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Tallawarra A Power Station Efficiency Upgrade

Environmental Impact Statement

EnergyAustralia

Reference: P522990

Revision: B

2023-11-03

Proposal details
Proposal name: Tallawarra A power station efficiency upgrade
Application number: SSD-60938959
Address of the land on which the infrastructure is to be carried out: Yallah Bay Road, Yallah NSW 2530
Applicant details
Applicant name: EnergyAustralia Pty Ltd (referred to as EnergyAustralia)
Applicant address: Level 19, Two Melbourne Quarter, 697 Collins Street, Docklands VIC 3008
Applicant ABN: 75 163 935 635
Details of person by whom this EIS was prepared
Name: Peter Fawcett on behalf of Aurecon Australasia Pty Ltd
Address: Level 11, 73 Miller Street, North Sydney NSW 2060
Professional qualifications: B.EnvSc, M.EBM
Declaration by registered environmental assessment practitioner
Name: Todd Robinson on behalf of Aurecon Australasia Pty Ltd
Registration number: 11215
Organisation registered with: Aurecon Australasia Pty Ltd

Declaration:

The undersigned declares that this EIS:

- Has been prepared in accordance with Part 8, Division 5 of the Environmental Planning and Assessment Regulation 2021;
- Contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which this EIS relates;
- Does not contain information that is false or misleading;
- Addresses the Planning Secretary's environmental assessment (SEARs) for the proposal;
- Identifies and addresses the relevant statutory requirements for the proposal, 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 proposal as a whole, having regard to the economic, environmental and social impacts of the proposal and the principles of ecologically sustainable development;
- Contains a consolidated description of the proposal in 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 proposal as a whole.

Todd Robinson

Date: 3 November 2023

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Glossary and abbreviations

Acronym	Definition
AEMO	Australian Energy Market Operator
AEP	Annual exceedance probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management Systems
AIA	Aviation Impact Assessment
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	*Biosecurity Act 2015*
CCGT	Combined cycle gas turbine
CEMP	Construction Environmental Management Plan
CLG	Community Liaison Group
CLM Act	*Contaminated Land Management Act 1997*
CLMP	Community Liaison Management Plan
COP	Conference of the Parties
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DPE	NSW Department of Planning and Environment
DWT	Deadweight Tonne
ECRTN	NSW Environmental Criteria for Road Traffic Noise
EGH	Exhaust gas housing
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental planning instruments
EPL	Environmental protection licence
ESD	Ecologically sustainable development
FM Act	*Fisheries Management Act 1994*
GHG	Greenhouse gas
GW	Gigawatts
HRMP	Hazard and Risk Management Plan

Acronym	Definition
Heritage Act	*Heritage Act 1977*
ICNG	Interim Construction Noise Guideline
ISP	Integrated System Plan
km	Kilometre
km/h	Kilometres per hour
kV	Kilovolt
LEP	Local Environment Plan
LGA	Local Government Area
LTSA	Long-term Service Agreement
MNES	Matters of Environmental Significance
MW	Megawatts
MWh	Megawatt-hour
NCAs	Noise catchment areas
NEM	National Energy Market
NGAF	National Greenhouse Account Factors
NGER	*National Greenhouse and Energy Reporting Act 2007*
NML	Noise management levels
NO_x	Nitrogen oxides
NPfI	NSW Noise Policy for Industry
NP&W Act	*National Parks and Wildlife Act 1974*
NSW EPA	NSW Environmental Protection Authority
NSW	New South Wales
OECC	Office of Energy and Climate Change
OTC	Once through cooler
POEO Act	*Protection of the Environment Operations Act 1997*
RAF	Rapid Assessment Framework
RBL	Rated background level
REAP	Registered environmental assessment practitioner
RNP	Road noise policy
Rural Fires Act	*Rural Fires Act 1997*
SEARs	Secretary's Environmental Assessment Requirements
SEIFA	Socio-Economic Indexes for Areas
SEPP	State Environmental Planning Policy

Acronym	Definition
SIA	Social Impact Assessment
SO_x	Sulphur oxides
SSD	State Significant Development
TWh	Terrawatt hours
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile organic compounds
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WM Act	*Water Management Act 2000*

Executive summary

Overview

EnergyAustralia owns and operates the Tallawarra A combined cycle gas turbine (CCGT) power station, which was commissioned in 2009. The power station is located approximately 13 kilometres south of Wollongong on Yallah Bay Road, Yallah, New South Wales. The power station is approved to generate 400 megawatts of energy, which is enough to supply electricity for up to 200,000 homes.

EnergyAustralia proposes to undertake an efficiency upgrade by replacing some internal components and adjusting the tuning of the generator performance characteristics of the Tallawarra A power station during a scheduled routine maintenance outage in April-May 2024 (the proposal).

The proposal would increase the nominal output of the power station from approximately 400 megawatts to 440 megawatts and would require that the network maximum output capacity registered with AEMO be increased from 440 megawatts to 480 megawatts. Due to the upgrade the power station would operate more efficiently, with improved reliability and would produce a lower intensity of carbon emissions.

The proposal

The proposal would require some existing equipment to be removed and replaced within the Tallawarra A power station turbine hall. Following completion of the upgrade there would be no outward change to the power station appearance. Key features of the proposal would include:

- upgrade of the existing compressor and turbine by replacing the blades and vanes with a new design that reduces emissions intensity and increases operational reliability
- upgrade of the existing combustion process by replacing existing hardware components with newer technology to reduce the consumption of natural gas required for the same energy output
- upgrade of the steam cycle and steam turbine internal components to increase the power station's overall combined cycle reliability
- modification and tuning of the generator performance characteristics to increase the power output consistent with energy system regulations and performance requirements.

Planning approval

The proposal is classified as a State Significant Development (SSD) under Clause 2.6(1) of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). In accordance with section 4.12(8) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), the application is required to be accompanied by an Environmental Impact Statement (EIS) that meets the requirements of Part 8, Division 5 of the EP&A Regulation and any other relevant legislative instruments that relate to the proposal.

The operation of the power station is currently authorised under development consent number D98/784 granted by Wollongong City Council under the EP&A Act. The proposal would not require the existing Wollongong City Council consent to be amended or surrendered. Upon completion of the upgrade, the operation of the power station would continue in accordance with the existing Wollongong City Council consent and in accordance with any additional requirements associated with this SSD.

Need for the proposal

The Tallawarra A power station is a reliable and vital electricity generation facility. It provides support for the energy market during the 'Energy Crisis' in 2022 that lead AEMO to direct registered participants in the NEM to be dispatched under emergency provisions.

The proposal is consistent with the resulting Integrated System Plan (2022); the outcome of which states that "gas-fired generation, potentially fuelled by hydrogen, will play a crucial role as coal-fired generation retires,

both to help manage extended periods of low variable renewable energy output and to provide power system services to provide grid security and stability" (AEMO, 2022).

The proposal enables Tallawarra A to increase its contribution to the NEM. The proposal would be critical to meet peak energy demands through to, and beyond the third coal fired power station closure in 2029 (Vales Point power station). Tallawarra A will be able to supply up to 15 per cent of the State's baseload frequency support required to meet peak demands. The increased level of reliable and firm generation that would be provided by the proposal makes Tallawarra A critical infrastructure as large thermal generators are being progressively retired.

The proposal would extend the intervals between major maintenance periods which is consistent with the NSW Electricity Infrastructure Roadmap to deliver the major infrastructure needed to modernise the electricity system and power the NSW economy. Under the Roadmap, the power station would facilitate the transition of NSW to lower emissions while maintaining reliability at lowest cost to consumers.

EnergyAustralia recognises the need to transition to cleaner energy through lower emissions technologies. In November 2022, EnergyAustralia released its *Climate Change Statement*, which addressed the ongoing transformation of its assets to support clean, reliable, and affordable energy generation. The upgrade would contribute to the clean energy transformation in line with the *Climate Change Statement*.

Consultation

Various government agencies were consulted about the proposal and its anticipated impacts, including the Department of Planning and Environment, NSW Environment Protection Authority (EPA), Wollongong City Council and Shellharbour City Council. Issues raised by these government stakeholders have been addressed and incorporated into the proposal.

Consultation has been carried out with community stakeholders through the Community Liaison Group (CLG) that EnergyAustralia regularly hosts for the existing operations of the Tallawarra A power station. The CLG was established as the principal means of communication with the community for the Tallawarra A power station and Tallawarra B project. The CLG has been used to inform interested members of the local community about the proposal, the existing Tallawarra A power station operations, and environmental performance matters.

Additional community consultation for the proposal has included EnergyAustralia's July 2023 community newsletter and updates published on EnergyAustralia's website.

Environmental assessment

The environmental assessment for the proposal was informed by the Secretary's Environmental Assessment Requirements (SEARs) (SSD-60938959), which were published on the NSW planning portal for the proposal and are included in Appendix A of this EIS. The environmental impacts of the proposal are summarised in the following sections.

Air quality

An air quality impact assessment was prepared by Katestone Environmental Pty Ltd (Katestone, 2023a), in accordance with the updated *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (approved methods) (EPA, 2022).

During the upgrade, the proposal would contribute negligible emissions to air from delivery vehicles and from other fixed and mobile plant and equipment. Commissioning of the new equipment installed as part of the proposal would require testing and optimisation. During commissioning of the new equipment, the power station would generate combustion emissions. These emissions would be consistent with the testing and optimisation period that follows all routine maintenance outages.

