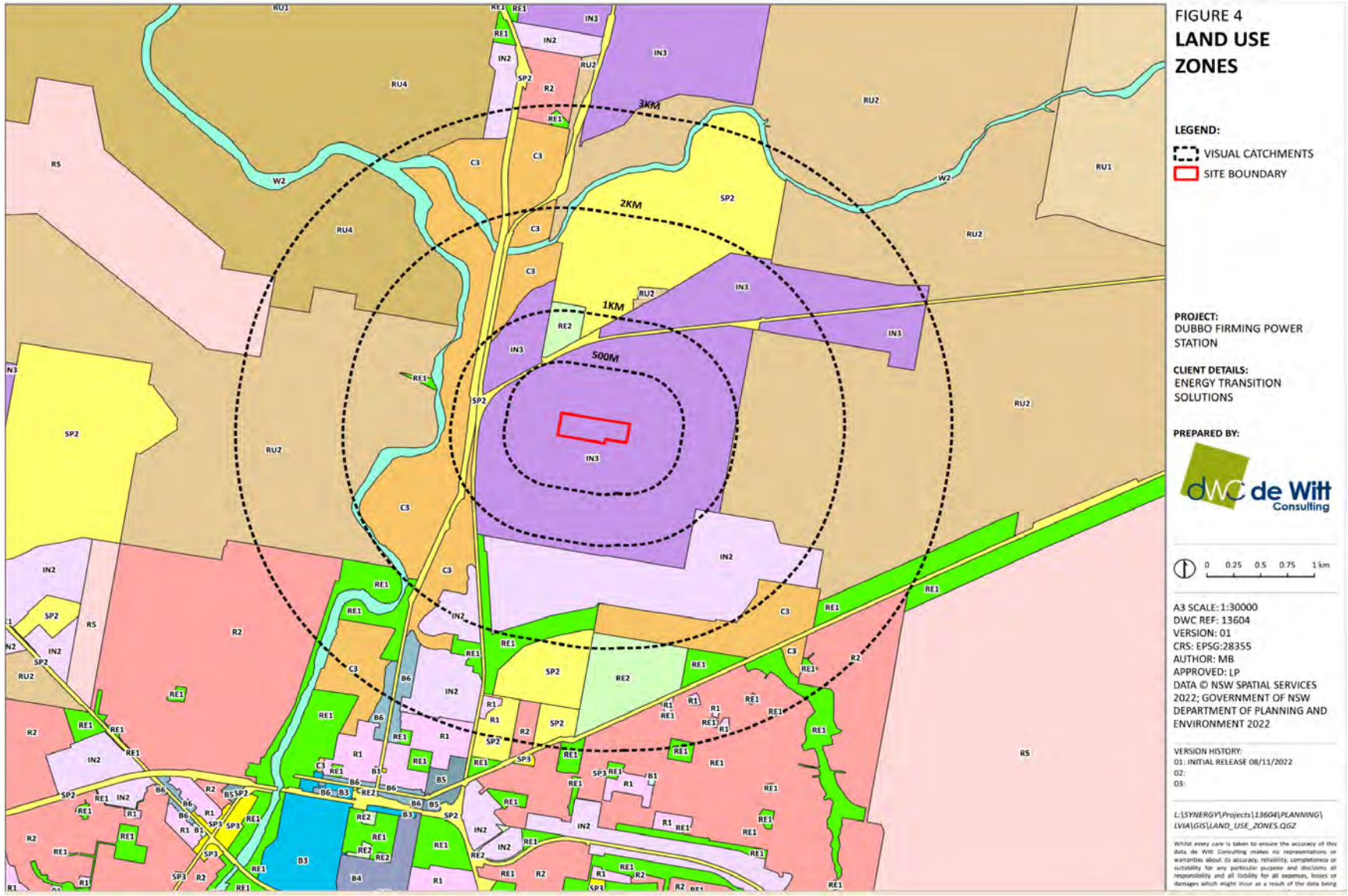
- the key features of the landscape including key public and private viewpoints
- the key components of the Project which result in a visual impact; and
- the likely extent of visibility that the key components of the Project will have on both public and private key viewpoints.

A series of visual catchments were established to define the extent of the assessment on both the landscape character and the landscape and visual effects.

A viewshed analysis was undertaken to determine the study area for the assessment and is based on the distance at which the tallest component of a structure would take up less than five per cent of the vertical field of view. For this assessment, the distance at which approximately 18m high gas turbine exhaust stacks in the landscape would take up five per cent of the vertical field of view is 3km. Thus, for the purposes of this assessment, the viewshed was defined as the area within 3km of the Project Site.

Figure 14.1 sets out the Project site location, the visual catchment areas and the relevant zoning of the surrounding land.

Figure 14.1 – Project site location, the visual catchment areas and the relevant zoning of land



14.2 Existing Environment

14.2.1 Site location and description

The Project site is located at 28L Yarrandale Road, Dubbo. The site has an area of approximately 14 hectares and has a frontage to Yarrandale Road of approximately 186m.

The surrounding landscape (within 3km of the Project Site) comprises gently undulating topography and there are no distinct ridgelines or notable areas of relief. The Wambuul/Macquarie River is located less than 1.5km west of the Project Site and the Talbragar River is located less than 2km north of the site, each of which is bounded by trees. While the landscape generally lacks significant landscape features, the rolling green pastures are noted to be highly distinctive and characteristic to the rural/semi-rural landscape character. The site itself generally falls away from Yarrandale Road with elevations recorded at approximately 289m AHD to the east and 277m AHD to the west. This presents a gradual fall of 12m across the approximately 643m length of the site.

The Project site is currently an improved pasture which is in good condition and a positive contribution to the overall greenery of the surrounding area.

Due to the transitioning phase of the industrial zoned land, there is evidence throughout the surrounding landscape of more abrupt changes between industry/built uses to pastures and natural land. An electricity substation and a gas scraper station are located proximate to the site. The existing subdivision immediately south of the site is in the early stages and is intended to be industrial land.

The Project site is located approximately 112km (as the crow flies) from the Siding Spring Observatory.

14.2.2 Landscape Character and Value

Landscape character is determined by the way the physical, natural and cultural components within a landscape interact, which together create a distinctive area or character (Landscape Institute & IEMA, 2013). The landscape character can be both objective and subjective with opinions differing between individuals.

Landscape character can also be separated into landscape character zones which are areas with strongly defined spatial qualities and features which are distinct from other areas. The applicable environmental planning instrument land use zoning of the Project site and surrounding land includes:

- E5 Heavy Industrial (current zoning of site) (formerly referred to as zone IN3)
- E4 General Industrial (formerly referred to as zone IN2)
- SP2 Infrastructure (Railway; Sewerage System; Classified Road; Educational Establishment; Health Services Facility)
- RU2 Rural Landscape
- C3 Environmental Management
- RE1 Public Recreation
- RE2 Private Recreation
- W2 Recreational Waterways
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RU4 Primary Production Small Lots

Figure 14.1 above sets out the various land use zones in the study area.

The character identified within a 3km buffer of the Project site can generally be captured under two landscape character zones being:

- Semi-rural/agricultural
- Urbanised/transitioning

The landscape characteristics of these two landscape character zones were used in the impact assessment and assessed using the landscape assessment criteria prescribed in the Guidelines against the following characteristics:

- landform and topography
- landcover/vegetation
- land use
- texture and colour
- settlement and human influence
- rarity

14.2.3 Landscape and Visual Effects

The significance of landscape and visual effects is perceived differently by individuals based on personal preferences and values associated with the landscape and views. As with landscape character, these values and the perceived significance of changes can be difficult to quantify. The key criteria used in the assessment of significance of changes is the result of the combined assessments of the sensitivity of receptors and magnitude of change derived from the Guidelines.

Sensitivity is the judgement about:

- the sensitivity of the receptor to the type of change arising from the specific proposal; and
- the value attached to the receptor.

The assessment criteria and grading system to determine the degree of sensitivity is set out in Table 14.1 below.

Table 14.1 – Summary of assessment criteria and grading system to determine the degree of sensitivity

Sensitivity	Receptor	Criteria
High	Landscape	The effect will result in a significant change to the landscape receptor, landscape character and/or value.
	Visual	The most sensitive visual receptors are residents at home in high proximity to the proposal.
Moderate	Landscape	The effect can be accommodated to some degree but prominent elements of the proposal are uncharacteristic.
	Visual	People engaged in activities whose attention is likely to be focused on the landscape and on particular views; people at work whose attention is not focused on their surroundings and where the setting is not important to the quality of working life.
Low	Landscape	The effect can be accommodated within the landscape without altering the existing character or value; or the existing landscape characteristics/amenity are of poorer quality.
	Visual	The effect is difficult to distinguish from the receptor (i.e., due to distance/separation/visibility).

Sensitivity	Receptor	Criteria
Negligible	Landscape and Visual	The effect is almost imperceptible and/or will not result in an adverse change to views or the landscape including its character and/or value.

Magnitude relates to the:

- size or scale of the effect from the proposed development
- geographical extent of the area influenced; and
- duration and reversibility of the effect.

The assessment criteria and grading system to determine the degree of magnitude is set out in Table 14.2 below.

Table 14.2 – Summary of assessment criteria and grading system to determine the degree of magnitude

Sensitivity	Receptor	Criteria
High	Landscape	The effect results in major alterations to the landscape characteristics.
	Visual	It consumes a large proportion of the view; high degree of contrast or integration of new features/changes in terms of form, scale and mass, height, colour and texture.
Moderate	Landscape	The effect will result in some change to the view due to loss of existing features and addition of new features in the view without significant change in its composition or compromising the specific basis for the landscape character.
	Visual	The effect is a noticeable element in the view from the receptor but not in the direct line of sight.
Low	Landscape	The effect will not result in an obvious change to the view due to significant loss of existing features or addition of new features.
	Visual	The effect is difficult to distinguish from the receptor (i.e., due to distance/separation/visibility).
Negligible	Landscape and Visual	The effect is almost imperceptible and/or will not result in an adverse change to views or the landscape including its character and/or value.

14.3 Impact Assessment – Construction

Visual impacts during the construction phase would largely be limited to areas that have direct visibility of the Project site. Construction activities that require elevated machinery such as cranes may be visible to locations beyond these surrounding roads.

The visual impact of construction activities, which would be temporary in nature, is expected to be low-negligible.

14.4 Impact Assessment – Operation

The potential equipment and structures to be used in the Project which may have a landscape or visual impact are:

- power generation equipment up to a maximum height of approximately 18.8m (dependent on equipment selection)
- buildings/sheds between 4 – 8m in height
- water and fuel storage tanks less than 4m in height

- above ground pipework less than 2m in height
- landscape screening 15m in height along the northwest and part of the southern boundaries

Most structures would be positioned centrally on the Project site and toward Yarrandale Road.

14.4.1 Landscape Receptors

Landscape receptors include the constituent elements of the landscape, the specific aesthetic or perceptual qualities and the character of the landscape in different areas.

In considering impact to landscape receptors from the Project, the impact assessment considered the following landscape attributes and made the summarised conclusions set out in Table 14.3 as to the value of these attributes to the subject land:

Table 14.3 – Landscape Character Assessment

Characteristic	Assessment Conclusion
Landform and topography	High-Moderate Due to the rolling green pastures that were noted to be highly distinctive and characteristic to a rural/semirural landscape character.
Landcover/vegetation	High-Moderate Due to large expanses of pasture and mostly maintained grassed land with scattered vegetation and remnant vegetation along the rivers.
Land use	Moderate Due to the transitioning phase of the industrial zoned land from pastures and natural land to industry/built uses.
Texture and colour	Moderate-Low Due to the surrounding area not displaying distinctive diversity in colour or texture.
Settlement and human influence	High-Moderate Due to the gradual transition between zones and the balance between built form and the natural landscape.
Rarity	Moderate-Low Due to there being no evidence of significantly rare cultural or environmental features in the subject area.

The overall visual impact of the Project once constructed is expected to be of moderate to low significance as the landscape can accommodate the visual changes without significantly altering its composition or adversely compromising the value.

Table 14.4 and Table 14.5 summarise the assessment with respect to land receptors.

Table 14.4 – Assessment of Landscape Receptors

Rating	Sensitivity Criteria	Magnitude Criteria
High	The effect will result in a significant change to the landscape receptor, landscape character and/or value.	The effect results in major alterations to the landscape characteristics.
Moderate	The effect can be accommodated to some degree but prominent elements of the proposal are uncharacteristic.	The effect will result in some change to the view due to loss of existing features and addition of new features in the view without significant change in its composition or compromising the specific basis for the landscape character.
Low	The effect can be accommodated within the landscape without altering the existing character or value; or the existing landscape characteristics/amenity are of poorer quality.	The effect will not result in an obvious change to the view due to significant loss of existing features or addition of new features.
Negligible	The effect is almost imperceptible and/or will not result in an adverse change to views or the landscape including its character and/or value.	The effect is almost imperceptible and/or will not result in an adverse change to views or the landscape including its character and/or value.