During operation, the proposal is likely to result in slightly higher concentrations of air pollutants at some sensitive receivers due to the likelihood of the exhaust gases having a lower temperature and velocity of discharge from the stack after the upgrade.

Modelling of emissions from the Tallawarra A power station pre- and post-upgrade demonstrate that changes in concentrations as a result of the upgrade would be insignificant. Contributions from the power station to annual average concentrations of NO_x, SO_2 and particulate matter, maximum 1-hour average concentrations of SO_2 and maximum 24-hour average concentrations of particulate matter are extremely small with or without the upgrade. The contribution to maximum 1-hour average NO_x concentrations at ground level increases slightly, which shows that while the spatial footprint of the impacts of Tallawarra A power station shifts with the upgrade, the magnitude of any change as a result of the upgrade is insignificant.

Greenhouse gas

The assessment covered Scope 1, Scope 2, and Scope 3 greenhouse gas (GHG) emissions related to the proposal. This assessment analysed the comparison in GHG emissions resulting from the pre and post-upgrade scenarios. As per the information provided by EnergyAustralia, the gas consumption in both the pre and post-upgrade scenarios is considered to be 16.9kg/s, with the turbine power output at 440MW and 470MW, respectively.

GHG emissions associated with the construction of the proposal would be 0.038 kt CO_2-e. This includes emissions from various activities associated with the upgrade including shipping of materials, movement of trucks, equipment used for installation of the turbine, and business flights.

Historically the power station operates with an average capacity factor (annual run-time hours) of about 30 per cent annually. The upgrade would not alter power station capacity factor, however, the capacity factor would continue to vary from year to year. At the average capacity factor, post-upgrade emissions would be 488 kt CO_2-e/year, which is consistent with the pre-upgrade scenario. Despite the same amount of gas consumption, the upgrade would result in an increase in an annual electricity output of 78,840 MWh, due to an increase in the turbine power output.

As the gas consumption between the pre- and post-upgrade scenarios is the same, there will be no increase in the GHG emissions from the proposal and continued operation of the Tallawarra A power station. However, the GHG intensity of the electricity generated would decrease by 6%, reducing the impact of the electricity supplied to the NEM, resulting in positive operational impacts.

Socio-economic

A Social Impact Assessment (SIA) was prepared for the proposal for a ‘minor’ level assessment under the NSW Department of Planning and Environment (DPE) Social Impact Assessment Guidelines for State Significant Projects (SIA Guidelines) (DPE, Feb 2023). The minor level of assessment reflects the proposal scale and magnitude of potential impacts to the socio-economic environment. The study area for the SIA was bounded by the Princes Motorway from Berkeley to the north and Albion Park to the south.

The Tallawarra A power station is located on the fringes of Lake Illawarra in the Wollongong LGA. Due to its closeness to Sydney, the Illawarra Shoalhaven region has experienced swift population growth in recent years. The study area is connected to strategic regional economic centres such as Wollongong, Shellharbour and Kiama. An additional 100,000 people are expected to migrate from Sydney to the Illawarra Shoalhaven region by 2041.

As the upgrade would be contained within the existing footprint of the Tallawarra A power station, social and human health impacts relating to dust, noise and visual impacts are not anticipated. Traffic impacts are also anticipated to be negligible, meaning the socio-economic impacts of the upgrade are anticipated to be minor to minimal, in line with the impact definitions noted in the SIA Guidelines.

During operation the proposal would not alter the surrounding environment of the Tallawarra A power station, meaning there would be no negative socio-economic impact during the operation of the proposal. The proposal would result in long-term positive operational socio-economic impacts through improvements to the power station’s reliability, which would allow for greater energy security. The proposal would also provide the potential to use hydrogen as a fuel in the future and this demand may contribute to development of hydrogen supply industry in the Illawarra region.

EnergyAustralia would continue to inform stakeholders and community members about the timing and likely impacts of the upgrade and operation of the proposal. The Community Liaison Management Plan includes complaints and enquiries management for identifying and responding to community issues.

Noise and vibration

A construction (upgrade) noise assessment was carried out for the proposal by SLR Consulting (2023) and is included in Appendix E. The upgrade noise assessment applied the Interim Construction Noise Guideline (ICNG) (DECC, 2009) for the assessment of potential airborne noise impacts on sensitive receivers and the Road Noise Policy (RNP) (DECCW, 2011) for the assessment of potential construction traffic impacts.

The ICNG contains procedures for determining project-specific noise management levels (NMLs) for sensitive receivers based on the existing background noise in the area. The worst-case noise levels from the upgrade are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impacts. The assessment of predicted construction noise levels shows that these are less than the NMLs for sensitive receivers near the Tallawarra A power station. Maximum noise levels at night are also predicted to be below levels that would disturb sleep. Noise during construction would be consistent with the noise levels of normal maintenance performed under the existing approval.

Assessment of construction noise from vehicle movements for delivery has taken into account the anticipated twelve heavy vehicle movements. Since there are no sensitive receivers adjacent to Yallah Bay Road and the construction traffic volumes are low compared to existing traffic volumes on the Princes Highway, no traffic noise impacts associated with the upgrade are anticipated.

There are no anticipated changes in the operational noise emissions at the Tallawarra A power station as a result of the upgrade. As a result, a qualitative assessment of operational noise impacts was carried out. The assessment concluded that there would be no anticipated operational noise impacts as a result of the proposal and that the upgraded power station would continue to comply with operational noise limits specified in the NSW Noise Policy for Industry and operational noise limits specified in EPL 555.

Hazard and risk

Any dangerous goods associated with the upgrade would be transported, stored and used in accordance with relevant Australian Standards and legislation. They are anticipated to largely relate to fuels and lubricants, which present a minimal risk.

A review of the bushfire risk of the proposal area and its surrounds revealed the presence of vegetation category 1 land (vegetation with the highest likelihood of forming fully developed fires) located around 250 metres southwest and 700 metres northwest of the proposal area. This vegetation is surrounded by vegetation buffers, which include Yallah Bay Road and Lake Illawarra near Yallah Bay Wharf. The presence of buffers acts to minimise the bushfire risk to the proposal area. Bushfire hazard is not anticipated to increase as a result of the upgrade or operation of the proposal.

The proposal is anticipated to reduce the temperature, exhaust velocity and volumetric flow rate of emissions to air from the upgraded power station. An aviation risk assessment was prepared to calculate the impact of these changes on the Tallawarra A and Tallawarra B power station exhaust plumes. The assessment predicts a reduction in the vertical velocity of the plume at all heights. As such, the upgrade would result in reduced aviation risk.

Waste

Waste generated by the proposal would include decommissioned equipment such as removed turbine/compressor vanes and blades, packaging materials associated with any equipment deliveries, and general maintenance waste. Where practical waste generated by the proposal would be reused or recycled. All waste generated as part of the proposal would be managed in accordance with NSW EPA Waste Classification Guidelines and / or resource recovery orders or exemptions under the POEO Act.

Minimal waste is anticipated to be generated during the operation of the proposal. The key activities with the potential to generate waste during operation of the proposal would be consistent with current operational waste.

Safeguards associated with waste reuse and disposal are included in section 6.6.5.

Biodiversity

It is a requirement, under section 7.9 of the Biodiversity Conservation Act, that all SSD proposals be accompanied by a Biodiversity Development Assessment Report (BDAR) prepared by an Accredited Assessor in accordance with the Biodiversity Assessment Method (BAM) (2020), unless a waiver to this requirement has been approved. A BDAR Waiver has been approved for the proposal and is included in Appendix F.

Given there would be no impacts to terrestrial biodiversity and a BDAR Waiver has been approved for the proposal, only impacts to aquatic ecology are required to be assessed for the proposal in this EIS (in accordance with the SEARs).

During operation, the proposal would result in negligible change to the water discharges made to Lake Illawarra. Accordingly, there would be no additional impacts to aquatic ecology, including aquatic biodiversity and key fish habitat, as a result of the operation of the proposal. Safeguards for potential aquatic ecology impacts would be consistent with those already included in the original Tallawarra Power Station EIS (Pacific Power, 1998).

Traffic and transport

No new access from the public road network is anticipated as a result of the upgrade. Site access would be via existing power station gates on Yallah Bay Road. The key transport route to access the site would be via the Princes Highway and then Yallah Bay Road.

A typical maintenance outage at the Tallawarra A power station requires approximately 150 additional staff which would result in up to 360 vehicle movements per day when combined with the vehicle movements of the 30 operational power station staff. These vehicle movement numbers are expected to apply each day during the planned maintenance outage for the proposal over the two-month period.

During the upgrade, there would be a temporary increase in the number of heavy vehicles accessing the site which would be associated with the delivery of equipment needed for the proposal. It is anticipated that only twelve heavy vehicle movements would be required for the proposal in addition to the vehicle movements required for a typical maintenance outage. This would include six containers of equipment that would need to be transported to site from Port Botany and up to six container loads of equipment that would leave site following the upgrade. These containers would be transported by standard sized heavy vehicles, meaning over size over mass (OSOM) vehicle movements would not be required.

Yallah Bay Road does not provide access to any residential or commercial properties. As such, overall traffic impacts as a result of the minor increases in heavy vehicles are anticipated to be negligible. Local delays would not be experienced and access to properties and local roads would not be impacted.

Negligible traffic and transport impacts are anticipated as a result of the operation of the proposal.

Other impacts

In accordance with the SEARs, qualitative assessments were undertaken for Aboriginal heritage, non-Aboriginal heritage, water resources, visual, soils and contamination potential impacts. The assessments determined that there would be no impacts associated with any of these impact categories. This is largely due to the proposal being carried out entirely within the existing footprint of the Tallawarra A power station and not requiring any ground disturbance, changes to water use, water discharges or adjustments to the external physical appearance of the power station. No mitigation measures are required for these impact categories.

Cumulative impacts

The cumulative impacts of other nearby projects have been assessed. Other nearby projects include the Tallawarra B power station and the West Dapto Urban Release Area.

Cumulative construction impacts as a result of the proposal's proximity to the Tallawarra B project would be minimal given the works for both developments would occur within the existing power station footprint, which is a heavily disturbed area and relatively distant from the nearest sensitive receivers.

Cumulative construction impacts as a result of the proposal and the West Dapto Urban Release Area are anticipated to be negligible. The West Dapto development is located around three kilometres from the Tallawarra A power station and the two developments are separated by the Princes Highway and urban areas.

EPL 555 provides for emission limits to water and air for both Tallawarra A and Tallawarra B power stations. Ongoing water quality and aquatic habitat monitoring in Lake Illawarra would confirm the anticipated negligible operational impacts of the Tallawarra A and Tallawarra B developments. Ongoing air quality monitoring would confirm that the air quality impacts of both developments are minimal and compliant with relevant air quality goals.

The proposal would reduce temperature, exhaust velocity and volumetric flow rate from the upgraded Tallawarra A power station stack. The assessment predicts a reduction in the vertical velocity of the Tallawarra A power station plume at all heights and concluded that the upgrade would result in reduced aviation risk. As such, there would be no increase in cumulative aviation risk as a result of the operation of an upgraded Tallawarra A power station concurrently with the Tallawarra B power station.

Conclusion and justification

The proposal is State Significant Development subject to assessment under Part 4 of the EP&A Act. This EIS has been prepared to address the SEARs and reflects the form and content requirements of the EP&A Regulations. This has included consideration of the objects of the EP&A Act. The proposal as described in the EIS best meets the proposal objectives and would result in negligible change in environmental impacts from the continued operation of the Tallawarra A power station.

1 Introduction

This Environmental Impact Statement (EIS) has been prepared to inform an application for development approval for an efficiency upgrade to the existing Tallawarra A power station, located in New South Wales.

1.1 Proposal overview

EnergyAustralia owns and operates the Tallawarra A combined cycle gas turbine (CCGT) power station, which was commissioned in 2009. The power station is located approximately 13 kilometres (km) south of Wollongong on Lot 1092 DP1140369 at Yallah Bay Road, Yallah, New South Wales. The power station is approved to generate 400 megawatts of energy, which is enough to supply electricity for up to 200,000 homes.

EnergyAustralia proposes to upgrade some internal components and adjust the tuning of the generator performance characteristics of the power station (the proposal) during a scheduled routine maintenance outage over two months, from April-May 2024. The proposal would provide design improvements and allow for the installation of new technology and improved materials.

The proposal would increase the nominal output of the power station from approximately 400 megawatts to 440 megawatts and would require that the network maximum output capacity registered with AEMO be increased from 440 megawatts to 480 megawatts. Due to improvements in technology, the upgraded power station would operate more efficiently with improved reliability and would produce more electricity whilst emitting a lower intensity of carbon emissions. The proposal would not change the capacity factor of the power station, therefore there would be no material change to total CO_2 and NO_x emissions. Further details of the proposal are described in section 3.

The proposal has an estimated capital investment value of approximately $39 million and is accordingly considered a State Significant Development (SSD) for the purposes of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in accordance with Clause 20 of schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). In accordance with section 4.12(8) of the EP&A Act, the application is therefore required to be accompanied by an EIS that meets the requirements of Part 8, Division 5 of the EP&A Regulation and any other relevant legislative instruments that relate to the proposal.

Approval is sought for the rated capacity increase as part of the proposal. The operation of the power station is currently authorised under development consent number D98/784 granted by Wollongong City Council under the EP&A Act. The proposal would not require the existing Wollongong City Council consent to be modified or surrendered. Upon completion of the upgrade, the operation of the power station would continue in accordance with the existing Wollongong City Council consent and in accordance with any additional requirements associated with this SSD.

It is essential that the proposal be timed in line with the next planned outage in April 2024 to improve NSW's energy security, noting that planned maintenance outages are scheduled to occur at the power station approximately every five years. The activities associated with the upgrade would be generally consistent with typical maintenance outage activities that are currently authorised under development consent number D98/784 granted by Wollongong City Council.

All works as part of the proposal would be carried out within the existing turbine hall at Tallawarra A with no change required to the existing impact footprint. The proposal is limited in scope to only the replacement of some internal components and the adjustment of the tuning of the generator performance characteristics of the power station. Importantly, the proposal does not include any changes to the existing operational management of the Tallawarra A power station, which would continue to be managed in accordance with the existing authorisations, including Environmental Protection Licence (EPL) 555, as further described in section 4.6.

The proposal would also make the Tallawarra A power station capable of using hydrogen as a fuel in the future, subject to separate approval.

1.2 Proposal objectives

The objectives of the proposal are to:

- increase the efficiency in the power station
- minimise natural gas consumption
- improve the reliability of the Tallawarra A power station
- increase the maximum energy generation capacity of the Tallawarra A power station to provide network stability during the transition to renewable energy supply in NSW.

The proposal would improve the reliability and security of electricity supply to NSW at a time when large thermal generators are being progressively retired, including Liddell Power Station which closed in April 2023 and Eraring power station which is scheduled for closure in 2025. AEMO is forecasting expected breaches of reliability standards in NSW following the closure of Eraring power station. The proposal would help of manage the risk of reliability standard breaches.

1.3 The applicant

The applicant of the proposal is EnergyAustralia Tallawarra Limited (EnergyAustralia), a wholly owned subsidiary of EnergyAustralia NSW Pty Ltd. The applicant's details are provided in Table 1-1.

EnergyAustralia is a leading energy retailer and generator with around 2.4 million customers across eastern Australia. Their modern energy portfolio contributes important volumes to the power system and is underpinned by thermal power plants, as well as renewable energy sources, that exceed 5,000 megawatts in capacity.

EnergyAustralia also currently operates Australia's largest energy sector carbon offsets program, with more than five million tonnes of CO_2e already fully offset and accredited by Climate Active. Under EnergyAustralia's offsets offering, more than 440,000 of its customers receive carbon neutral electricity and gas at no extra cost.

EnergyAustralia is building a portfolio that enables it to operate its assets more flexibly to complement and support increasing penetration of cleaner forms of energy. EnergyAustralia's reputation, capability, and history places it well to lead an orderly energy transition that benefits NSW and its consumers, by developing replacement capacity and economic opportunity for the regions in which it operates.

Table 1-1: Applicant details

Applicant details	
Name	EnergyAustralia NSW Pty Ltd
Postal Address	Level 19, Two Melbourne Quarter 697 Collins Street Docklands VIC 3008
ABN	75 163 935 635
Nominated contact	Amanda Jones
Contact details	Amanda.Jones@energyaustralia.com.au
Environmental Impact Statement	Prepared by Aurecon Australasia Pty Ltd