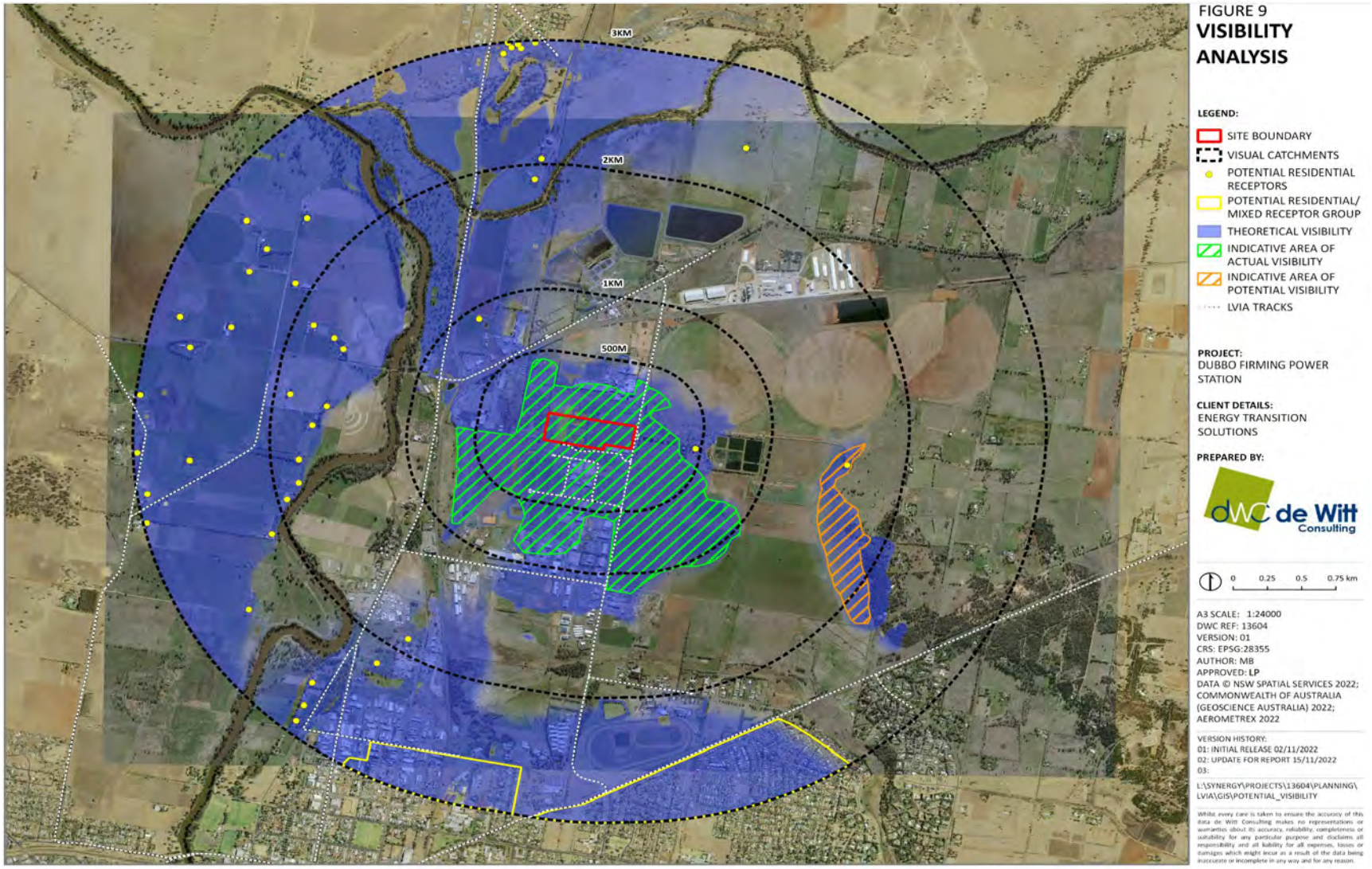
Table 14.5 – Assessment of Overall Significance of the Effect on Landscape Receptors

Sensitivity of Receptors		Magnitude of Effects			
		High	**Moderate**	**Low**	**Negligible**
	High	High Significance	High-Moderate Significance	Moderate Significance	Negligible Significance
	Moderate	High-Moderate Significance	Moderate Significance	Moderate-Low Significance	Negligible Significance
	Low	Moderate Significance	Moderate-Low Significance	Low Significance	Negligible Significance
	Negligible	Negligible Significance	Negligible Significance	Negligible Significance	Negligible Significance

14.4.2 Visual Receptors

Visual receptor refers to an individual or defined group/s of people who have the potential to be affected by a proposal where visual effects on specific views and on the general amenity are experienced by people. A viewshed analysis was undertaken to assist in identifying key potential receptors and areas to target for visual inspection during the field survey. The areas with the greatest potential of visibility are within 500 metres to 1 kilometre of the Project site and are depicted in green in Figure 14.2 below.

Figure 14.2 – Visibility Analysis



The potential visual receptors identified in the viewshed analysis were focused on residential dwellings with rural dwellings considered to be of the highest sensitivity rather than those within suburban areas. The residential areas that were targeted during the field survey are set out in Table 14.6 below together with the outcomes from the impact assessment applying the ratings set out in section 14.4 for sensitivity and magnitude. Figure 14.3 sets out the visualisations of the Project site from these locations.

Table 14.6 – Targeted areas for visual impact assessment

Area Description	Significance Rating
Residential dwellings west of Wambuul/Macquarie River and north of Talbragar River	Negligible
Residential development on outskirts of Dubbo	Negligible
Residential dwelling – 1.5 kilometres east of the Project site	High-Moderate
Residential dwelling - <500m east of site	Moderate-Low

Figure 14.3 – Visualisations of Project site from nearest sensitive visual receptors

Plate 1: Looking west, the subject site in the close foreground

Plate 2: Looking south, the emerging industrial zone nearest to the subject site

Plate 3: Looking east, gradual undulation of topography

Plate 4: Looking west, vegetation within the site itself

Plate 5: Looking southwest, silos and concrete works adjoining the subject site

Plate 6: Looking northwest, large abattoir north of the subject site

Plate 7: Looking southeast from within industrial subdivision south of the site

Plate 8: Looking northeast, grain handling facility and inter modal freight terminal

Plate 9: Looking west, gas substation south of the subject site

Plate 10: Looking northeast, electricity substation opposite subject site

The results demonstrate a high degree of consistency with respect to the potential visual effect from the proposed development to the vast majority of residential receptors, where the significance of the effect is considered to be negligible. Only two isolated dwellings, owned by the current landowner of the Project site, scored above this at either moderate-low or high-moderate, noting that the greater score was assigned due to a conservative approach being applied where the dwelling was unable to be visually inspected. Other receptors of a non-residential dwelling nature are considered to potentially experience a visual effect of low significance.

This emphasises the ability of the existing landscape to absorb the visual effect of the Project without compromising the landscape character or its value.

14.5 Siding Spring Observatory

The Siding Spring Observatory is located approximately 112km from the site (as the crow flies). Once operational, light emitting from the Project during night hours would occur only because of security lighting being activated. The Project would also produce limited dust emissions that can otherwise disperse light at night.

Based on the size and nature of the Project, it is considered capable of emitting less than 1,000,000 lumens. Potential adverse impacts to the Siding Spring Observatory can be appropriately mitigated and/or avoided through adoption of the recommendations outlined in Section 4.6 of the LVIA and the Dark Sky Planning Guideline. Mitigation measures include the use of warm-coloured light bulbs, directional lighting below the horizontal plane, shielding of lights, sealing of dust-emitting surfaces during construction and operation use of low-reflective materials throughout the development.

14.6 Cumulative Impacts

The cumulative impact of the Project on landscape and visual amenity is considered minor as the Project is consistent with size/scale, materiality, form and general land use (industrial) when considered alongside other structures and future growth within the area. There is no cumulative impact of the Project on the Siding Spring Observatory.

14.7 Mitigation Measures

Mitigation measures to manage potential landscape and visual impacts of the Project's construction and operation are summarised in Table 14.7 below.

Table 14.7 – Proposed Mitigation Measures

Reference	Mitigation Measure	Timing
LV1	Landscape screening be extended, where possible and subject to maintaining a safe line of sight for traffic in accordance with the Traffic Impact Assessment, to the frontage of Yarrandale Road to provide additional screening.	Construction
LV2	Landscape screening should be at least two rows of vegetation, the species of which should be appropriate to local climate and require minimal maintenance with a mature vegetation height of 15 metres. Planting should commence prior to the commencement of operation.	Construction
LV3	Use of warm-coloured light bulbs, directional lighting below the horizontal plane, shielding of lights, and use of low-reflective materials throughout the development	Construction and Operation
LV4	Dust will be managed during the construction and operational phases as per the requirements set out in the associated Air Quality Assessment	Construction and Operation

15 SOCIO ECONOMIC

15.1 Introduction

This chapter provides a summary of the Project's likely social impacts. Appendix M (Umwelt May 2023) is also attached as part of the assessment of likely social impacts for the Project.

15.1.1 Assessment Methodology

The methodology for this assessment has been informed by the requirements of the *Social Impact Assessment Guideline for State Significant Projects* (Department of Planning and Environment, November 2021) (**Social Impact Guidelines**) and the *Technical Supplement – Social Impact Assessment Guidelines for State Significant Projects* (Department of Planning and Environment - November 2021) (**Social Impact Technical Supplement**).

Assessment based on these guidelines involved:

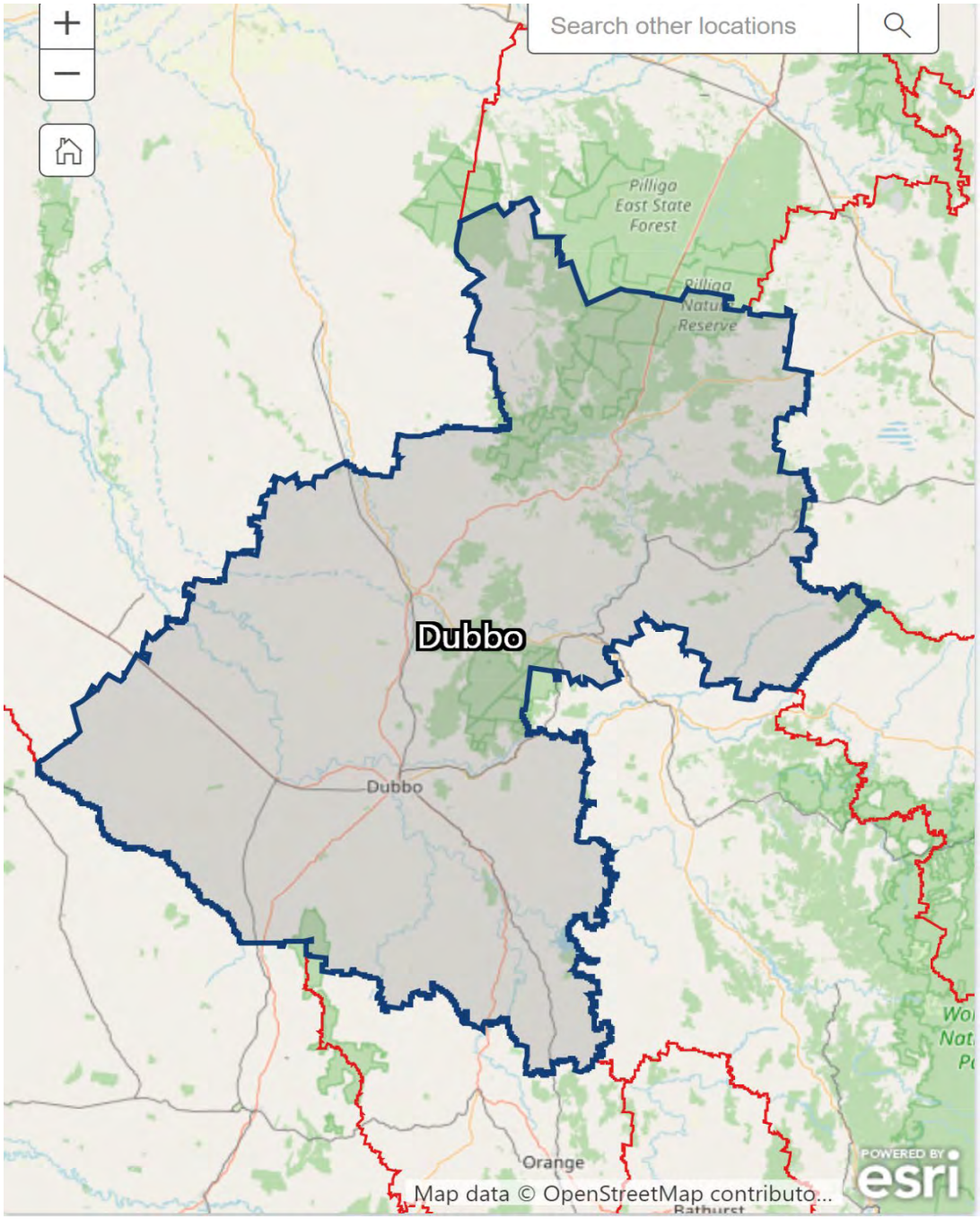
- establishing a study area or social locality
- describing the baseline conditions for the existing social environment from which to assess the potential impacts of the Project
- assessing the potential impacts of the Project – both positive and negative impacts
- developing appropriate and justified responses (e.g., avoidance, mitigation and enhancement measures) to potential social impacts and identifying and explaining any residual social impacts
- proposing arrangements, where necessary, to monitor and manage residual social impacts over the life of the Project

15.1.2 Social Locality or Study Area

The social locality adopted for this social impact assessment focuses on the Australian Bureau of Statistics (**ABS**) Dubbo Statistical Area Level 3 (SA3) as shown in Figure 15.1.

This area was adopted as it encompasses the broader Dubbo area and provides a more comprehensive set of statistics as a comparator than a smaller statistical area and ensures that impacts have been assessed taking into account not only central Dubbo and the Project site but the broader region.

Figure 15.1 – Social impact assessment social locality (Dubbo Region Statistical Area Level 3)



15.2 Social Baseline (Existing Environment)

15.2.1 Regional Context

The Wiradjuri People are the original inhabitants and custodians of land and water in the Dubbo Region. The region is one of the fastest growing in regional NSW. Geographically located in the heart of New South Wales, the region is ideally located at the intersection of major road, rail and air routes.

The main industries in the social locality are health, retail, education, government services, tourism, manufacturing, construction, agriculture, business services and transport. The Region is also well positioned as a growing mining services centre with mining and exploration projects, both established and emerging, across the surrounding region.

Dubbo is the main population centre with a population of approximately 39,000 residents and a labour force of approximately 20,000[4]. Dubbo is in the Central West region of NSW, and is the key agricultural, transport and industrial hub of the region. Retail trade, public administration, education and health care are also central to Dubbo's employment providing essential services to the city and surrounding region. The town is situated on the banks of the Macquarie River in Central West NSW and is home to the famous Taronga Western Plains Zoo which houses hundreds of rare and endangered animal species from around the world.

15.2.2 Community Profile

Key population and demographic data for the social locality along with data for regional NSW and the state of NSW as a comparison is presented in Table 15.1.

In 2021, the social locality had a total estimated resident population of 74,084 people with a median age of 38 years.

Communities in the social locality had:

- A population profile generally consistent with both Regional NSW and the State but a younger population compared to Regional NSW in terms of median age and a higher proportion of children under 14 years and a lower proportion of people over 65 years of age
- A higher proportion of people who identified as Aboriginal and/or Torres Strait Islander compared to the State average and lower levels of diversity in relation to people born overseas and people who speak a language other than English at home than the State average
- A similar proportion of family households as both Regional NSW and the State
- A similar proportion of dwellings owned outright or owned with a mortgage and dwellings that are rented as both Regional NSW and the State as a whole

[4] https://abs.gov.au/census/find-census-data/quickstats/2021/UCL112006

Table 15.1 – Summary of key population and demographic data for Dubbo SA3, Regional NSW and NSW

Source: https://www.abs.gov.au/census/find-census-data/quickstats/2021/10503

Characteristic	Dubbo SA3	Regional NSW	NSW
Estimated resident population	74 084	2,829,637	8,072,161
Median Age	38 years	43 years	39 years
0-14 years	20.5%	17.9%	18.2%
15-64 years	60.2%	59.8%	64.1%
65+ years	19.3%	22.3%	17.7%
Aboriginal and/or Torres Strait Islander peoples	16.1%	6.6%	3.4%
Australian born	81.4%	81.3%	65.4%
Speaks language other than English at home	7.7%	8.4%	29.5%
Family households	68.7%	68.8%	71.2%
Dwelling owned outright or owned with a mortgage	65.9%	69.2%	64.0%
Dwellings rented	29.1%	26.8%	32.6%

15.2.3 Economic Profile

15.2.3.1 Income

Table 15.2 provides an overview of the income data for the social locality as at August 2021 along with data for Regional NSW and NSW.

At the 2021 Census, communities in the social locality generally had lower incomes, with median incomes below the State average, higher proportions of low-income households and lower proportions of high-income households in comparison to the State. However, the median incomes and proportions of low-income households and high-income households were similar to those in Regional NSW.

Table 15.2 – Overview of income data for Dubbo SA3, Regional NSW and NSW

Source: https://www.abs.gov.au/census/find-census-data/quickstats/2021/10503

Characteristic	Dubbo SA3	Regional NSW	NSW
Median weekly personal income	$779	$722	$813
Median weekly household income	$1,463	$1,434	$1,820
Less than $650 total household weekly income	19.7%	20.2%	16.3%
More than $3000 total household weekly income	16.7%	18.0%	26.9%

15.2.3.2 Employment

Table 15.3 provides an overview of the key employment statistics recorded for the social locality as of August 2021 together with the same statistics as a comparator for Regional NSW and NSW.

Table 15.3 – Summary of employment data

Source: https://www.abs.gov.au/census/find-census-data/quickstats/2021/10503

Characteristic	Dubbo SA3	Regional NSW	NSW
Participation Rate	58.3%	56.4%	58.7%
Unemployment	4.0%	4.6%	4.9%

This data indicates that while labour supply is tight owing to the low unemployment rate, there are a reasonable number of job seekers who may benefit from new employment opportunities.

The skills base of the social locality is reflected in its occupational structure. ABS Census Data (2021) shows 31.3% of all the workers in the social locality were occupied in activities generally associated with the types of skills required for the construction and operation of the Project (for example, technicians and trades workers, labourers and machinery operators and drivers). The social locality's representation in these occupations is higher than Regional NSW of 29.6% and the State average of 26.1% indicating that there is a suitable occupational base in the locality to service the Project.

The ABS Census Data (2021) also shows that the social locality has 2,453 workers directly employed in the construction sector and a further 1,160 workers employed in the transport, postal and warehousing sector. In total, these two sectors employ 3,613 workers. This indicates that the social locality provides a good labour force base upon which to service the Project.

As of 2021, there were 7,677 businesses in the social locality. Of these 7,677 businesses, 1,150 were operating in the construction sector and 436 businesses in the transport, postal and warehousing sector. In addition, there were 334 businesses operating in the accommodation and food services sector.

15.2.4 Project Location

The proposed Project site is wholly within the Dubbo Regional Council LGA. The Project site is in the heavy industrial area of North Dubbo. Surrounding the proposed site includes Fletcher International Export Abattoir (the largest employer in Dubbo), the Dubbo Livestock Markets, the Dubbo Sewage Treatment Plant and commercial agricultural enterprises including pivot irrigation. To the south of the proposed site, is a concrete batching plant and the Fletchers Industrial Estate which is currently undergoing subdivision for further industrial development.

As the Project site is in a heavy industrial zone, there are no residential developments, community service facilities such as hospitals or aged care or recreational facilities such as parks and playgrounds. There are 6 residential properties in the 2 km radius of the Project site.

The proposed site is located along Yarrandale Road, which links to Boothenba Road to the north and Purvis Lane to the south, both of which are arterial roads connecting north Dubbo to the Newell Highway. Yarrandale Road also extends to connect with the Golden Highway further south.

The Project is located within the CWO REZ, being the State's first REZ. The establishment of the CWO REZ has attracted significant interest from renewable energy and storage developers, with 113 registrations of interest received, representing up to 27 gigawatts of new energy generation and storage projects (EnergyCo NSW, 2022). The REZ is anticipated to unlock up to 3 gigawatts of new network capacity by the mid-2020s, enough to power 1.4 million homes. New transmission infrastructure will enable wind and solar generators to participate in the REZ to export electricity to the rest of the network. The REZ is expected to facilitate up to $5.2 billion in private investment to the Central West Orana region by 2030 and at its peak, is expected to support around 3,900 construction jobs within the region.

15.2.5 Housing and Accommodation

The ability to accommodate workers who are not resident in the social locality or within a commutable distance is often a key consideration for major projects.

15.2.5.1 Commercial Accommodation

A range of short-term visitor and tourist accommodation is available in the social locality particularly in Dubbo itself including motels, caravan parks, self-contained apartments, and hotels. These provide accommodation for a diverse range of customers including recreational travellers, tourists, and business travellers.

As of 30 June 2020, the Central NSW Region[5] had 158 establishments offering accommodation with 10 or more rooms and a total of 4,795 rooms available to accommodate visitors to the region (Destination NSW 2020). In the June quarter of 2022, occupancy rates of hotels and serviced apartment accommodation with 10 or more rooms for the Central NSW Region recorded an occupancy rate of 73.6% (Destination NSW 2022).

In addition to accommodation establishments with 10 or more rooms, there are many self-contained apartments, holiday house, bed and breakfast accommodation, and caravan, camping and holiday parks within the social locality.

15.2.5.2 Private Accommodation

Private accommodation such as holiday homes and investment properties may be used to house construction workers. ABS Census Data (2021) indicates that 9.9% of dwellings in the social locality were unoccupied which was lower than the number of unoccupied dwellings in Regional NSW of 11.2% but slightly higher than the State average at 9.4%.

Table 15.4 – Private Accommodation

Source: https://www.abs.gov.au/census/find-census-data/quickstats/2021/10503

	No. of Occupied Dwellings	No. Unoccupied Dwellings	Total No. Dwellings	Unoccupied Dwelling Share
Dubbo Region SA3	26,168	2,872	29,040	9.9%
Regional NSW	1,071,609	134,891	1,206,500	11.2%
New South Wales	2,900,468	299,524	3,199,992	9.4%

15.2.6 Access

The Project site is situated approximately 4 kilometres northeast of central Dubbo with access to the site proposed via two new driveways that connect with Yarrandale Road. Yarrandale Road connects with the Golden Highway to the south and Boothenba Road and Purvis Lane which connects with the Newell Highway to the west.

There are no public transport services operating within the vicinity of the site.

There are no formal off-road cycling facilities provided on Yarrandale Road although it does form part of the 'town loop' which is used mostly during early morning periods on the weekends by cyclists. Engagement with the Dubbo Cycling Group in December 2022 has indicated that Yarrandale Road forms part of a loop regularly used by Dubbo cyclists. The Dubbo Cycling Group have advised that the loop is frequently used by Dubbo Social cycling on Mondays, Wednesdays, Fridays and Saturdays seeing riders pass through near the Project location at approximately 6.30am Monday - Friday with groups of 10 - 15 riders and groups of up to 20 on Saturdays at approximately 7am along with a few individuals scattered through the day on Saturday

[5] Central NSW Region includes Dubbo, Orange, Bathurst, Mudgee, Coonabarabran, Cowra, Narromine and Parkes.

and Sunday at various times. The Dubbo Cycling Group also indicated that it may be likely that occasional rider/s may also use the loop on weekdays in the afternoons from 5pm.

15.2.7 Local Business

Situated in a heavy industrial zone of Dubbo, the Project is generally separate from local businesses other than the industrial businesses located in the industrial zone including:

- Fletcher International Exports – abattoir and meat works
- Hanson Australia – concrete supplier
- Real Pet Food Company – pet food manufacturer
- Nufarm – chemicals company

The social locality more broadly has a wide range of local businesses including retail and commercial servicing residents and industries within the social locality and the broader Orana and Far West Region.

15.2.8 Social Infrastructure

Social infrastructure located within two (2) kilometres of the Project site is generally limited and includes:

- the Western District Memorial Park located about 900 metres to the north of the site along Boothenba Road
- the Dubbo City Crematorium located about two (2) kilometres to the south of the site along Moffatt Drive

Dubbo College Senior Campus and Charles Sturt University (Dubbo Campus) are located approximately four (4) kilometres south of the Project site along Yarrandale Road.

Dubbo, as the regional hub, accommodates a range of Council and NSW Government social infrastructure and community facilities to cater for residents, workers and visitors to the region. These include:

- Health and medical services including the Dubbo Base Hospital which includes an Emergency Department, acute inpatient service, and specialist medical services
- Education facilities including government and private primary schools, government and private secondary schools, tertiary education facilities including Charles Sturt University and Dubbo TAFE and kindergartens and childcare centres
- Cultural and public attractions such as the Taronga Western Plains Zoo and the Old Dubbo Gaol
- Recreation, leisure, and sporting facilities including sporting grounds, sporting clubs, playgrounds and aquatic centres
- Emergency services including Ambulance NSW, Fire and Rescue NSW and NSW Police

15.2.9 Community and Way of Life

The social locality is largely made up of the traditional lands of the Wiradjuri people, the traditional custodians of the Wiradjuri Nation and the Project is located on the land of the Tubbagah People of the Wiradjuri Nation and within the Dubbo Local Aboriginal Land Council area. The character and identity of the social locality is influenced by the rural and agricultural industries.

The region contains a diverse mix of urban, rural and industrial land uses as well as significant areas of natural bushlands and state forests. Protecting endangered ecological communities, threatened species, habitats and environmental assets is one of the key themes in the Dubbo Regional Council Towards 2040 Community Strategic Plan (Dubbo Regional Council 2022) (DRC Strategic Plan). Maximising the realisation of economic development opportunities for the region is also a feature of the Dubbo Regional Council Strategic Plan with a focus on proactively attracting major investments in line with regional opportunities and

ensuring that land is suitably zoned, sized and located to facilitate a variety of development and employment generating activities.

Communities in the social locality have access to a wide range of social infrastructure and community services including education, sport and recreation facilities, health care and social services. These services and infrastructure foster health and wellbeing and were a particular focus in the Dubbo Regional Council Strategic Plan.

15.3 Impact Assessment – Construction

DPE's Social Impact Significance Matrix has been used to assess each social impact and benefit of the Project.

In assessing each notable social impact and benefit of the Project, consideration has been given to engagement with the local community and key stakeholders, research and analysis of the local area and the technical assessments undertaken for the EIS.

Key social impacts and benefits identified as having a potential notable impact/benefit because of the Project together with the social impact rating are summarised below in Table 15.5. Each of these notable social impacts or benefits are explained in more detail below.

Table 15.5 – Summary of Social Impacts and Benefits for the Project

Social Aspects	Nature	Social Impact Category	Timing	Magnitude Level	Likelihood Level	Social Impact Rating[6]
CONSTRUCTION						
Housing and Accommodation	Negative	Way of Life, Livelihoods	Construction	Minor (2)	Possible (C)	Medium
Access	Negative	Way of Life, Access	Construction	Minimal (1)	Possible (C)	Low
Amenity	Negative	Health and Wellbeing, Way of Life, Community Values	Construction	Minimal (1)	Unlikely (D)	Low
Pressure on Local Facilities and Services	Negative	Health and Wellbeing, Way of Life, Community Values	Construction	Minimal (1)	Unlikely (D)	Low
Conflicting Land Use	Negative	Health and Wellbeing, Way of Life, Community Values	Construction	Minimal (1)	Unlikely (D)	Low
Employment	Positive	Livelihood	Construction	Minor (2)	Almost Certain (A)	Medium
Local Business Opportunities	Positive	Livelihood	Construction	Minor (2)	Almost Certain (A)	Medium
OPERATION						
Reliability of energy supply	Positive	Health and Wellbeing, Livelihood	Operation	Moderate (3)	Almost Certain (A)	Medium
Amenity	Negative	Health and Wellbeing, Way of Life, Community Values	Operation	Minimal (1)	Possible (C)	Low
Employment and Local Business Opportunities	Positive	Livelihood	Operation	Minor (2)	Almost Certain (A)	Medium

[6] Rating prior to the implementation of recommended mitigation measures

15.3.1 Housing and Accommodation

During construction, the Project would generate employment for up to 150 workers. Whilst it is anticipated that most of the construction workforce would be sourced from the social locality or region, it is expected that some workers may be required from outside of the region.