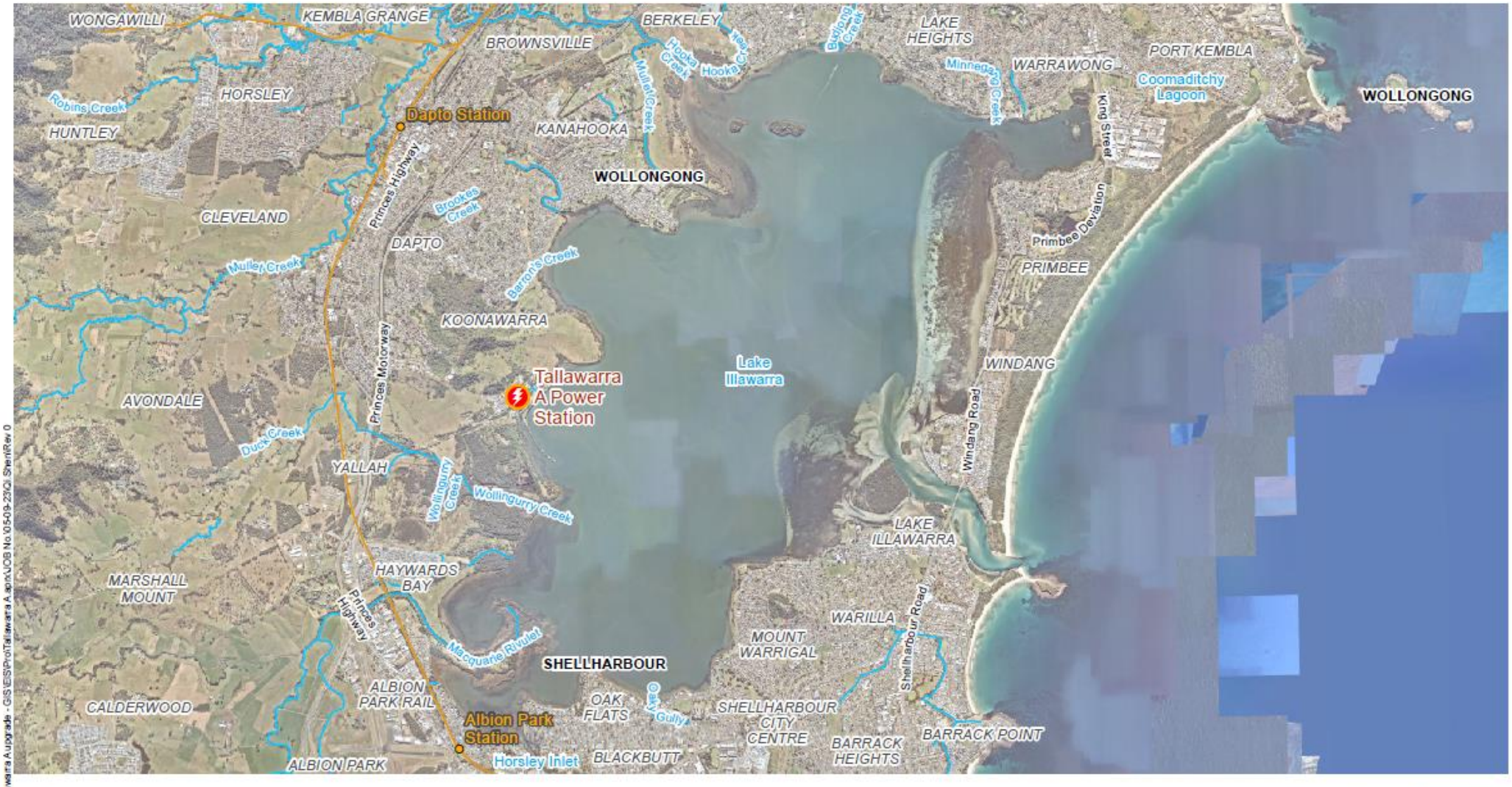
1.4 Proposal location

The proposal would be undertaken on EnergyAustralia owned land on Lot 1092 DP1140369 Yallah Bay Road, Yallah NSW 2530. The proposal is approximately two kilometres from the suburb of Koonawarra and is approximately 13 km south of Wollongong, in the NSW south coast region.

The proposal area comprises existing building structures and existing cleared land used for carparking and equipment storage. As is outlined in section 4.3.1, the proposal land is zoned SP2 Infrastructure – Electricity generating works. The primary objectives of the SP2 Infrastructure zone under the Wollongong LEP are:

- to provide for infrastructure and related uses
- to prevent development that is not compatible with or that may detract from the provision of infrastructure
- to provide for key transport corridors.

The proposal location is shown in a regional context in Figure 1-1. More detailed illustrations of the proposal are included in Chapter 3 of this EIS.



Tallawarra A Power Station

Railway Station

Railway Line

Source: Aurecon, TfNSW, Spatial Services, Nearmap

1:70,000 @ A4

0 1 2Km

Projection: GDA2020 MGA Zone 56

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Tallawarra A Power Station Upgrade

FIGURE 1-1: Regional context

1.5 Proposal history

Tallawarra A is Australia's most efficient thermal power station. Before the Tallawarra gas-fired power station commenced operations in January 2009, there was a 320-megawatt coal-fired power station at the site, which operated between 1954 and 1989.

Tallawarra A power station includes main plant areas and ancillary infrastructure. The primary power station components include turbine hall for a gas turbine, steam turbine and generator, heat recovery steam generator unit, and control room complex. The ancillary infrastructure includes a gas pipeline, 132kV switching station (including control buildings and fences), 132kV capacitor bank, 132kV transmission lines to connect the switching station to existing 132kV transmission network, transmission line works to connect switching station to power station, administrative building, and visitor's centre.

The power station is powered by the GT26 gas turbine installed over 13 years ago. A Long-Term Service Agreement (LTSA) for the gas turbine portion of the plant is in place, which stipulates the requirement for routine outages in accordance with the plant outage maintenance schedule. The Tallawarra A power station is scheduled for servicing during a routine maintenance outage in April-May 2024. During this planned maintenance event, EnergyAustralia propose to replace several internal components of the power station with a high efficiency alternative compared to existing infrastructure.

Table 1-2 below outlines the key approvals and authorisations, which currently apply to Tallawarra A and outlines the likely interaction of the proposal with each of these approvals.

Table 1-2: Key authorisations and proposal interaction

Authorisation	Interaction with the proposal
Tallawarra A operations Development consent number D98/784 granted by Wollongong City Council under the EP&A Act	The ongoing operation of Tallawarra A would continue to be regulated by the existing development consent.
Environment protection licence Environment protection licence 555 (EPL 555) issued by the New South Wales Environment Protection Authority (EPA) under the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act)	EnergyAustralia holds an existing EPL for Tallawarra A power station (EPL 555). The EPL regulates the operation of the Tallawarra A power station and includes emissions discharge limits as well as monitoring conditions. The current EPL specifies that the combined load limit from both Tallawarra A power station and Tallawarra B power station must not exceed 900 tonnes per annum of nitrogen oxides. The proposal would not cause the power station to exceed the specified emissions or discharge limits, or the electricity generation capacity levels prescribed in the EPL.

1.6 Purpose and structure of this EIS

EnergyAustralia is seeking approval for the proposal via the SSD approvals pathway. This EIS has been prepared to follow the general form, content, and structure requirements outlined in the *State significant development guidelines – preparing an environmental impact statement* (Appendix B to the State Significant Development Guidelines) (DPE, 2022).

This EIS has been prepared by Aurecon on behalf of EnergyAustralia NSW Pty Ltd to support the approval of the proposal. This EIS has been prepared in accordance with the Secretary's Environment Assessment Requirements (SEARs) issued on 25th August 2023 by the Department of Planning and Environment (DPE), under the EP&A Act and Part 8, Division 5 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation). The SEARs set out the technical assessment and consultation required to be carried out in the preparation of this EIS.

In accordance with section 190 of the EP&A Regulation, this EIS presents an assessment of the potential environmental impacts identified during planning and assessment of the proposal. The assessment considers the areas directly or indirectly affected by construction and operation of the proposal, as relevant to each environmental matter considered.

The structure of this EIS is as follows:

- **Executive Summary**: Provides a summary of the EIS in non-technical language
- **Chapter 1 – Introduction**: Introduces the proposal and the EIS, including a simple description of the proposal and its background
- **Chapter 2 – Strategic context**: Provides a description of the strategic context and need for the proposal
- **Chapter 3 – Project description**: Provides a description of the proposal and DPE SEARs
- **Chapter 4 – Statutory context**: Provides a summary and assessment of the Project having regard to relevant statutory legislation
- **Chapter 5 – Consultation and engagement**: Provides a summary of the findings of community and stakeholder engagement undertaken for the proposal
- **Chapter 6 – Environmental impacts**: Provides a detailed summary of the results of the assessment of the potential impacts of the proposal
- **Chapter 7 – Management and mitigation**: Provides a summary of the existing management plans in place for the Tallawarra A power station and of the management measures for the proposal as outlined in this EIS
- **Chapter 8 – Conclusion**: Provides a summary of the outcomes of the EIS in support of the overall proposal justification.

Technical reports are also appended to this EIS to provide additional detail on some of the assessments summarised in the EIS chapters. They are:

- Appendix A: SEARs compliance table
- Appendix B: Air quality assessment
- Appendix C: Aviation risk assessment
- Appendix D: Social impact assessment
- Appendix E: Construction noise assessment
- Appendix F: BDAR waiver.

2 Strategic context

The proposal is being developed in response to energy market requirements and the strategic direction of EnergyAustralia. The following sections outline various drivers which form the justification for the proposal in a strategic context. They outline the international, national, regional, and local policy contexts for the proposal. They also describe the importance of the proposal in assisting the ongoing transformation of the NEM towards a market with increasing reliability and a reduced overall carbon emissions intensity.

2.1 International context

2.1.1 COP 21 and the Paris Agreement

On 12th December 2015, the Conference of the Parties (COP) adopted the Paris Agreement, made under the United Nations Framework Convention on Climate Change (also referred to as the UNFCCC) (UNFCCC, 2015) to strengthen the global response to climate change by:

- keeping the increase in global average temperature to well below 2°C above pre-industrial levels
- pursuing efforts to limit the temperature increase to 1.5°C.

Australia announced its ratification of the Paris Agreement on the 10 November 2016. By 2030, the Australian Government is committed to reducing emissions by 43% below 2005 levels. In 2022, the Australian Government released *Australia's emissions projections 2022*, outlining Australia's progress towards its Paris commitments. The report details how Australia is on track to reduce emissions by 32% below 2005 levels by 2030, and how improved energy efficiency and renewable uptake, including through the target of 82% renewable energy in Australia's electricity grids, will allow Australia to exceed its Paris commitments.

Electricity generation contributes to about one-third of total carbon emissions in Australia, and improved efficiency in energy generation is crucial to achieving a low-emissions future and delivering on the Paris Agreement. This proposal supports a low carbon future through improved energy efficiency and output at the Tallawarra A power station, which would contribute to Australia's international emissions reductions commitments.