Of the 150 anticipated jobs, it is anticipated that:

- approximately 15% of these jobs will be in management and site services roles
- approximately 55% will be in primary earthworks including site setup, concreting, underground services, stormwater/drainage, fencing and construction of the structures for the power generation facility and the hydrogen generation facility
- approximately 20% will be utilised for electrical, instrumentation and controls; and
- approximately 10% will be specialist contractors (likely engaged by the EPC contractor or the OEM) to install and commission the power generation and hydrogen generation technology and to install and commission the storage pipeline.

Whilst the management roles and specialist contractors are likely to be sourced from outside of the Dubbo region, given the Project's proximity to Dubbo and the fact that the Project footprint is localised making it convenient for workers to access from Dubbo, it is anticipated that many of the roles associated with site set up, primary earthworks and construction of the structures will involve local resources. Local contractors based in Dubbo have lodged expressions of interest to be involved in the Project during the community information sessions.

In addition, the works involved in construction of the Project will be divided into separate work phases over the 12 – 18 months of construction which will result in these work phases being typically shorter in duration than larger projects such as wind and solar farms being undertaken in the REZ. This will allow local workers to be involved in short bursts of work locally.

Given the low vacancy rates and the dearth of available accommodation, the need for accommodation for these workers is likely to have a negative impact on other local businesses who are also looking to accommodate workforces sourced from outside of Dubbo and the region.

Stakeholder engagement activities noted the perceived scarcity of accommodation available in Dubbo for any workers sourced from outside of the local region. This perception is supported having regard to room occupancy rates in the Central NSW Region which were recorded as 73.6 per cent in the June quarter of 2022. Any impacts associated with increased demand for tourist accommodation are expected to be managed using a variety of accommodation types and locations where workers are accommodated. The Project would collaborate and coordinate with Dubbo Regional Council (in line with Objective 16 of the Central West Orana Regional Plan 2041) and other Squadron Energy projects in the region such as Spicers Creek Wind Farm and Uungula Wind Farm, as well as other large employers (e.g., Fletchers International Exports) to minimise any impact to the ability of these stakeholders to accommodate their respective workforces. This would be addressed in Squadron's Energy Workforce Accommodation strategy.

It is possible that some construction workers may choose to rent within the social locality for the duration of the works. This has the potential to increase pressure on rental prices, particularly in the context of existing low rental vacancy rates within the social locality. Increases in rental costs may affect the availability of affordable rental housing and rental affordability for some groups on low or fixed incomes (e.g., unemployed, elderly, students), contributing to rental housing stress for some households or result in some households having to move to more affordable accommodation elsewhere. However, any such impacts from increased demand for rental accommodation are likely to be low given demand for rental accommodation near the social locality by workers is expected to be minimal.

Table 15.6 – Assessment of Impact on Accommodation – Construction

Social Impact: Impact on availability of accommodation and rental housing **Category: Way of Life, Livelihoods**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Local Residents and Tourist Accommodation Businesses	Negative	Minor (2)	Possible (C)	12 – 18 months	Medium (C2)
Mitigation	• Collaboration with Dubbo Regional Council, other Squadron Energy projects in the region and large regional employers to minimise impact				
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Mitigated)**
Local Residents and Tourist Accommodation Businesses	Negative	Minimal (1)	Possible (C)	12 – 18 months	Low (C1)

15.3.2 Traffic

Increased traffic associated with the construction phase of the Project may impact the social locality in terms of accessibility and how people live and get around. A consultation process will be incorporated into the Project's CEMP and OEMP which will include a framework for consulting with local businesses, residents, local cyclist groups and other stakeholders to manage any impact to traffic and to notify these stakeholders of potential traffic impacts.

Based on the adoption of the recommended mitigation strategies in the Traffic Impact Assessment and continued community engagement with road users and the local community, the Project would have a low residual negative social impact for road users and local residents.

Table 15.7 – Assessment of Impact on Traffic – Construction

Social Impact: Impact of increased traffic in social locality on access, how people live and get around and impact on safety for road users **Category: Way of Life, Access**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Road Users and Local Residents	Negative	Minimal (1)	Possible (C)	12 – 18 months	Low (C1)
Mitigation	• Implementation of a Traffic Management Plan and other recommendations in the Traffic Impact Assessment				
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Mitigated)**
Road Users and Local Residents	Negative	Minimal (1)	Possible (C)	12 – 18 months	Low (C1)

15.3.3 Amenity

Construction noise and dust have the potential to cause a temporary decline in the way of life and associated health and wellbeing for residents. EPA NSW noted the need for detailed noise and air quality impact assessments which have been undertaken (Appendix I and Appendix J).

Construction activities for the Project would not result in significant construction noise, dust or lighting impacts for nearby communities, with the nearest dwellings generally located more than one kilometre from the Project site. During construction, visual impacts (refer Chapter 14) would mainly be limited to areas with direct visibility of the Project site at Yarrandale Road. These impacts would be temporary and are expected to be minor.

During construction, it is unlikely that local businesses would be impacted by noise, dust and traffic from construction activity given the location of the Project site in a heavy industrial zone.

The Project's CEMP will include a consultation process which will enable any local businesses and residents to provide feedback and to lodge concerns or issues to be addressed during the construction process.

The Project is generally removed from social infrastructure and community facilities, with the nearest community facility being the Western District Memorial Park located about 900 metres to the north of the site along Boothenba Road. As such, noise, dust and traffic from increased construction activities are not expected to affect the use or enjoyment of social infrastructure.

Table 15.8 - Assement of Amenity Impacts - Construction

Social Impact: Amenity (noise, air quality and visual) impacts **Category: Way of Life, Health and Wellbeing, Accessibility, Community Values**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Local Residents and Businesses	Negative	Minimal (1)	Unlikely (D)	12 – 18 months	Low (D1)
Mitigation	• Implementation of any recommendations in the Noise, Air Quality and Visual Impact Assessments				
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Mitigated)**

Social Impact: Amenity (noise, air quality and visual) impacts Category: Way of Life, Health and Wellbeing, Accessibility, Community Values					
Local Residents and Businesses	Negative	Minimal (1)	Unlikely (D)	12 – 18 months	Low (D1)

The social locality accommodates a high level of community services and facilities, including health and medical services, emergency services, cultural facilities and sporting and recreation facilities. Potential impacts on existing Council and NSW Government social infrastructure and community services due to increased demand on that social infrastructure and community services by construction workers is unlikely, given the existing high level of services and facilities available and the size of the construction workforce in relation to the existing populations of Dubbo and the social locality.

Table 15.9 - Assessment of Incoming Construction workforce causing increased pressure on local facilities and services

Social Impact: Incoming Construction workforce causing increased pressure on local facilities and services particularly local health care and facilities. Category: Way of Life, Health and Wellbeing, Accessibility, Community Values					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Local Residents and Businesses	Negative	Minimal (1)	Unlikely (D)	12 – 18 months	Low (D1)
Mitigation	• No mitigations required				

Protecting endangered ecological communities, threatened species, habitats and environmental assets is one of the key themes in the Dubbo Regional Council Strategic Plan and potential impacts on environmental values from the Project may be a concern for some people. The presence of biodiversity values is a key consideration in the Project design. However, the proposed Project site has been previously disturbed through agricultural and industrial uses and contains very little conservation value. Any threatened species, native vegetation and other environmental features will be avoided where possible in the final development footprint and are discussed further in Chapter 7 - Biodiversity.

Table 15.10 - Conflicting Land use and loss of environmental or agricultural values

Social Impact: Conflicting land use and loss of environmental or agricultural values as a result of land clearing for the Project. Category: Way of Life, Health and Wellbeing, Community Values					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Local and Regional	Negative	Minimal (1)	Unlikely (D)	12 – 18 months	Low (D1)
Mitigation	• Implementation of avoidance measures and to maintain works to areas of previous disturbance where possible				
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Mitigated)**
Local and Regional	Negative	Minimal (1)	Unlikely (D)	12 – 18 months	Low (D1)

15.3.4 Employment

The Project would have positive impacts on employment in the Region and social locality through the creation of direct employment opportunities during the 12–18 months of construction. Construction of the Project would generate direct employment for approximately 150 jobs at the peak of construction activity.

The Project is also likely to indirectly support generation of employment in local, regional and national businesses and industries from increased economic activity and spending at businesses providing goods and services to support construction activities.

Without experience installing electrolysers and managing renewable electricity generation in concert with hydrogen production, Australia is unlikely to have the scale and experience necessary to support a hydrogen industry. The Project may increase the capability of the local workforce to construct and operate a large-scale plant and to increase skills relevant to renewable energy technologies. The Project would leverage from the region's existing/developing expertise and make the Central West Orana Renewable Energy Zone a unique place to train workers.

The creation of employment opportunities from the Project also has the potential to support improved social and economic outcomes for individuals through increased incomes and skills development in a nascent and emerging area.

Stakeholder engagement activities highlighted the importance of local procurement and jobs and noted the perceived pressure on the local workforce from a tight labour market. A local procurement policy prepared by the Proponent may enhance the expected benefits to the community and proposed collaboration with Dubbo Regional Council in respect of the constrained local workforce would mitigate any perceived negative impact.

It is expected that the direct and indirect employment benefits from the Project during construction are a medium to high social benefit.

Table 15.11 - Assessment of Impact on Employment Opportunities

Social Impact: Additional employment opportunities in the region **Category: Livelihoods**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Regional	Positive	Minor (2)	Almost Certain (A)	12 – 18 months	Medium (A2)
Mitigation	• Implementation of local procurement policy • Collaborating with Dubbo Regional Council				
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Mitigated)**
Regional	Positive	Moderate (3)	Almost Certain (A)	12 – 18 months	High (A3)

15.3.5 Local Business

During construction, potential indirect benefits for businesses would mainly be associated with the provision of goods and services to support construction activities such as specialty trades, construction material supply, equipment hire and fuel supplies. By utilising local suppliers, this would help support local business growth and development within the social locality and broader region. Spending by workers on things such as accommodation, food and services is also likely to have a positive indirect impact on businesses in the region.

Table 15.12 - Assessment of Economic Benefits to Local Business - Construction

Social Impact: Economic benefits for local businesses through provision of goods and services to support construction **Category: Livelihoods**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Regional	Positive	Minor (2)	Almost Certain (A)	12 – 18 months	Medium (A2)
Mitigation	• Implementation of local procurement policy • Collaborating with local business groups				
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Mitigated)**
Regional	Positive	Moderate (3)	Almost Certain (A)	12 – 18 months	High (A3)

15.4 Impact Assessment – Operation

15.4.1 Reliability of Energy Supply

Reliability of energy supply refers to the extent to which customers have a continuous supply of electricity. The AEMO uses forecasting processes to determine customer demand and a statutory reliability standard is imposed which requires 99.998 per cent of forecast customer demand to be met each year. In February 2023, AEMO released an Update to 2022 Electricity Statement of Opportunities which highlighted that reliability gaps would begin to emerge from 2025 onwards with these gaps forecast to widen until all mainland states in the NEM are forecast to breach the reliability standard from 2027 onwards. In this Update, AEMO also called for investment in firming generation.

These forecast reliability gaps from 2025 onwards are likely to increase public awareness of the perceived lack of energy security and supply.

Blackout events can have a range of negative impacts on households and businesses which may include:

- inability to operate businesses without reliable and consistent energy supply which can impact the livelihoods of individuals and businesses and cause health and wellbeing concerns caused by the loss of perishable foods or the inability to manufacture goods or services resulting in a loss of trade and custom
- inability to heat or cool households which can have health and wellbeing impacts due to individuals inability to keep warm or cold in extreme temperatures
- increased anxiety and stress to individuals if the lack or loss of supply results in an inability to keep appliances operating such as refrigerators and hot water services
- for residents who rely on stable telephone and internet services to keep in contact with friends and family or to work from home

As a firming project, the Project would contribute to bridging the generation capacity gap which in turn would assist in improving the reliability of electricity supply and contributing to a more resilient electricity network. The Project would benefit communities, businesses and industry by increasing the reliability of supply in the National Electricity Market. The Project would support the renewable energy industry by providing firming capacity from the dual fuel power station and an opportunity to use excess electricity to produce clean hydrogen. This would encourage further investment in renewable energy projects in the region. The Project is expected to have a medium to high social benefit.

Table 15.13 - Assessment of Energy Reliability Benefits – Operation

Social Impact: Reliability of energy supply/Energy Security **Category: Health and Wellbeing, Livelihoods**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Regional	Positive	Moderate (3)	Almost Certain (A)	40 years	High (A3)
Mitigation	• No mitigations required				

15.4.2 Employment and Local Business

The generation of hydrogen at the Project would also attract further investment in the region as industrial consumers seek out co-location opportunities with new energy infrastructure delivering efficient and low carbon energy sources in the pursuit of low-cost clean energy. Hydrogen production might also support elements of the Central Orana Regional Economic Development Strategy (2018-2022) around the development of a logistics cluster and intermodal facilities and the capitalisation of growth potential in mining and construction to boost related clusters in energy, manufacturing and transportation.

During operation, the Project would generate permanent employment for about 6 full time workers. It is expected that these workers would live locally and therefore there would be no impact to accommodation or housing. The Project would also generate additional and ongoing contractor roles such as maintenance and cleaning.

It is expected that the direct and indirect employments from the Project during operation are a medium social benefit.

Table 15.14 - Assessment of Benefits to Employment and Local Business – Operation

Social Impact: Economic benefits from direct and indirect employment as a result of the Project **Category: Livelihoods**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Local Residents and Business	Positive	Minor (2)	Almost Certain (A)	40 years	Medium (A2)
Mitigation	• No mitigation measures required				

15.4.3 Amenity

Potential impacts on community values in the operation phase would mainly relate to visual, air and noise impacts from the presence and operation of the Project infrastructure. It is unlikely that potential visibility of the Project would pose a significant adverse visual impact to potential receptors as the Project would be generally sympathetic to the existing development within the surrounding landscape in terms of scale and nature and would not be a dominant feature in the landscape or alter the landscape character (see Chapter 14 - VISUAL AMENITY).

Operational emissions to air and noise from the Project would be managed within limits prescribed by the NSW EPA and subject to detailed assessments.

The use of attenuation measures for air quality and noise within the Project design would result in the social impact associated with noise and air quality to be assessed as low (see Chapter 12 - Noise and Vibration and Chapter 11 - Air Quality).

Table 15.15 - Assessment of Amenity Impacts – Operation

Social Impact: Impact on amenity as a result of air quality, noise and visual changes **Category: Way of Life, Health and Wellbeing**					
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Unmitigated)**
Local Residents and Businesses	Negative	Minimal (1)	Possible (C)	40 years	Low (C1)
Mitigation	• Implementation of recommendations from Noise, Air Quality and Visual Impact Assessments including the use of screening, noise and air quality attenuation				
Scale	**Nature**	**Magnitude**	**Likelihood**	**Time**	**Impact (Mitigated)**
Local Residents and Businesses	Negative	Minimal (1)	Unlikely (D)	40 years	Low (D1)

15.5 Cumulative Impacts

The Project may need to compete for labour, accommodation and construction-related resources with other energy and public infrastructure projects that are under construction or planned to be developed in the social locality in the coming years.

A review was undertaken for proposed major projects which may occur at a similar time to the construction of the Project. It is apparent that the continued development of the industrial zoned land around Yarrandale Road will likely occur although these are not listed on the major projects website.

The following renewable projects are also proposed:

- Forest Glen Solar Farm is located 75km east of the site and is not yet approved
- Spicers Creek Wind Farm is located 55km east of the site and is not yet approved
- Dunedoo Solar Farm is located 75km east of the site and is not yet approved

Orana BESS is located 45km southeast of the site and is not yet approved

- Wellington South BESS is located 45km southeast east of the site and is not yet approved
- Aspley BESS is located 55km southeast of the site and is not yet approved
- Uungula Wind Farm is located 60km southeast of the site and construction commencing in early 2023
- Wellington North Solar Farm is located 40km southeast of the site with construction understood to have commenced in July 2022; and
- Wellington Solar Farm is located 45km southeast of the site and has completed construction.

The construction phase of the Project is anticipated to commence in mid-2024 and at a time when it is likely that the above projects will be nearing the end of construction. The Project is likely to contribute to the opportunities available for workers and businesses in the energy infrastructure sector and to further develop the skills which may have been obtained through employment on the above projects.

Interproject communication will likely be important for the Project to manage any cumulative impacts associated with the number and breadth of development in the region.

15.6 Mitigation Measures

Mitigation measures to manage potential social impacts of the Project's construction and operation are summarised in Table 15.16 below.

Table 15.16 - Proposed Mitigation Measures

Reference	Mitigation Measure	Timing
SE1	Identify opportunities to maximise the use of local suppliers, workforce and businesses in the provision of goods and services to the Project and implement a local procurement policy for the Project prioritising local employment, services and materials where practicable.	Construction
SE2	Consult and liaise with the local accommodation providers, large employers in the region and Dubbo Regional Council to minimise impacts to short term rental and tourist accommodation having regard to a broader Workforce Accommodation Strategy across Squadron Energy Projects in the Central West Orana REZ.	Construction
SE3	Consult and liaise with large employers in the region and Dubbo Regional Council to minimise impacts to labour force shortages.	Construction
SE4	Implement the recommendations put forward in the impact assessments in respect of visual, air quality and noise	Construction and Operation
SE5	The Project's CEMP will include a framework for consultation with stakeholders during construction and a complaints handling process.	Construction
SE6	The Project's OEMP will include a framework for consultation with stakeholders during operation and a complaints handling process.	Operation

16 WASTE

16.1 Introduction

This chapter characterises and quantifies the waste that is likely to be generated during construction and operation of the Project.

The chapter adopts the principles of the circular economy, where practical, and provides the framework within which the Project would manage, reuse, recycle and safely dispose of generated waste.

16.1.1 Assessment Methodology

Quantification and categorisation are central to the waste assessment methodology. Waste has been calculated via evaluation of the Project's design to gain an understanding of the intended size, scale and capacity of equipment, componentry, piping and storage.

Where there is limited information at this stage of the Project, conservative assumptions have been made. Waste streams have been classified in accordance with the *EPA Waste Classification Guidelines* (EPA 2014) (**Waste Guidelines**).

Waste generated during construction has been considered separately to the operation phase as the expected volume and classifications are expected to change and diminish following commissioning of the Project.

16.2 Waste Streams

16.2.1 Definition of waste streams

An assessment of likely waste materials and volumes for the Project has been undertaken and waste has been classified in accordance with the classes of waste defined in clause 49 of Schedule 1 of the *Protection of the Environment Operations Act* 1997 (NSW) and listed in Part 1 of the Waste Guidelines.

The classes of waste are set out in Table 16.1 below.

Table 16.1 – Waste Classifications

Waste Classification	Description
Special Waste	Clinical waste, asbestos, waste tyres and anything classified as special waste under an EPA gazettal notice
Liquid Waste	Waste (other than Special Waste) that has an angle of repose of less than 5 degrees horizontal, becomes free-flowing at or below 60 degrees celsius or when it is transported, is generally not capable of being picked up by a spade or shovel and is classified as liquid waste under an EPA gazettal notice.
Hazardous Waste	Waste (other than Special or Liquid) that is pre-classified by the EPA as being 'hazardous waste': • containers, having previously contained a substance of Class 1, 3, 4, 5 or 8 within the meaning of the Transport of Dangerous Goods Code, or a substance to which Division 6.1 of the Transport of Dangerous Goods Code applies, from which residues have not been removed by washing or Vacuuming. • coal tar or coal tar pitch waste (being the tarry residue from the heating, processing or burning of coal or coke) comprising of more than 1% (by weight) of coal tar or coal tar pitch waste.

Waste Classification	Description
	• lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services Purposes). • lead paint waste arising otherwise than from residential premises or educational or child care institutions. any mixture of the wastes referred to above.
General Solid Waste (putrescible)	Waste (other than Special, Liquid, Hazardous or Restricted Solid Waste) but is pre-classified as: • household waste that contains putrescible organics. • waste from litter bins collected by or on behalf of local councils. • manure and Night soil. • disposable nappies, incontinence pads or sanitary napkins. • food waste. • animal waste. • grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids. • any mixture of the wastes referred to above.
General Solid Waste (non-putrescible)	Waste (other than Special, Liquid, Hazardous, Restricted Solid Waste or General solid waste (putrescible)) that is pre-classified and includes: • glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal • paper or cardboard • household waste from municipal clean-up that does not contain food waste • garden waste • wood waste • waste previously containing dangerous goods which have been cleaned • virgin excavated natural material • building and demolition waste

16.2.2 Application of the Waste Hierarchy

The waste hierarchy put in place under the *Waste Avoidance and Resource Recovery Act* 2001 (NSW) will be applied in consideration of waste management on the Project.

Table 16.2 describes how the waste management hierarchy will be adopted in each Project phase.

Table 16.2 – Waste Management across the Project phases

Project Phase	Adoption of the Waste Management Hierarchy
Detailed Design and Planning	• Ensure design incorporates the intent of the NSW Waste and Sustainable Materials Strategy (NSW DPIE, 2021) • Project design will be internally validated to ensure that the Project is fit for purpose and appropriate to the nature and scale of its intended use. • Design will reduce waste generation to a level that is as low as is reasonably practicable. • Project planning incorporates the principles of the *Waste Avoidance and Resource Recovery Act 2001*
Procurement, Tendering and Award of construction contract(s)	• Procurement of plant and equipment will be considerate of the NSW Energy Efficiency Policy and Energy Efficiency Action Plan. • Incorporation of waste management plan into contract tender consistent with applicable items within *Construction and demolition waste. A management toolkit NSW EPA 2020*

Project Phase	Adoption of the Waste Management Hierarchy
	• Weight tender assessment based on quality of contractor Waste Management Plan. • Weight tender assessment based on contractor sustainability criteria • *Standards for managing construction waste in NSW* (NSW EPA 2019) is adopted and reflected in the Project Construction Environmental Management Plan.
Post-award, pre-mobilisation	• Construction contractor's Construction Environmental Management Plan (CEMP) must include a Waste Management Plan that is reflective the principles of reduce, reuse, recycle and recovery of waste. • *Standards for managing construction waste in NSW* (NSW EPA 2019) is adopted and reflected in the Project Construction Environmental Management Plan
Construction	• Construction contractor implements the CEMP and Waste Management Plan effectively and remains compliant with the commitments and conditions contained within those documents.
Operation	• An Operational Waste Management Plan is prepared as part of the Operational Environmental Management Plan.
Decommissioning	• Waste management is key to the decommissioning of the Project with reuse, recycling and recovery at the centre of the decommissioning waste management plan.

16.3 Impact Assessment

16.3.1 Waste Generation – Construction

The Project will be designed and constructed having regard to the waste hierarchy, however it is likely that residual waste would be generated during construction. Waste generation may include:

- generation of vegetation and green waste from clearing subject land requiring treatment or disposal
- generation of spoil from site establishment and levelling activities which would be largely reused on site
- generation of packaging wastes requiring reuse or disposal
- generation of general construction wastes requiring reuse or disposal
- generation of sewage by construction personnel

An estimate of construction waste generation is listed in Table 16.3 below.

Table 16.3 – Summary of Construction Waste Generation

Waste Stream	Project Quantity	Assumption / Rationale
Sewage	1.65ML/Year	Assumes: 100 litres of liquid waste per person, an average of 45ppl on site for 1 year.
Packaging (scrap metals, timber, cardboard)	75 tonnes	Estimate quantity based on expected packaging in relation to Project design.
Other recoverable recyclables (cans, cartridges, metal offcuts, etc)	25 tonnes	Estimate quantity based on expected recovery rate in relation to consumables and Project design.
Solid waste to landfill	Nil	Nothing in additional to what has already been estimated.
Excess spoil	Up to 20 tonnes	Most spoil will be used in the cut/fill of the site and remaining spoil will be stockpiled on site. Provision

Waste Stream	Project Quantity	Assumption / Rationale
		should be made to send a small amount of excess to waste.
Other general waste to landfill (general litter, site office waste, builders waste, oils, greases, etc)	27 tonnes	Allowance of 0.5kg/person/day for the duration of construction.

16.3.2 Waste Generation – Operation

The operation of the Project would result in the generation of some waste that is captured and accumulated in equipment like the oily water separator, sumps and pits and needs to be removed from the site when reaching capacity. Other chemical wastes would also be produced in small quantities like the regeneration of the demineralised water plant and gas turbine water wash. There would also be sporadically produced chemical wastes from substances such as scale, sludge and scrapings from the inside of tanks during maintenance activities.

Some liquid waste from the operation of the Project, such as compressor wash water, would be managed as trade waste after going through the necessary treatment process on site. Trade waste volumes and quantities created by the Project would be influenced by the chosen technology, which is subject to further contractor involvement and detailed design.

Following equipment technology selection during detailed design, the waste quality and composition will be defined, which will then be reviewed with local registered waste handling companies to define a suitable trade waste pre-treatment and disposal methods. This method will be adhered to during operation.

Operational waste streams and expected or predicted quantities are listed in Table 16.4 below.

Table 16.4 – Summary of Operational Waste Generation

Waste Stream	Project Quantity	Assumption / Rationale
Sewage	0.16 ML /Year	Assume 100 litres per person, an average of 6 people on site for 260 days.
Filter grit	1 tonne.	High level estimate based on similar operating systems.
Oily water separator waste and turbine wash water	500kg/year	High level estimate based on similar operating systems.
Packaging (scrap metals, timber, cardboard)	1 tonne/year	10% of replacement equipment.
Other recoverable recyclables	200 kg/year	Estimate based on equivalent business recovery values.
Mechanical and electrical (Power) equipment	5000kg/year	Estimate based on expected replacement pumps and drives.
Electronics	200 kg/year	Estimate based on replacement controllers, etc
Landscaping	500 kg/year	Allowance for grass clippings
Solid waste to landfill	1.2 tonne/year	Office waste: 200kg/person/year Food waste: 0.2kg/person/day

16.3.3 Hazardous Waste

Certain materials that may be used on the Project site are defined as hazardous either under the Waste Classification Guidelines or the *Hazardous Waste (Regulation of Exports and Imports) Act* 1989 and would require management or specific disposal processes.

Hazardous chemicals which may generate small volumes of waste may include:

- Methane (CH_4)
- Hydrogen (H_2) Carbon dioxide (CO_2)
- Nitrogen (N_2)
- Sulphur hexafluoride (SF_6)
- Acetone (C_3H_6O)
- Aerosols (propellant)
- Acids, hydrochloric acid (HCl) or sulphuric acid (H_2SO_4)
- Caustic, sodium hydroxide (NaOH)
- Chlorine remover, e.g., Sodium bisulphate
- Biocide, e.g., DNBPA based solution
- Aqueous Ammonia
- Antiscalant
- Antifoam
- Fire suppression foam
- Various herbicides for weed controlHydrocarbons including diesel, lubricating oil and grease.

Any materials that can be reused or recycled would be separated, collected and taken off site for recycling. Any hazardous waste materials that cannot be reused or recycled, would be disposed of at a suitably licensed waste facility.

16.4 Cumulative Impacts

The volumes of waste expected to be generated from construction and operation of the Project would not place uncertainty or undue pressure on the operating capacity of the local/regional waste facilities.

The residual volumes of waste going to landfill or licenced waste facilities would be insignificant, provided appropriate adoption of the waste hierarchy is undertaken,

It is not expected that Project waste generation will create any further risk or threat to the broader environment.