2.1.2 COP 26 and COP 27

COP 26 further developed on previous commitments from COP 21. At COP 26, Australia joined the Glasgow Breakthroughs Initiative, which sets global goals to make clean technologies the most affordable and accessible option before 2030. This proposal would contribute to Australia's commitment to this initiative through the improved energy efficiency of the Tallawarra A power station and the ability to use hydrogen as a clean technology at the power station in the future.

COP 27 largely addressed funding issues for developing countries facing the worst impacts of climate change. Funding arrangements were agreed to by those attending the conference to address loss and damage experienced in nations dealing with rising sea levels and unprecedented weather conditions to a greater extent than wealthier nations. COP 27 had less of a focus on emissions reduction targets, meaning the ability for the proposal to align with Australia's international commitments from this conference is limited.

2.2 National policy and context

The following sections describe some of the critical features of the NEM and related national planning policies of relevance to the proposal.

2.2.1 National Electricity Market (NEM)

The NEM in Australia operates as a wholesale market across NSW, the Australian Capital Territory, Queensland, South Australia, Victoria and Tasmania. It comprises a wholesale market for electricity sales and the physical system comprising transmission infrastructure. The Australian Energy Market Operator (AEMO) manages the NEM. AEMO is responsible for monitoring electricity consumption and the flow of energy across the electricity network. In 2022 the NEM supplied more than 10 million customers.

Consistent with global trends seen across developed nations, the NEM in Australia has experienced a notable increase in generation from renewable energy sources over the past decade. This includes increasing energy generation from wind and solar farms across a more distributed network in a shift away from the high-capacity point generation provided by traditional power stations.

This rise in energy generation from renewable sources is driven by policies and agreements regarding climate change and targets to reduce greenhouse gas emissions, in addition to commercial drivers as renewable energy generation has become increasingly cost competitive. Whilst energy generation from renewable sources is rising, multiple coal-fired power stations are planned to be retired in Australia in the coming decades. To compensate for the loss of traditional baseload energy generation an increasing number of new generation and dispatchable resources such as gas fired power stations are required to meet market demands.

The proposal would support the continued operation of the NEM by contributing to security of energy supply across the network.

2.2.2 2022 Integrated System Plan

The 2022 Integrated System Plan (ISP) (AEMO, 2022) provides a comprehensive roadmap for the NEM. The ISP and its optimal development path support Australia's highly complex and rapid energy transformation towards net zero emissions, enabling low-cost renewable energy and essential transmission to provide consumers with reliable, secure and affordable power. This plan is for a true transformation of the NEM, from fossil fuels to firmed renewables. It calls for levels of investment in generation, storage, transmission, and system services that exceed all previous efforts combined.

The system today has approximately 43 gigawatts (GW) of firming capacity, including 23 GW from coal-fired generation, 11 GW from gas-fired and liquid-fuelled generation, 7 GW from hydro generation and 1.5 GW from dispatchable energy. Today, the NEM delivers just under 180 terawatt hours (TWh) of electricity to industry and homes per year. The ISP suggests that the NEM needs to almost double the electricity delivered to approximately 320 TWh per year by 2050 to serve the electrification of our transport, industry, homes, and offices.

The proposal is consistent with the ISP which states that an additional 10 GW of gas-fired generation is needed by 2050 to efficiently operate and firm variable renewable energy generation. The proposal would also make the Tallawarra A power station capable of using hydrogen as a fuel in the future, subject to separate approval. The outcome of the proposal is consistent with the ISP which states that "gas-fired generation, potentially fuelled by hydrogen, will play a crucial role as coal-fired generation retires, both to help manage extended periods of low variable renewable energy output and to provide power system services to provide grid security and stability" (AEMO, 2022).

2.2.3 Climate Change Act 2022

In September 2022, the Australian government passed legislation targeting a 43% reduction in emissions by 2030 (compared with 2005 levels) and to reach net zero by 2050. The aim of the act is to advance an effective and progressive response to the urgent threat of climate change. By drawing on the best available scientific knowledge and setting a greenhouse gas emissions reduction target, these actions will contribute to global goals, such as those agreed under the Paris Agreement.

The proposal would contribute to the aims of this Act through a reduction in emissions produced per unit of energy output at the Tallawarra A power station. The added potential to use hydrogen as a fuel in the future, as a result of the proposal, further enhances its ability to reduce emissions and contribute to Australia's climate change commitments as outlined in the Climate Change Act.

2.3 NSW policy

NSW policy has identified that increasing output from renewable generation within the NEM will help achieve the state's objective of delivering reliable electricity at lower prices for consumers. Several strategies have been identified to facilitate reaching energy targets, some of which are outlined in the following sections.

2.3.1 NSW Electricity Infrastructure Roadmap

The purpose of the NSW Electricity Infrastructure Roadmap (DPE, 2020) is to deliver energy infrastructure and secure NSW's future as an energy superpower. The Electricity Infrastructure Roadmap is the NSW Government's 20-year plan to transform our electricity system into one that is cheap, clean and reliable. As the world shifts towards a greener future in reducing its carbon emissions, the roadmap identifies NSW as one of the best renewable energy resources in the world which can attract huge investments.

The roadmap recognises that power stations in NSW are retiring and that it is crucial that these power stations are replaced with new energy infrastructure to help support the network and protect consumers from substantial energy price rises.

It is expected that the roadmap will deliver $32 billion in private sector investment by 2030 and support 6,300 construction jobs and 2,800 ongoing jobs mostly in regional NSW in 2030. A number of these jobs will be delivered through the upgrade and futureproofing of existing energy infrastructure.

The proposal would contribute to meeting the roadmap by potentially catalysing investment into future hydrogen-based firming infrastructure whilst utilising existing power supply transmission networks. Employment outcomes and local economic activity would be associated with the upgrade, aligning with the vision of the NSW Electricity Infrastructure Roadmap.

2.3.2 NSW Electricity Strategy

The NSW Electricity Strategy (DPE, 2019) is the NSW Government's plan for a reliable, affordable and sustainable electricity future. The purpose of the NSW Electricity Strategy is to improve the efficiency and competitiveness of the NSW electricity market and encourage investment in new lower cost generation and energy saving technology.

The strategy has outlined a three-layered approach that aims to achieve the objectives outlined in the strategy. The NSW Government will:

- support the market to deliver reliable electricity at the lowest price, while protecting the environment
- set an Energy Security Target to ensure that the State has sufficient generation capacity to cope with unexpected generator outages during periods of peak demand, such as during heatwaves
- ensure the State has sufficient powers to deal with an electricity emergency if one arises.

The NSW Electricity Strategy identifies 'delivering more resilient electricity supplies' as a key action towards supporting a competitive and low-cost electricity market. It plans to do so through initiatives such as the setting of an energy security target and the avoidance of electricity emergencies.

The increased electricity output as a result of the proposal, with lower carbon emission intensity, would align with these strategy initiatives.

2.4 Regional context

2.4.1 Illawarra Shoalhaven Regional Plan 2041

The Illawarra Shoalhaven Regional Plan 2041 (DPE, 2021) is a 20-year land use plan that aims to protect and enhance the region's assets and plan for a sustainable future. It informs councils' land use planning, the work of infrastructure agencies to plan for growth and change, the private sector and the wider community of the NSW Government's approach to creating a connected, sustainable, innovative and vibrant region.

The plan identifies 15 regionally significant precincts that will drive jobs creation, housing diversity, and vibrant communities. These places contain more than 2,300 hectares for employment, hubs for recreation, culture, housing and innovation, as well as almost 45,000 jobs.

The plan contains several objectives towards a productive and innovative region. The proposal would support at least one of these objectives, namely:

- Objective 15, which is to "plan for a net zero region by 2050" (DPE, 2021). In particular, the proposal is consistent with Strategy 15.3, which is to "promote opportunities for clean energy in the region including pumped hydro, hydrogen and biogenic gas" (DPE, 2021) since the proposal would enable the future use of hydrogen as a fuel source, subject to separate approval.

2.5 Local context

2.5.1 Our Wollongong 2032: Community Strategic Plan

The Our Wollongong 2032 (the community strategic plan), adopted on 27th June 2022, is a 10-year plan that identifies the community's vision for the future. It outlines the community's priorities and aspirations, and how these can be achieved. The community strategic plan highlights a community vision to value and protect the natural environment and to be leaders in building an educated, creative, and connected community. The community strategic plan also acknowledges issues and challenges for the community's future, which include climate change (Wollongong City Council, 2022).

The proposal is consistent with the plan because it would reduce the carbon emissions intensity of the power station and make possible further reductions through the implementation of hydrogen as a fuel source in the future, subject to separate approval.

2.5.2 Wollongong Local Strategic Planning Statement 2020

The Wollongong Local Strategic Planning Statement 2020 (Wollongong City Council, 2020) builds on the community strategic plan's vision and is required to:

- demonstrate how Council will continue to implement the actions contained in the Illawarra Shoalhaven Regional plan and other State and local government policy documents
- identify future land use actions, studies and strategies to be undertaken by Council
- be used as part of the assessment of planning proposals to ensure they have strategic merit and are consistent with Council's vision.