16.5 Waste – Mitigation Measures

Table 16.5 sets out the mitigation measures to be implemented to address any potential waste management impacts of the Project.

Table 16.5 – Proposed Mitigation Measures - Waste

Reference	Mitigation Measure	Timing
W1	A Construction Waste Management Plan will be prepared prior to commencement of construction that will include: • Consideration of the waste hierarchy, providing transparency on how it will be incorporated into project delivery. • Definition of waste streams and estimated quantities of produced material in each waste category. • Inclusion of a site plan that includes detail on waste segregation and storage location on site.	Construction

Reference	Mitigation Measure	Timing
	• Description of how waste generation and disposal will be managed on site.	
W2	The OEMP will incorporate a Waste Management Plan that will include: • Consideration of the waste hierarchy, providing transparency on how it will be incorporated into operation of the Project • Definition of waste streams and estimates quantities of produced material in each waste category • Inclusion of a site plan that includes detail on waste segregation and storage location on site • Description of how waste generation and disposal will be managed on site	Operation

17 EVALUATION OF COSTS AND BENEFITS

17.1 Introduction

This chapter presents an evaluation of the Project having regard to:

- relevant matters for consideration under the EP&A Act including ecologically sustainable development
- the strategic need and justification for the project having regard to energy security and reliability in NSW and the broader NEM including an analysis of gas supply availability; and
- the biophysical, economic and social costs and benefits of the Project.

17.2 Project Rationale and Justification

Australia is targeting 80% renewable electricity generation by 2030, which will see an increase in the number of wind and solar farm projects. However, wind and solar can only power Australia when the sun shines and the wind blows.

Firming is the term used for supporting energy supply provided by projects such as pumped hydro, battery storage, and gas for peak loads.

Firming projects supply dispatchable energy that can be activated quickly and effectively for a committed period to top up supply when the sun is not shining, the wind is not blowing, if there is a sudden surge in demand, or large increase in maintenance outages.

The Project would support the electricity market:

- to provide consistent and constant energy supply to customers without interruption
- to promote increased renewable energy penetration in the market
- to optimise system constraints
- to match customer energy needs more appropriately
- to minimise costs

Batteries are quick to build, but they currently only provide firming for up to around 4 hours. Pumped hydro provides longer duration but must be close to water and typically has significant lead times for approvals and construction.

A hydrogen and biofuel capable power station like Dubbo Firming Power Station can bridge the gap. It has no finite duration, can be turned on and off very quickly and can support renewables on an intermittent basis.

By 2050, the Australian energy market will need to firm renewable generation without relying on coal. The Project might only be needed around 5 to 12 per cent of the time but providing a peak firming service is critical to keeping the lights on as coal stations continue to retire in the coming years.

Three quarters of NSW's electricity supply is expected to reach the end of its technical life within 15 years. This has the potential to lead to significant price increases and interruptions in energy supply, particularly with the integration of intermittent renewable energy into the electricity grid.

The Project aligns with the NSW Government's objectives for energy security and reliability outlined in the objects of the *Electricity Infrastructure Investment Act* 2020. The Project would provide firming services to facilitate the continued growth of the region's renewable energy generation within the Central-West Orana REZ, and also create a new market for hydrogen production for excess electricity in the REZ.

The Project is consistent with the Federal Government's priority to deliver a reliable, secure and affordable energy system with improved outcomes for energy consumers.

The EIS addresses the issues identified in the SEARs. The detailed impact assessments undertaken for the EIS demonstrate that the construction and operation of the Project can occur without significant impacts on

the environment or community. The potential impacts of the Project have been managed and avoided through the site selection and Project design process where practicable and where certain impacts cannot be avoided, these impacts will be mitigated by implementation of mitigation measures.

17.3 Gas Supply Availability

The Proponent is the proponent of the Port Kembla Energy Terminal project which includes a liquified natural gas import facility injecting into the NSW gas transmission network system. The Project intends to source its gas through this Port Kembla Energy Terminal to be transported via the CWPL. As an alternative, the Proponent is also working with local NSW biomethane projects where biomethane is produced through the anaerobic digestion of agricultural wastes.

17.4 Objectives of the EP&A Act

Section 1.3 of the EP&A Act sets out the objectives of the legislation. These objectives and how they are addressed in relation to the Project are set out in Table 17.1 below. This illustrates that the Project is justified based on its consistency with the objectives of the EP&A Act.

Table 17.1 – 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 objective of the Project is to provide dispatchable electricity to support the intermittency of wind and solar and to facilitate the continued growth of the region's renewable energy generation whilst minimising potential environmental and community impacts. It would also create a new market for hydrogen production for excess electricity production in the renewable energy zone. The EIS demonstrates that the Project can be constructed and operated in accordance with principles of proper management, development and conservation of the State's natural and other resources.
To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development is considered in section 17.5 of this Chapter.
To promote the orderly and economic use and development of land.	The Project site is appropriately located in a heavy industrial zone, is highly disturbed and largely cleared of vegetation. The Project will provide dispatchable electricity and firming capacity with minimal impact on the natural environment or on the amenity of nearly residents. The Project is considered a compatible use of the land and would not conflict with existing land uses or hinder the orderly and economic use and development of the surrounding land.
To promote the delivery and maintenance of affordable housing.	It is possible that some construction workers may choose to rent within the social locality for the duration of the works. This has the potential to increase pressure on rental prices, particularly in the context of existing low rental vacancy rates within the social locality. Increases in rental costs may affect the availability of affordable rental housing and rental affordability for some groups on low or fixed incomes (e.g., unemployed, elderly, students), contributing to rental housing stress for some households or result in some households having to move to more affordable accommodation elsewhere. However, any such impacts from increased demand for rental accommodation are likely to be low given that it is anticipated that the majority of the workforce will be sourced locally and any demand for rental accommodation derived from the small minority of the workforce coming from outside of the social locality is

Objective	Comment
	unlikely to have a significant impact on the delivery and maintenance of affordable housing due to the small numbers and the short term nature of their stay..
To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	During the Project design phase, all practicable steps have been taken to avoid or minimise potential impacts to threatened flora and fauna. As a result, the Project would largely avoid areas of native vegetation. The residual direct and indirect impacts on biodiversity values have been assessed in accordance with the BC Act and are considered not to have a significant impact on biodiversity values.
To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The Project has assessed the potential for impacts to cultural heritage. When mitigation measures are implemented, there is likely to be minimal impact to cultural heritage by the Project.
To promote good design and amenity of the built environment.	Project design would be completed consistent with applicable standards for industrial development with particular emphasis on visual, noise and air quality attenuation to protect the amenity of the built environment and to minimise the impact to the environment. The bulk and scale of the facility are appropriate for an industrial land use. Suitable technology would be adopted to achieve the required noise and air quality standards.
To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Project construction would be completed in accordance with applicable standards. A Preliminary Hazard Analysis was undertaken for the Project which demonstrates that the risks from the Project comply with all quantitative and qualitative land use safety risk criteria in HIPAP No.4. In addition to flammable gas fire and explosion, the preliminary hazard analysis considered and assessed a broad range of credible major hazard events, operational hazards and environmental impacts. No unusual risks were identified that cannot be mitigated through the application of good industry practice, safety in design processes (including siting of office and administration buildings) and operating practices.
To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	All relevant local and State environmental planning instruments and legislation have been considered in preparing the EIS. Dubbo Regional Council has been, and will continue to be, consulted as part of the stakeholder engagement strategy for the Project notwithstanding that the Project will be assessed as an SSD by the NSW Minister for Planning. The EIS addresses the key issues raised by Dubbo Regional Council in response to the SEARs in respect of water, waste, hazards, traffic and stormwater.
To provide increased opportunity for community participation in environmental planning and assessment.	Consultation and engagement have been, and will continue to be, an important part of the Project's development and design process. Further detail of the consultation and engagement is set out in Chapter 5 of the EIS. The EIS will be publicly exhibited and any submissions received will be responded to and considered by the Minister for Planning in determining the development application.

17.5 Ecologically Sustainable Development

Clause 193 of the EP&A Regulation sets out the principles of ecologically sustainable development as follows:

- the precautionary principle
- inter-generational equity

- conservation of biological diversity and ecological integrity
- improved valuation, pricing and incentive mechanisms.

These principles and how the Project is justifiable in respect of each of these principles is described below.

17.5.1 The Precautionary Principle

This principle provides that 'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.

No threats of serious or irreversible environmental damage have been identified and there are no environmental safeguards or mitigation measures which have been postponed due to a lack of scientific certainty.

The power generation technology proposed to be used in the Project is well-established technology that has been used, and continues to be used, to generate power in facilities and grid connection applications across Australia and other parts of the world. Whilst more nascent than the power generation technology, the hydrogen generation technology proposed to be used in the Project is also well-proven and being used at different scales with natural gas blends in a variety of projects in Australia including the HypSA project in South Australia and the Western Sydney Green Hydrogen Hub in NSW. All technology proposed for the Project is readily available through existing equipment manufacturers and will be operated within the design limits.

The Project design process has sought to minimise environmental impact through the avoidance of impacts, wherever practicable and where there may be residual impacts, these residual impacts will be mitigated through the implementation of a range of mitigation measures during the design, construction and operational phases of the Project.

17.5.2 Inter-generational Equity

This principle provides that 'the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations'.

As Australia transitions to a low emissions economy underpinned by renewable energy, firming generation will play a critical role by efficiently supporting the intermittency of solar and wind energy and future renewable technologies whilst assisting in the continued development of an internationally competitive economy.

As renewable generation increases, there will be a reliance on firming generation to provide rapid response generation. Without sufficient dispatchable generation, there is a risk of customers experiencing blackouts.

The Project would make an important contribution in the long-term transition to renewable energy by facilitating the displacement of carbon intensive electricity generation which will benefit future generations.

17.5.3 Conservation of Biological Diversity and Ecological Integrity

This principle provides that 'the conservation of biological diversity and ecological integrity should be a fundamental consideration'.

Extensive consideration has been given to the protection of biological diversity and the maintenance of ecological integrity in the development of the Project. Project decisions have been guided by careful evaluation to avoid significant impact to the environment wherever practicable and have been informed by specialist reports undertaken as part of the EIS process and through consultation with key stakeholders including the community, indigenous groups and landowners.

No significant impacts to threatened flora or fauna species have been identified. Biodiversity impacts have been mitigated by site selection and biodiversity credits would be offset in accordance with the BC Act.

17.5.4 Improved Valuation, Pricing and Incentive Mechanism

This principle provides that 'environmental factors should be included in the valuation of assets and services, such as:

- polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement
- the users of goods and services should pay prices based on the full life cycle of the costs of providing the goods and services, including the use of natural resources and assets and the ultimate disposal of waste; and
- established environmental goals 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.'

Examples of environmental factors being included in the valuation of the Project are as follows:

- the cost of compliance with applicable environmental regulations – an example of this is the implementation of emission control technologies as part of the power generation equipment for the Project to contain emission limits in accordance with the Clean Air Regulation
- the pricing of electricity generated by the Project will include the costs associated with construction, operation and decommissioning of the Project and will be met by the end user of the electricity through firmed contracting with renewable energy sources (e.g., wind, solar); and
- biodiversity credits would be offset in accordance with the NSW Biodiversity Offsets Scheme.

17.6 Site Selection

The Project site was selected as the preferred site for the Project due to its strategic location within the Central West Orana REZ. The power station will provide firming services to the intermittent renewable energy developments and connections in the REZ whilst the hydrogen generation facility can utilise cheap renewable electricity to produce, store and blend hydrogen into the gas mix. The city of Dubbo and industrial energy users in the area also provide for a source of localised demand for electricity.

The Project is consistent with the land use objectives for the E5 zone under the Dubbo LEP. The objectives for E5 Heavy Industry zoning are:

- To provide areas for industries that need to be separated from other land uses
- To ensure the efficient and viable use of land for industrial uses
- To minimise any adverse effect of heavy industry on other land uses
- To encourage employment opportunities

As the Project is for energy generating works, the Project is permissible with consent in the E5 Heavy Industry zone under the Dubbo LEP.

In addition to the Project's location within the REZ, the selected site also provides key infrastructure requirements for dual fuel power generation and hydrogen facilities, including:

- Proximity to existing gas transmission pipelines and facilities
- Proximity to the existing high voltage electricity transmission network and demand centre
- Proximity to industrial energy users
- Capacity of the electricity transmission network to accommodate the nominated generation at the proposed power station
- Availability of suitably zoned land with compatible existing land use

- Access to major roads and highways in proximity for the delivery of heavy vehicle loads and ongoing transport and deliveries to/from the Project
- Availability of skilled construction and operations workforce
- Proximity to Dubbo for operational maintenance, contractors and suppliers
- Availability of water for industrial use.

17.7 Social Costs and Benefits

Infrastructure projects have the potential to generate social impacts if land occupation, land severance, or changes to amenity associated with the project affect social activity. Infrastructure projects may also change the social profile of a community and generate further impacts. The potential social impacts associated with the Project were assessed and it was found that only minor social impacts, both positive and negative, would result from the construction and operation of the Project.

Construction of the Project would generate up to approximately 150 full time jobs and about 6 permanent jobs during operation. The Project is also likely to indirectly support generation of employment in local, regional and national businesses and industries from increased economic activity and spending at businesses providing goods and services to support construction and operational activities.

Without experience installing electrolysers and managing renewable electricity generation in concert with hydrogen production, Australia is unlikely to have the scale and experience necessary to support a hydrogen industry. The Project would increase the capability of the local workforce to construct and operate a large-scale plant and to increase skills relevant to renewable energy technologies. The Project would leverage from the region's existing/developing expertise and make the Central West Orana REZ a unique place to train workers.

The creation of employment opportunities from the Project also has the potential to support improved social and economic outcomes for individuals through increased incomes and skills development in a nascent and emerging area.