A key focus outlined in the planning statement is enabling infrastructure and transport, and part of this includes secure and reliable electricity supply. The Tallawarra A power station is specifically referenced as a key supplier of electricity to the area. The planning statement outlines the necessity to ensure that infrastructure is provided to protect and enhance employment opportunities, and that energy infrastructure can reliably power homes, offices and factories. The proposal aligns with this priority of the strategic planning statement because it would increase electricity reliability and security and would support employment opportunities during construction.

2.6 Justification of the proposal

The proposal would improve the reliability, efficiency, and security of electricity supply to NSW at a time when large thermal generators are being progressively retired. This includes Liddell power station which closed in 2023 and is scheduled for demolition in 2024, and Eraring power station which was initially set to close in August 2025, however its life has been extended to a timeframe that is yet to be announced. AEMO is forecasting expected breaches of reliability standards in NSW following the closure of Eraring power station.

The proposal is consistent with the 2022 ISP which states that an additional 10 GW of gas fired generation is needed by 2050 to efficiently operate and form variable renewable energy generation.

The proposal would make the Tallawarra A power station capable of using hydrogen as a fuel in the future, subject to separate approval. The proposal is consistent with the ISP which states that 'gas-fired generation, potentially fuelled by hydrogen, will play a crucial role as coal-fired generation retires, both to help manage extended periods of low variable renewable energy output and to provide power system services to provide grid security and stability" (AEMO, 2022).

Tallawarra A power station is located in a major electricity load-centre of Newcastle, Sydney and Wollongong. It does not face transmission constraints and has an existing grid connection that would not need to be altered by the proposal.

The proposal would utilise new technology and improved materials to increase efficiency in the power station. The proposal would increase stability and reliability of the NEM, by extending major outage intervals from five to eight years. These reduced outages would provide immediate support to the NEM as major coal stations are closed. Unplanned power station down-time would also be able to be reduced by the proposal because the new equipment would be more reliable.

The proposal represents an incremental upgrade of an existing gas power station that would increase the approved generating capacity of the power station by approximately 10 per cent. This incremental upgrade could be delivered quickly and would help to overcome the forecasted tighter electricity supply in the market, whilst improving the power station reliability. These outcomes would be consistent with the operational objectives of the NEM.

The proposal would also contribute to positive environmental outcomes. Key environmental benefits of the proposal would include:

- supporting the NSW Roadmap objectives and facilitating the transition of NSW to lower carbon emissions while maintaining reliability at lowest cost to consumers
- reducing power station carbon emissions intensity
- conversion of the power station to become hydrogen capable so that up to 35 per cent hydrogen could be used in the power station fuel in the future to further reduce air emissions, subject to separate approval.

These environmental benefits would be associated with very minor to negligible and short-term negative potential impacts during the upgrade that would be managed effectively with standard environmental management approaches.

Following the upgrade, power station operations would resume consistent with the existing operating strategy of the power station. The proposal would reduce the frequency of future planned outages by reducing overall maintenance requirements and extending major outage intervals from five to eight years. Unplanned down-time would likely be reduced given the new equipment would be more reliable. Due to increased efficiency, the upgraded power station would produce more electricity with a lower intensity of carbon emissions. There would be no material change to total CO_2 and NO_x emissions as the proposal is not intended to change the average annual capacity factor (run-time) of the power station.

Overall, the proposal is consistent with National, State and local strategic planning objectives and would be positive for the NSW economy, environment and society. By contributing to the security of energy supply across the network, the proposal would support the continued operation of the NEM.

2.7 Strategic alternatives

2.7.1 'Do nothing' scenario

The 'do nothing' scenario would mean no power station upgrade would be undertaken. A routine maintenance outage would still occur in April 2024, however the increased output associated with the upgrade would not be realised. This would have the following outcomes:

- This option would not support national targets in relation to emissions reduction through the diversification of the NEM.
- This option would not support the 2022 ISP and the need for more secure and affordable energy services across the NEM.

- This option would not support regional and local objectives including increasing energy reliability and security in the region or other themes identified in the Wollongong community strategic plan and strategic planning statement.

The 'do nothing' scenario is not the preferred option.

2.7.2 The proposal

The proposal would result in a power station upgrade being undertaken during the scheduled maintenance outage, with the following outcomes:

- This option would support national targets in relation to emissions reduction through continued diversification of the NEM.
- This option would align with the 2022 ISP and the provision of services which contribute to more secure and affordable energy provision across the NEM.
- This option would upgrade an existing gas power station, which could be delivered quickly and would help to overcome the forecasted tighter electricity supply in the market, whilst improving power station reliability, which would be consistent with the operational objectives of the NEM.
- This option would support regional and local objectives including increasing energy reliability and security in the region and the themes identified in the Wollongong community strategic plan and strategic planning statement.
- This option would reduce power station NO_x emissions intensity for the amount of power generated.
- This option would reduce power station carbon emissions intensity.
- This option would allow for the power station to become hydrogen capable so that up to 35 per cent hydrogen could be used in the power station as fuel in the future to further reduce air emissions, subject to separate approval.

The proposal is the preferred option.

3 Proposal description

This chapter provides a description of the proposal including relevant design considerations and features of construction and operation.

3.1 Secretary's Environmental Assessment Requirements

The SEARs were issued for the proposal on 25th August 2023 (SSD-60938959). These outline the assessment requirements for the various anticipated impacts of the upgrade. Appendix A includes a SEARs compliance table, which outlines how this EIS has addressed each requirement. Sections 5 and 6 also include the SEARs relating to consultation and environmental impacts and how these have been addressed within the relevant chapters.

3.2 Proposal overview

The Tallawarra A power station is scheduled for servicing during a routine maintenance outage in April-May 2024. During this planned maintenance event, EnergyAustralia propose to replace several internal components and adjust the generator performance of the power station. The routine maintenance outage is required at defined operating hour intervals that are largely inflexible. EnergyAustralia has been monitoring the operating hours of the Tallawarra A power station and modifying the gas turbine operations to ensure that the timing of the major maintenance will be due on 1st April 2024. Operating the gas turbine past its due date for maintenance results in unplanned outages, longer outage periods due to unforeseen failures and increased costs. The existing turbine at the power station is shown in Figure 3-1 and Figure 3-2.

Figure 3-1: Existing turbine with cover removed

Figure 3-2: Existing turbine with cover removed

The ancillary sites and work areas that would be used during the upgrade would be limited to existing cleared and hardstand areas within the site boundaries adjacent to the Tallawarra A and Tallawarra B power stations. These areas are shown in Figure 3-3.

The proposal would utilise new technology and improved materials to increase the efficiency of the power station. The proposal would increase the nominal output of the power station from 400 megawatts to 440 megawatts and would increase the maximum output capacity from 440 megawatts to 480 megawatts. No additional natural gas fuel would be used in the power station following the upgrade. Following the upgrade, power station operations would resume consistent with the existing operating strategy of the power station. Due to increased efficiency, the upgraded power station would produce a lower intensity of carbon emissions. There would be no material change to total CO_2 and NO_x emissions as the proposal would not change the average capacity factor (run-time) of the power station.

The proposal would make the power station 'hydrogen capable', which would enable future opportunities to further reduce carbon emissions, subject to separate approval. Should this be pursued, subject to commercial considerations, it may help to create demand for hydrogen development in the market.

3.3 Key proposal components

The proposal would require some existing equipment to be removed and replaced within the Tallawarra A power station turbine hall. Following the completion of the upgrade there would be no outward change to the power station appearance. Key features of the proposal would include:

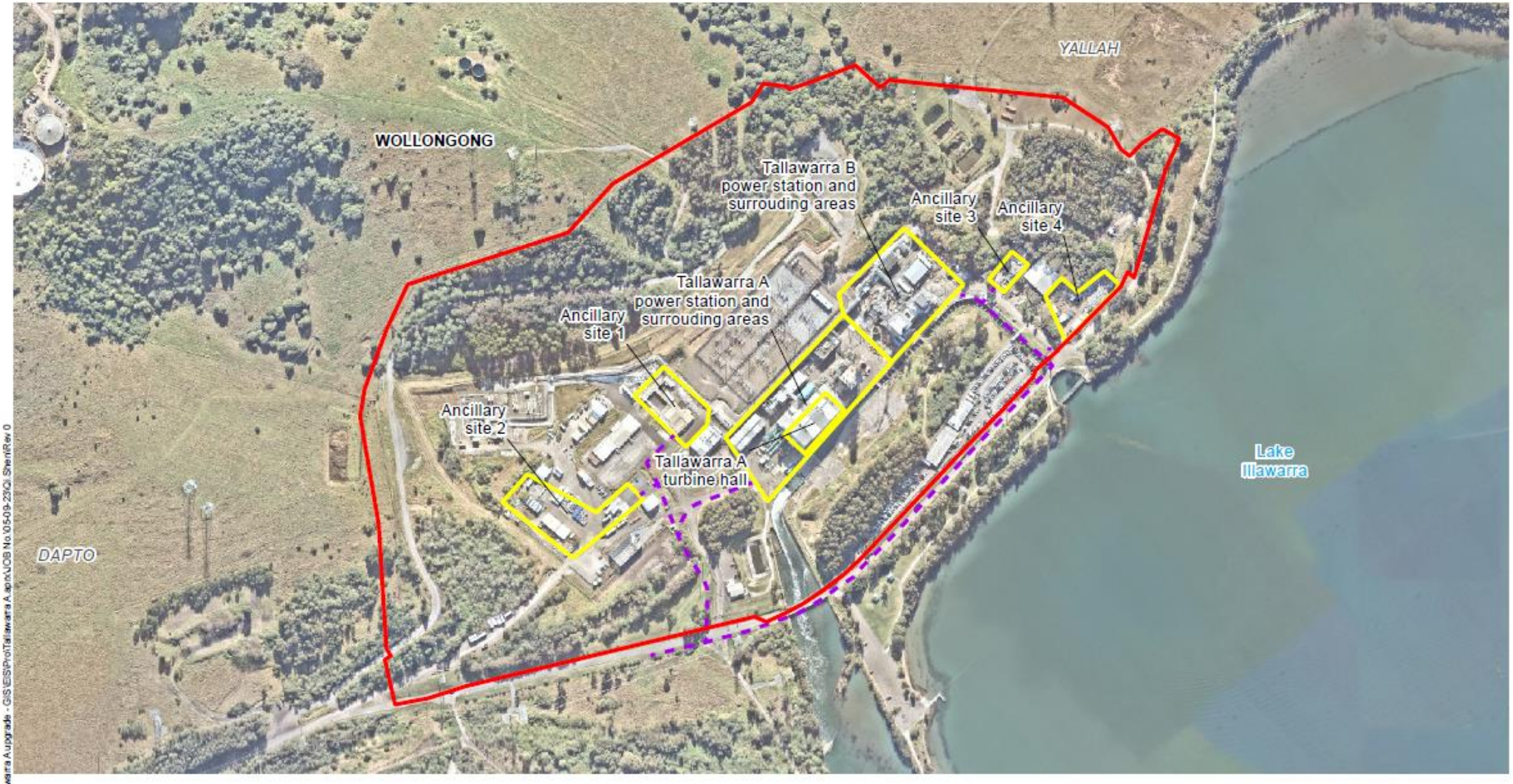
- upgrade of the existing compressor and turbine by replacing the old blades and vanes with a new design that reduces emissions intensity and increases operational reliability
- upgrade of the existing combustion by replacing existing hardware components with newer technology to reduce the overall consumption of natural gas required for the same output
- upgrade the steam cycle and steam turbine internal components to increase the power stations overall combined cycle reliability
- modification and tuning of the generator performance characteristics to increase the power output consistent with energy system regulations and performance requirements.

The proposal is described in more detail in Table 3-1 and is shown in Figure 3-3.

Table 3-1: Key features of the proposal

Proposal	Summary
Site details	
Local Government Area (LGA)	Wollongong
Proposal location	Yallah Bay Road, Yallah, NSW, 2530
Application land	Lot 1092 DP 1140369
Zoning	The proposal is located on land zoned as SP2 (Electricity generating works).
Access	Access to the proposal area would be via Yallah Bay Road. Most traffic would access the proposal area through the existing main Tallawarra A power station access security gate; however some traffic may use an existing gate closer to ancillary site 3 and 4 (gate 12) which is located to the east of the inlet canal.
Construction (upgrade works)	
Upgrade activities	Most of the activities that would occur during the upgrade would occur as part of a scheduled maintenance outage that would otherwise be undertaken, and which has already been assessed and approved under the existing consent from Wollongong City Council. The upgrade would generally involve the following activities: ■ Establishment of ancillary sites and required environmental controls ■ Equipment delivery to site during standard working hours by light and heavy vehicles ■ Removal of equipment being replaced for reuse, recycling or to be taken to an appropriate waste management facility ■ Equipment installation within the existing turbine shed using existing internal lifting equipment within the turbine hall, where possible. One 220 tonne mobile crane will be required for the once through cooler (OTC) attemperator install due to the height required and one 40 tonne mobile franna crane will be required to remove the old exhaust gas housing (EGH) and install the new one ■ Testing and commissioning of new equipment ■ Demobilisation of ancillary sites and maintenance personnel to facilitate the resumption of operations.
Upgrade (construction) timing	Construction of the proposal is anticipated to commence in April 2024 during the scheduled routine maintenance outage. The proposal is anticipated to take two months to complete.

Proposal	Summary
Upgrade (construction) hours	Construction activities would be undertaken during and outside of standard working hours. This would include work six days a week, with two shift a day of 12 hours each. No work would be undertaken on Sunday (works would conclude at 6am on Sunday mornings, with no work occurring during the day or at night on Sunday).
Upgrade (construction) workforce	Up to 150 (100 per day shift and 50 per night shift)
Upgrade (construction) parking	Parking would be possible in the existing power station car park located at the site of ancillary site 2 (refer to Figure 3-3).
Operation	
Operational and maintenance of the proposal	The operational strategy of the Tallawarra A power station would not change as a result of the proposal. Accordingly, no additional natural gas fuel would be used in the power station as a result of the upgrade. Average annual capacity factor (run-time) for the power station would be unchanged by the proposal, noting that there is currently annual variability in the power station capacity factor and this annual capacity factor variability would continue post-upgrade.



Site access

Proposal area

Tallawarra power station site boundary

Source: Aurecon, Spatial Services, Nearmap

1:6,000 @ A4

0 100 200m

Projection: GDA2020 MGA Zone 56

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Tallawarra A Power Station Upgrade

FIGURE 3-3: Site context

3.4 Proposal design

3.4.1 Upgrade activities

During the upgrade, the Tallawarra A power station would be undergoing a routine scheduled maintenance shut down and would therefore not be operational. Accordingly, there would not be any disruptions to the existing power station operations during the upgrade.

The Tallawarra B power station is currently being constructed adjacent to the Tallawarra A power station. Construction of the Tallawarra B power station is scheduled to be completed in late 2023. Tallawarra B power station commissioning and subsequent operations would not be disrupted during the upgrade.

The proposal is anticipated to take approximately two months to complete. Upgrade activities would be undertaken during and outside of standard working hours. This would include work six days a week, with two shifts a day of 12 hours each, including public holidays. No work would be undertaken on Sundays. Any works occurring at night would largely be undertaken inside the turbine hall.

Most of the activities that would occur during the upgrade would occur as part of a scheduled maintenance outage that would otherwise be undertaken, and which has already been assessed and approved under the existing consent from Wollongong City Council.

The upgrade would generally involve the following activities:

- establishment of ancillary sites (as is detailed in Table 3-2 below)
- equipment would be delivered to site during standard working hours by light and heavy vehicles
- no oversize overmass (OSOM) vehicles would be required for the proposal
- equipment removed from the power plant would be taken off site for reuse, recycling or to be taken to an appropriate waste management facility
- equipment would be installed within the existing turbine shed. Existing lifting equipment within the turbine hall would be used during the upgrade, where possible
- one 220 tonne crane will be required for the OTC attemperator install due to the height required and one 40 tonne mobile franna crane to replace the EGH
- new equipment would be tested and commissioned
- following construction, ancillary sites and maintenance personnel would be demobilised to facilitate the resumption of operations.

3.4.2 Ancillary sites

Ancillary sites would be required to assist with the operation of the proposal. Figure 3-3 shows the location of ancillary facilities within the proposal area, within the Tallawarra A power station boundary. The location and use of each ancillary facility are described in Table 3-2.

Table 3-2: Ancillary sites

Ancillary site	Description
Ancillary site 1	This site is located to the west of the power station. The proposal would utilise existing crib huts, existing office and adjoining existing hardstand areas for workers' facilities.
Ancillary site 2	This site is an existing car park located to the west of the power station. The proposal would utilise the existing car park for parking and for the storage of equipment not in use. The area is enclosed within a security fence and has a concrete base.

Ancillary site	Description
Ancillary site 3	This site is located to the east of the power station. The proposal would utilise this existing construction compound site primarily for the storage of equipment. This area is enclosed within a security fence and has a concrete base.
Ancillary site 4	This site is located to the east of the power station. The proposal would utilise this existing construction compound site primarily for the storage of equipment. This area is enclosed within a security fence and has a concrete base. See Figure 3-4.
Areas surrounding the power station	The proposal would utilise existing hardstand areas surrounding the Tallawarra A and Tallawarra B power stations during the upgrade as temporary laydown areas and work areas.

Figure 3-4: Ancillary site 4

3.5 Development stages

3.5.1 Construction

Construction program

Construction of the proposed upgrade is planned to commence in April 2024 during the routine scheduled maintenance shutdown of the Tallawarra A power station, following all required statutory approvals being secured. The upgrade works are anticipated to take approximately two months to complete.

The outage start date was selected as it falls within a period of lower energy market demand and therefore reduces the risk of disruption to energy security and high prices for NSW energy consumers. Lower energy market demand periods occur in Autumn and Spring ("shoulder" periods) and, with a 65-day outage required to complete the work, this results in a largely inflexible outage window for it to occur in the period of lower energy market demand. The outage schedules are planned well in advance so that other EnergyAustralia power stations, other energy market participants and the Australian Energy Market Operator (AEMO) can ensure that there are not too many generators offline for maintenance at once, which ensures energy market security and reduced risk of high prices for consumers. Any changes to the outage schedule may have an impact on energy security and prices as other outages have been planned around the current schedule.