The Project would contribute to the resilience of the electricity network and help avoid blackout events.

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. Construction vehicle movements generated by the Project are not expected to impact on the operation of the road network or its level of service. Traffic levels generated by the Project's operation would generally be limited to on-site staff and scheduled maintenance and delivery of consumables.

Construction activities for the Project are not expected to result in significant construction noise, dust or lighting impacts for nearby communities, with the nearest dwellings generally located more than one kilometre from the Project site. Potential impacts on community values in the operation phase would mainly relate to visual, air and noise impacts from the presence and operation of the Project infrastructure. However, potential visibility of the Project would not pose a significant adverse visual impact to potential receptors as the Project would be generally sympathetic to the existing development within the surrounding landscape in terms of scale and nature and would not be a dominant feature in the landscape or alter the landscape character (see Chapter 14 - Visual Amenity). Operational emissions to air and noise from the Project would be managed within limits prescribed by the NSW EPA and subject to detailed assessments. Operation of the Project would be managed using attenuation measures for air quality and noise within the Project design (see Chapter 12 - Noise and Vibration and Chapter 11 - Air Quality).

It is likely that some short-term visitor accommodation or rental housing would be needed to accommodate workers from outside of the study area and surrounding region (for example, those required for speciality tasks). This accommodation is likely to be sourced from towns near the Project such as Dubbo, although some workers may choose to stay further away. Any impacts associated with increased demand for tourist accommodation are expected to be managed using a variety of accommodation types and locations where workers are accommodated. It is possible that some construction workers may choose to rent within the social locality for the duration of the works. This has the potential to increase pressure on rental prices,

particularly in the context of existing low rental vacancy rates within the social locality. Increases in rental costs may affect the availability of affordable rental housing and rental affordability for some groups on low or fixed incomes (e.g., unemployed, elderly, students), contributing to rental housing stress for some households or result in some households having to move to more affordable accommodation elsewhere. However, any such impacts from increased demand for rental accommodation are likely to be low given demand for rental accommodation near the social locality by workers is expected to be minimal.

The visual impact is considered low to negligible due to the existing industrial landscape character and sensitivity and limited visibility and distance form accessible viewpoints.

An assessment of Aboriginal cultural heritage was undertaken in consultation with local Registered Aboriginal parties and included an infield site survey. The main potential impact to Aboriginal cultural heritage is the disturbance of previously registered Aboriginal places during the construction phase, which has the potential to result in a loss of heritage value. The necessary processes to manage harm to identified Aboriginal places will be included within the Heritage Management Plan.

17.8 Economic Costs and Benefits

The Project has an estimated capital expenditure of $190 million.

Whilst both the power generation turbines and the hydrogen electrolyser are manufactured abroad, labour, plant, materials and equipment would be sourced locally where possible.

17.9 Biophysical Costs and Benefits

The Project would involve the clearing of approximately 0.12 hectares of derived native grassland, 1.02 hectares of regenerating vegetation and the loss of three scattered trees. However, as described in Chapter 7, only 0.12 hectares and the three scattered trees require biodiversity credits. The impact to this native vegetation would be offset in accordance with the BC Act.

No significant impacts on threatened flora or fauna species are anticipated.

The operation of the Project would generate primary pollutants from the exhaust emissions of Nitrogen dioxide (NO_2), Carbon monoxide (CO), and dust ($PM_{2.5}$). Whilst there is no significant risk of air quality impacts due to CO emissions from the Project when operating at maximum load whether fuelled by natural gas or biodiesels and the contribution of $PM_{2.5}$ would be very small, the Project may require the application of emissions control technology to ensure that the NO_2 emissions can be managed in accordance with the Clean Air Regulation in the highly unlikely scenario of 100% load capacity (the Project anticipates operating at a capacity factor of up to 12% only).

17.10 Human Health

No significant health risks were identified as part of the assessments undertaken for the Project.

The Air Quality Assessment (Appendix I) included the identification, and assessment, of potential emissions considered to have the highest risk to human health and concluded that the emissions from the Project can be managed in accordance with the Clean Air Regulation. Further detail is in section 5 of Appendix I.

The Preliminary Hazard Analysis (Appendix E) identified risk contours for risk of human fatality and injury which were assessed against the criteria in HIPAP No 4 and concluded that the Project complied with all relevant criteria in HIPAP No 4. Further detail is in Appendix E.

Potential contaminants to soil and water from the Project in construction and operation were assessed as part of the Land and Water Assessment (Appendix H) to establish, amongst other things, the level of risk to human health. No significant health risks were identified as part of this assessment. Further detail is set out in Appendix H.

17.11 Public Interest

Community and stakeholder engagement and consultation is ongoing and is further described in Chapter 5.

The EIS demonstrates that the construction and operation of the Project can occur without significant impacts on the environment or community. The potential impacts of the Project have been managed and avoided through the site selection and Project design process where practicable and where certain impacts cannot be avoided, these impacts will be mitigated by the implementation of mitigation measures.

The EIS will be publicly exhibited and any submissions received will be responded to and considered by the Minister for Planning in determining the development application.

The Project is considered to be in the public interest.

18 SUMMARY OF MITIGATION MEASURES

Table 18.1 provides a summary of the recommended mitigation measures presented throughout Chapters 7 through 16 of the EIS.

Combined with site selection and design elements, implementation of these mitigation measures will minimise potential impacts of the Project and ensure that residual impacts of the Project would be low.

Table 18.1 – Summary of Mitigation Measures

Reference	Mitigation Measure	Timing
BIODIVERSITY		
BD1	Dust suppression – use of dust barriers around construction area and using dust suppression measures outlined in the mitigation measures for Air Quality (Chapter 11) and Land and Water (Chapter 10).	Construction
BD2	Noise management – construction to be restricted to recommended standard hours as per EPA Draft Construction Noise Guidelines (NSW EPA 2020).	Construction
BD3	Light spill management – use of warm coloured light bulbs, directional lighting below the horizontal plane, shielding of lights, use of low-reflective materials throughout the Project	Construction and Operation
CULTURAL HERITAGE		
CH1	A Heritage Management Plan (to include cultural heritage and historical heritage) to be prepared for the Project to: • define the tasks, scope and conduct of all cultural heritage management activities • cover all relevant actions and requirements to be conducted during construction and operation of the Project in respect of cultural and historical heritage • include ongoing consultation with the Aboriginal community; and • remain active for the Project life.	Construction and Operation
CH2	A suitably qualified archaeologist is engaged to collect all surface stone artefacts at AHIMS site number 36-1-0788 as necessary to avoid harm with the objects to be appropriately recorded, curated and stored at a Keeping Place to be agreed in consultation with the registered Aboriginal stakeholders and Heritage NSW.	Construction
CH3	In the unlikely event that human skeletal remains are encountered during construction, all work with the potential to impact the remains must cease. Remains must not be handled or otherwise disturbed except to prevent further disturbance. If the remains are thought to be less than 100 years old the Police or the State Coroner's Office (tel: 02 9552 4066) must be notified. If there is reason to suspect that the skeletal remains are more than 100 years old and Aboriginal, the Proponent should contact the Environmental Line (tel: 131 555) for advice. In the unlikely event that an Aboriginal burial is encountered, strategies for its management would need to be developed with the involvement of the local Aboriginal community.	Construction
CH4	If any previously unidentified Aboriginal or historical cultural heritage places or objects are encountered during construction of the works all activities likely to affect the places or objects must cease immediately and Heritage NSW and the registered Aboriginal parties consulted about an appropriate course of action prior to recommencement of work.	Construction

Reference	Mitigation Measure	Timing
CH5	The proponent to provide training to all on-site personnel regarding the historical and Aboriginal cultural heritage management strategies relevant to their employment tasks.	Construction and Operation
HAZARDS AND RISKS		
PHA1	The location and design of the administration building will be in accordance with the recommendations in the PHA.	Design
PHA2	The PHA will be used as a reference document for design specification and future risk analysis relating to equipment selection and site layout during detailed design. This will include Hazard Identification, Hazard and Operability Workshop(s) and Failure Modes and Effects Criticality Analysis.	Design Construction Operation
PLU1	The installation and continued operation of a low intensity steady red obstacle light on the central or single exhaust stack in accordance with Australian Standards.	Construction and Operation
BF1	Asset Protection Zones – at the commencement of the Project and in perpetuity an Inner Protection Area Asset Protection Zone is provided between the buildings and any storage of hazardous materials and the boundary to the north, east and south and for 50m to the west as outlined in PBP 2019 Appendix 4.	Design, Construction and Operation
BF2	A 20,000L static water supply is to be available for firefighting purposes and suitable fittings to enable firefighting and to be marked accordingly in a prominent position.	Construction Operation
BF3	Formulate an emergency response plan in accordance with NSW RFS guidelines.	Construction Operation
BF4	Comply with sections 3 and 5 of AS3959-2018 ‘Construction of buildings in bush fire-prone areas’	Construction
BF5	Where applicable, reticulated or bottled gas to be installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of the relevant authorities and metal piping is used. All fixed gas cylinders are kept clear of all flammable materials to 10 metres and shielded on the hazard side, connections to and from gas cylinders are metal. Polymer-sheathed flexible gas supply lines are not used and above-ground gas service pipes are metal including and up to any outlets.	Construction Operation
LAND AND WATER		
SW1 and S1	A construction SWMP will be required and prepared as part of a CEMP to manage potential risks to soils and downstream water quality. The construction SWMP is to be prepared with reference to relevant development controls within the Dubbo DCP. Recommended measures for the construction SWMP include but are not limited to: • Measures to minimise and manage the potential for erosion and sediment transport within and from the project area. • Measures to manage accidental spills and waste storage • Measures to manage stormwater and the potential for contaminated runoff from the Project site. • Measures to ensure that excavation activities and any stockpiling are managed to minimise the potential for downstream contamination. • Measures to ensure that areas of exposed soil and the time in which they are exposed are minimised as far as practicable	Construction and operation
SW2 and S2	An ESCP will be required and prepared with reference to the principles and requirements of Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004) to detail erosion and sediment control measures during construction.	Construction and operation

Reference	Mitigation Measure	Timing
SW3 and S3	The construction of the development shall be managed in compliance with measures specified within the construction SWMP and ESCP to ensure impacts to water quality are appropriately managed. Measures shall be implemented to ensure that areas of exposed soil and the time in which they are exposed, are minimised as far as practicable during construction.	Construction and operation
SW4	Stockpiling of excavated material shall be managed to minimise the mobilisation and transport of dust, sediment and leachate into downstream environments. Recommended measures to manage stockpiling include but are not limited to: • Ensuring stockpiles are located away from drainage lines, waterways, and areas susceptible to erosion. • Minimising the number, size and duration of stockpiles used. • Ensuring stockpiles are stabilised and implementing dust suppression methods as required. • Ongoing review and inspection of the use of heavy vehicles and/or machinery, including transport tracks used, for erosion risk. Ensuring that vehicles transporting waste and/or excavated material are appropriately covered to reduce the potential for dust.	Construction and operation
SW5	The construction SWMP prepared as part of the CEMP shall contain procedures to ensure that any waste from concreting activities is captured, contained and appropriately disposed.	Construction and operation
SW6 and S4	The construction SWMP shall include procedures to reduce and manage the risk of emergency events and the potential for wastes and spills to contaminate soil. Recommended measures to manage the potential for contaminated discharge include: • The storage of all fuel chemicals and liquids in sealed bunded areas on level ground away from stormwater drainage lines and waterways • Ensuring refuelling and maintenance activities are restricted to designated areas with appropriate bunding and spill capture controls • Implementing controls as part of the construction SWMP that provide procedures to respond to emergencies and spills. • Ensuring visual inspections of drainage lines and disturbed areas are undertaken during construction to assess any potential soil or surface water issues. • The installation and maintenance of stormwater control measures including drainage networks that segregate stormwater runoff according to its contamination.	Construction
	During operation procedures shall be developed to reduce the potential contamination of soil and surface water resulting from wastes, spills and/or emergency incidents. Suggested measures to control the potential for contamination during operation include: • The appropriate storage of equipment and hazardous substances during operation. • Ensuring that plant and stormwater control measures are maintained to prevent contamination of soil. • Preparation of appropriate procedures to response to emergency incidents, spills and leaks from the Project site, including operational equipment and maintenance activities.	Operation
SW7	The increase in stormwater runoff resulting from additional impervious areas shall be managed through: • Designing and implementing a permanent drainage and water management network that adequately controls and minimises the potential for downstream surface water contamination.	Operation

Reference	Mitigation Measure	Timing
	• Inspection and maintenance of stormwater control measures, including drainage networks that segregate stormwater runoff according to its contamination	
HF1	Ensure compliance with the SWMP and ESCP to manage potential risks to soils and downstream water quality.	Construction
	Ensure compliance and maintenance of the stormwater drainage network as detailed in the drainage philosophy	Operation
GW1	Ensure compliance with the SWMP and the ESCP to manage potential risks to groundwater resources	Construction
	Ensure compliance and maintenance of the stormwater drainage network as detailed in the drainage philosophy	Operation
S5	As part of the SWMP for the Project, soil management measures should include: • Assessment of topsoil depth prior to stripping to minimise mixing of topsoil and subsoil • Topsoil and subsoil should be stripped and stockpiled separately for rehabilitation works following excavation • Avoid stripping and stockpiling soil following heavy rain periods • Avoid compaction of topsoil during stripping and stockpiling operations • If required, amelioration of topsoil and/or subsoil during stripping in accordance with a soil scientist's recommendations. • Prevent erosion of stockpiles using soil stabilising biopolymers, cover crops or other forms of stabilisation • Test stockpiled soils to determine amelioration requirements prior to reinstatement	Construction and operation
S6	As part of the SWMP for the Project, soil compaction management measures should include: • Development of controlled traffic practices for plant machinery movements • Avoid excavation and plant machinery movements on wet soils following heavy rain periods • Prevent long term storage of plant machinery on clay or wet soils • Avoid long term exposure of subsoils which are more susceptible to compaction • Progressively stabilise and rehabilitate soil as soon as practically possible after excavation • Ensure soil is replaced in correct subsoil/topsoil orders • Ensure vegetative cover is re-established after soil rehabilitation	Construction and operation
CL1	Any land disturbance that identifies the presence of building rubble should be assessed for the presence of asbestos in accordance with applicable SafeWork NSW guidelines and codes of practice and managed accordingly.	Construction
CL2	Avoiding skin contact with soil that is discoloured, malodourous, containing foreign matter and/or generally inconsistent with virgin soil.	Construction and operation
CL3	No unauthorised entry into the Project site, including confined spaces and excavations is permitted.	Construction and operation
AIR QUALITY		
AQ1	Construction Environmental Management Plan be prepared which includes an Air Quality Control Procedure to manage and monitor air emissions during construction and will include the following control measures:	Construction

Reference	Mitigation Measure	Timing
	• Monitor local weather conditions and minimise dust generating operations when conditions result in visible dust emissions, and implement mitigation measures or until weather conditions improve; • Daily dust inspection on-site and off-site. • Erection of wind breaks such as fences at relevant parts of the site boundary; • Locate stockpiled materials away from drainage paths, easement, kerb, or road surface, and near existing wind breaks such as trees and fences; • Dust suppression/wind breaks on stockpiles; • Limit stockpile height to 5m (maximum); • Measures to be implemented to determine whether any vehicles leaving the site are to be cleaned of dirt and other materials to avoid tracking onto public roads; • Enforce appropriate speed limits for vehicle on site. Recommended speed limit is <15km/hr; and • Cover all loads entering and leaving the site.	
AQ2	Provision in design for future NO_2 emission control technology in the event that there is non-compliance with limits prescribed by the NSW EPA and subject to detailed assessment.	Design, construction and operation
GG1	Environmental Standards and performance will be included in the selection criteria (and cost benefit analysis) for the tendering and award of key packages associated with equipment, plant and machinery to reduce greenhouse gas emissions in operation.	Operation
NOISE AND VIBRATION		
NV1	Noise Compliance Assessment once in operation to verify the predicted noise levels at the relevant receivers and to confirm the noise attenuation achieves compliance.	Operation
TRAFFIC, ROADS AND TRANSPORT		
TRT1	A Construction Traffic Management Plan (CTMP) will be prepared and implemented by the construction contractor and will include: • the workforce be advised of the crash history at the intersection of Boothenba Road and Newell Highway and advised to use Purvis Lane to access the site • neighbours of the Project be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access • loading and unloading is proposed to occur within the work area. No street or roads would be used for material storage at any time • all vehicles would enter and exit the site in a forward direction • management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site once the Project is operational: • utilisation of only the designated transport routes. • construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities. • implementation of a site drainage plan for on-site roads, hardstands and laydown area • installation of signage for entry and exit points from site to warn of cyclists	Construction and Operation

Reference	Mitigation Measure	Timing
	• all permits for working within the road reserve must be received from the relevant authority prior to works commencing. • a map of the primary haulage routes highlighting critical locations prone to a higher risk of accident • an induction process for vehicle operators and regular toolbox meetings • preparation of a complaints management process for construction and operation of the Project • inclusion of provision for inclement weather in safety procedure for driving and operation of machinery	
TRT3	An Operational Traffic Management Plan be implemented to include driver code of conduct.	Operation
VISUAL		
LV1	Landscape screening be extended, where possible and subject to maintaining a safe line of sight for traffic in accordance with the Traffic Impact Assessment, to the frontage of Yarrandale Road to provide additional screening.	Construction
LV2	Landscape screening should be at least two rows of vegetation, the species of which should be appropriate to local climate and require minimal maintenance with a mature vegetation height of 15 metres. Planting should commence prior to the commencement of operation.	Construction
LV3	Use of warm-coloured light bulbs, directional lighting below the horizontal plane, shielding of lights, and use of low-reflective materials throughout the development.	Construction and Operation
LV4	Dust will be managed during the construction and operational phases as per the requirements set out in the associated Air Quality Assessment	Construction and Operation
SOCIO-ECONOMIC		
SE1	Identify opportunities to maximise the use of local suppliers, workforce, and businesses in the provision of goods and services to the Project and implement a local procurement policy for the Project prioritising local employment, services and materials where practicable.	Construction
SE2	Consult and liaise with the local accommodation providers, large employers in the region and Dubbo Regional Council to minimise impacts to short term rental and tourist accommodation having regard to a broader Workforce Accommodation Strategy across Squadron Energy Projects in the Central West Orana REZ.	Construction
SE3	Consult and liaise with large employers in the region and Dubbo Regional Council to minimise impacts to labour force shortages.	Construction
SE4	Implement the recommendations put forward in the impact assessments in respect of visual, air quality and noise.	Construction and Operation
SE5	The Project's CEMP will include a framework for consultation with stakeholders during construction and a complaints handling process.	Construction
SE6	The Project's OEMP will include a framework for consultation with stakeholders during operation and a complaints handling process.	Operation
WASTE		
W1	A Construction Waste Management Plan will be prepared prior to commencement of construction that will include: • Consideration of the waste hierarchy, providing transparency on how it will be incorporated into project delivery. • Definition of waste streams and estimated quantities of produced material in each waste category.	Construction

Reference	Mitigation Measure	Timing
	• Inclusion of a site plan that includes detail on waste segregation and storage location on site. • Description of how waste generation and disposal will be managed on site.	
W2	The OEMP will incorporate a Waste Management Plan that will include: • Consideration of the waste hierarchy, providing transparency on how it will be incorporated into operation of the Project. • Definition of waste streams and estimates quantities of produced material in each waste category. • Inclusion of a site plan that includes detail on waste segregation and storage location on site. • Description of how waste generation and disposal will be managed on site.	Operation

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Appendix A Secretary's Environmental Assessment Requirements

Appendix A.1 SEARS

Refer to attachment Appendix A.1.

Appendix A.2

A summary of where each of the SEARs is addressed in the EIS is provided below.

	Requirement	Details	Where addressed in EIS
General Requirements	The EIS must meet the minimum form and content requirements prescribed by Schedule 2 of the Environmental Planning and Assessment Regulation 2021 and must have regard to the Department's State Significant Development Guidelines (2021).	A standalone executive summary	Executive Summary
		A full description of the project including: • All components, materials and activities required to construct the project • Site plans and maps at an adequate scale showing: the location and dimensions of all project components; and existing infrastructure, land use and environmental features in the vicinity of the project (including any other existing, approved or proposed infrastructure in the region) • Likely staging or sequencing of the project including construction and rehabilitation	Chapters 1 and 2
		The likely interactions between the project and any other existing, approved or proposed major projects in the vicinity of the site	Chapter 17
		A general description of any infrastructure that would be required for the project that is the subject of a separate approval process	Chapter 2
		A justification for the proposed project as opposed to other alternatives	Chapter 3
		Statutory context for the project including: • How the project meets the provisions and objectives of the Environmental Planning and Assessment Act 1979 (NSW) and the EPA Regs • Consideration of the project against all relevant environmental planning instruments • Any approvals that must be obtained before the project can commence	Chapter 3

	Requirement	Details	Where addressed in EIS
		An assessment of the likely impacts of the project on the environment, focussing on the specific issues identified below including a description of the existing environment likely to be affected by the project using baseline data	Chapters 7 - 16
		A description of how the project has been designed to avoid and minimise impacts	Chapters 7 - 16
		An assessment of the potential impacts of the project including any cumulative impacts and taking into consideration relevant guidelines, policies, plans and industry codes of practice	Chapters 7 – 16, 17
		A consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS	Chapter 18
		An evaluation of the project as a whole having regard to: • Relevant matters for consideration under the EP&A Act including ecologically sustainable development • The strategic need and justification for the project having regard to energy security and reliability in NSW and the broader NEM including an analysis of gas supply availability • The biophysical, economic and social costs and benefits of the project	Chapter 17
Key Issues	The level of assessment of likely impacts should be commensurate with the significance or degree or extent of impact within the context of the proposed location and surrounding environment and having regard to applicable NSW government policies and guidelines.	Biodiversity including: • An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with the NSW Biodiversity Conservation Act 2016, the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR) • The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM.	Chapter 7
		Heritage including: • An assessment of the likely Aboriginal impacts of the project in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010) including adequate consultation with	Chapter 8

	Requirement	Details	Where addressed in EIS
		Aboriginal stakeholders having regard to the Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH 2010) • An assessment of likely non-Aboriginal heritage impacts of the project	
		Hazards and Risks including: • A Preliminary Hazard Analysis (PHA) prepared consistent with Hazardous Industry Planning Advisory Paper No 6 – Guidelines of Hazard Analysis (DPE 2011) and Multi-level Risk Assessment, covering all aspects of the project that may pose risks to the public. The PHA must: – be a Qualitative Risk Assessment (QRA) that must include consideration of the change in risk as the quantity and concentrations of hydrogen used for operating the power station and in plant (piping, vessels, equipment etc) increases; and – consider current and new technologies and standards for the design and operation of the power station and pipelines with hydrogen; – must demonstrate that the risks from the project, including cumulative risk from all project components and any ancillary blending facilities, comply with the criteria set out in Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning (DPE 2011) – an assessment of bushfire risk in accordance with Planning for Bush Fire Protection 2019 (NSW RFS 2019) – a plume rise impact assessment prepared in accordance with CASA's guidelines for conducting plume rise assessments and an assessment of the potential impact to aviation in the vicinity of the project.	Chapter 9
		Land and Water including: • an assessment of the impacts of the project on soils, including consideration of the extent and nature of any existing contaminated materials on site, and the potential risks to human health and the receiving environmental and measures that would be	Chapter 10

	Requirement	Details	Where addressed in EIS
		implemented to avoid and mitigate impacts • an assessment of the project on groundwater aquifers and groundwater dependent ecosystems having regard to the NSW Aquifer Interference Policy and relevant Water Sharing Plans • an assessment of the impacts of the project on surface water quality having regard to the NSW Water Quality and River Flow Objectives (DECCW 2006), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) and ANZEXX Guidelines and Water Quality Objectives in NSW (DEC 2006) • a detailed site water balance for the project and a description of the water demands and identification of a water supply for the life of the project and any water licensing requirements • details of wastewater disposal arrangements • an assessment of flooding and the hydrological impacts of the project • a description of the erosion and sediment control measures that would be implemented to mitigate any impacts during construction.	
		Air Quality including: • an assessment of the likely air quality impacts of the project in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA 2016) • ability to comply with the relevant regulatory framework specifically the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (Clean Air) Regulation 2010 • an assessment of the likely greenhouse gas impacts of the project.	Chapter 11
		Noise and Vibration including: • assessment of the likely construction noise impacts of the project under the Construction Noise Guidelines if available or the Interim Construction Noise Guidelines (DECCW 2009) if the Construction Noise Guideline is not available	Chapter 12

	Requirement	Details	Where addressed in EIS
		• an assessment of the likely operational noise impacts of the project under the NSW Noise Policy for Industry (EPA 2017) • an assessment of the likely vibration amenity and structural impacts of the project under Assessing Vibration: A Technical Guideline (DEC 2006) and German Standard DIN 4150-3 Structural Vibration – effects of vibration on structures.	
		Transport including: • An assessment of the transport impacts of the project on the capacity, condition, safety and efficiency of the local and State road network including consideration of cumulative impacts of traffic associated with construction of other major projects in the area • An assessment of the likely transport impacts to the site access route and site access point having regard to Oversized or Over mass vehicles (if required) • A description of the measures that would be implemented to mitigate any impacts during construction • A description of any proposed road upgrades developed in consultation with the relevant road authorities (if required)	Chapter 13
		Visual including an assessment of the: • Likely visual and landscape character impacts of the project on the amenity of the surrounding area and private residences in the vicinity of the project; and • Lighting impacts on Siding Spring observatory having regard to the requirements of the Dark Sky Planning Guideline	Chapter 14
		Socio-Economic including an assessment of the social impacts of the project prepared in accordance with the Department's Social Impact Assessment Guideline for State Significant Developments (2021) and the likely impacts on the local community and community infrastructure (including consideration of cumulative impacts from other major projects in the area)	Chapter 15
		Waste including identifying, quantifying and classifying the likely waste stream to be generated during construction and operation, and describing the measures	Chapter 16

	Requirement	Details	Where addressed in EIS
		to be implemented to manage, reuse, recycle and safely dispose of this waste.	
Engagement	During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. The EIS must detail the engagement undertaken and demonstrate how it was consistent with the Department's Undertaking Engagement Guide: Guidance for State Significant Projects. The EIS must detail how issues raised and feedback provided has been considered and responded to in the project.		Chapter 5

Appendix B Biodiversity Development Assessment Report

Appendix C Aboriginal Cultural Heritage Assessment

Appendix D Historical Cultural Heritage Assessment

Appendix E Preliminary Hazard Analysis

Appendix F Plume Rise Assessment

Appendix G Bushfire Risk Assessment

Appendix H Land and Water Assessment

Appendix I Air Quality Assessment

Appendix J Noise and Vibration Impact Assessment

Appendix K Transport Assessment

Appendix L Landscape and Visual Assessment

Appendix M Social Impact Assessment

Squadron Energy is Australia’s leading renewable energy company. Proudly Australian owned, our mission is to be a driving force in Australia’s transition to a clean energy future by providing green power to our customers.

We develop, operate and own renewable energy assets in Australia, with 1.1 gigawatts (GW) of renewable energy in operation and a development pipeline of 20GW.

With proven experience and expertise across the project lifecycle, we work with local communities and our customers to lead the transition to Australia’s clean energy future.

Squadron Energy acknowledges the Traditional Owners of Country throughout Australia. We pay our respects to Elders past , present, and emerging.

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