Construction workforce

During construction, approximately 150 workers per day (100 per day shift and 50 per night shift) would be needed on site for the upgrade works. It is anticipated that the majority of the workforce would be a specialist workforce engaged by a specialist provider under a Long Term Service Agreement that EnergyAustralia holds with the equipment supplier. It is anticipated that all staff would be accommodated in the Wollongong area. These workforce numbers are typical of any routine scheduled maintenance outage at the power station under the current operations, meaning the proposal would not adjust the number of workers required at the power station for the upgrade compared to an already-approved maintenance outage.

Construction plant and equipment

Construction of the proposal is anticipated to require the use of hand tools, power tools and a forklift. Existing lifting equipment inside the turbine hall would be utilised, where possible. One 220 tonne mobile will be required for the OTC installation due to the height required and would be in use for approximately two days. One 40 tonne mobile franna crane would be required for to remove the old EGH and install the new one, and would be in use for approximately 12 days.

Construction traffic and access

The proposal would be accessed from the existing main Tallawarra A power station access security gate from Yallah Bay Road. Yallah Bay Road is a two-way road with one lane in each direction. Vehicles travelling to the power station would use the Princes Highway from the northbound direction to then access Yallah Bay Road. Yallah Bay Road and the Princes Highway would also be used for vehicles departing the power station to then travel north towards Wollongong or south towards Shellharbour. Site access is shown in Figure 3-3.

During construction, there would be a temporary increase in the number of vehicles accessing the site. This is anticipated to vary over the course of the construction period. A typical maintenance outage at the Tallawarra A power station requires around 150 additional staff. This would equate to 300 vehicle movements for these workers entering and leaving the site. In addition, 30 operational power staff are also anticipated to be on site during the upgrade. This would equate to 60 vehicle movements for these staff entering and leaving site. As such, the proposal would result in up to 360 light vehicle movements per day based on the maximum number of workers needed per day for the upgrade works.

Additionally, there would be a temporary increase in the number of heavy vehicles accessing the site which would be associated with the delivery of equipment needed for the proposal. It is anticipated that twelve heavy vehicle movements would be required for the proposal in addition to the light vehicle movements required for a typical maintenance outage. This would include six containers of equipment that would need to be transported to site from Port Botany and up to six container loads of equipment that would leave site following the upgrade. These containers would be transported by standard sized heavy vehicles, meaning OSOM vehicle movements would not be required.

3.5.2 Operation and maintenance

No change to the current operational strategy of the Tallawarra A power station is proposed as part of the proposal. The current Tallawarra A operational workforce is up to 30 people per day, resulting in approximately 60 light vehicle movements per day. There would be no change to the operational staffing requirements, or the skills of the people needed post-upgrade. Furthermore, it is expected that no additional natural gas fuel would be used annually in the power station following the upgrade.

The upgraded and more efficient equipment would be 'hydrogen capable' meaning the power station would be capable of using up to 35 per cent hydrogen by volume as a component of the fuel mix in the future. The proposal would not include any change to the approved power station fuel, however EnergyAustralia intends to consider the use of hydrogen as a component of the power station fuel for future operations. Any change to the power station fuel such as to incorporate the use of hydrogen would be subject to separate approval.

The proposal would reduce the frequency of future planned outages by reducing overall maintenance requirements and extending major outage intervals from five to eight years. Unplanned down-time would likely be reduced given the new equipment would be more reliable.

3.6 Post-approval environmental management

Should the proposal be approved, the Tallawarra A Project Execution Plan would address the environmental management requirements needing application during the upgrade activities.

During operation, the existing Tallawarra Environmental Management Plan (EMP) and associated management plans would continue to be used to manage operational environmental requirements.

4 Statutory context

This chapter identifies the relevant statutory context and requirements for the proposal, as well as other relevant environmental planning and statutory approval requirements as required by the proposal SEARs.

4.1 Commonwealth legislation

A summary of Commonwealth legislation and how it applies to the proposal is outlined in Table 4-1, while section 4.1.1 to section 4.1.3 provide further detail.

Table 4-1: Summary of Commonwealth legislation and application

Legislation	Consideration and Discussion	Relevance to the proposal
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Under the EPBC Act, a referral to the DEECCW is required for proposed 'actions' that have the potential to significantly impact on any Matter of National Environmental Significance (MNES) or the environment of Commonwealth land (including leased land).	Based on the available information it is considered unlikely that the proposal would result in significant impacts to MNES. No EPBC Act referral is being pursued. See section 4.1.1 for further detail.
Native Title Act 1993	The Native Title Act recognises and protects native title.	There is one active Native Title claim in the proposal area. See section 4.1.2 for further detail.
National Greenhouse and Energy Reporting Act 2007 (NGER Act)	Under section 19 of the NGER Act, corporations registered under Division 3 of Part 2 must provide a report to the regulator relating to greenhouse gas emissions, energy production and energy consumption. Additionally, under section 21 of the NGER Act, a registered corporation may provide a report to the regulator relating to the reduction of greenhouse gas emissions.	As a registered corporation under Division 3 of Part 2 of the NGER Act, EnergyAustralia must provide a report to the regulator relating to its greenhouse gas emissions. Additionally, given the proposal would result in a reduced amount of greenhouse gas emissions per unit of electricity produced at the Tallawarra A power station, EnergyAustralia may provide a report to the regulator detailing this greenhouse gas project. Further details can be found in section 4.1.3.

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth Government's primary environmental protection and biodiversity conservation legislation. It sets out requirements for natural resource and environmental management in Australia, and provides for the listing of threatened species, threatened ecological communities and key threatening processes.

A proposal must be referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act if it has, or is likely to have, a significant impact on one or more Matters of National Environmental Significance (MNES). Following the submission of a referral under the EPBC Act, the Federal Minister for Environment has 20 business days to determine if the proposed action triggers the matters protected by the EPBC Act and requires further assessment and approval. The Minister will make one of the three below decisions following the 20 business days:

- Not controlled action – The Minister or delegate decides that approval is not required if the action is taken in accordance with the referral; Consequently, the action can proceed (subject to any State, Territory or local government requirements). Should the Minister make this decision, no further assessment is required under the EPBC Act.
- Not controlled action – 'particular manner' – The Minister or delegate may decide that approval is not required if the proposed action is undertaken in a manner specified in the decision. Deviation from the 'particular manner' specified in the decision may require a further referral.

- Controlled action – If the proposed action is likely to be significant, it is called a 'controlled action' and is subject to one of the assessment pathways specified under the EPBC Act (or a State assessment pathway agreed under a bilateral), and subsequent approval or refusal under the Act.

Given the limited scope of the proposal and following the review of the results of a Protected Matters Search Tool Report (DAWE 2021) and a desktop assessment of the proposal area, it was concluded that no MNES would be impacted by the proposal. Therefore, a referral to the Commonwealth DCCEEW is not required.

4.1.2 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. Section 8 of the Act states that it is not intended to affect the operation of any law of a State or a Territory that is capable of operating concurrently with the Act. Native title cannot be claimed on freehold land, as it is extinguished over the area. However, protection is required on freehold land under State and federal legislation for the protection of sacred sites.

A search of the registers maintained by the National Native Title Tribunal indicate there is one active native title claim in the project area. Details of this claim are outlined in Table 4-2.

Table 4-2: Native Title claim

Name	NNTT file no	Federal Court file no	Date field	Application status
South Coast People	NC2017/003	NSD1331/2017	31/01/2018	Active

4.1.3 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) was introduced to create a single national reporting framework for the reporting and dissemination of information related to greenhouse gas emissions**,** greenhouse gas projects**,** energy consumption and energy production of corporations. This was done to inform energy policy formulation, to fulfil Australia's international reporting obligations, to assist Commonwealth, State and territory programs and activities, and to avoid the duplication of similar reporting requirements in states and territories.

The NGER Act, its regulations and associated legislation applies to facilities that emit more than 25,000 tCO2-e per year or consume or produce more than 100 TJ of energy per year. Under section 19 of the NGER Act, corporations registered under Division 3 of Part 2 must provide a report to the regulator relating to greenhouse gas emissions, energy production and energy consumption. Corporations registered under Division 3 of Part 2 refers to those corporations and individuals listed on the National Greenhouse and Energy Register.

EnergyAustralia Holdings Ltd is listed for the 2021-22 reporting year on the register, meaning it is obligated to provide a report to the regulator relating to the greenhouse gas emissions and energy production and consumption of the Tallawarra A power station.

Additionally, under section 21 of the NGER Act, a registered corporation may provide a report to the regulator relating to the reduction of greenhouse gas emissions from a greenhouse gas project. Under the NGER Act, a greenhouse gas project is any activity which is designed to remove or reduce the emission of greenhouse gases. As such, the reduced emissions per unit of electricity produced at the Tallawarra A power station as a result of the proposal could meet the definition of a greenhouse gas project, meaning EnergyAustralia would have the opportunity to provide a report to the regulator relating to these emissions reductions.

4.2 NSW planning and environmental instruments

A summary of the NSW framework and instruments and how they apply to the proposal is outlined in Table 4-3, with further detail provided in the subsequent sections.

Table 4-3: Summary of NSW instruments

Legislation	Consideration and Discussion	Relevance to the proposal
Environmental Planning and Assessment Act 1979	The EP&A Act defines the statutory framework for planning approval and environmental assessment in NSW.	Approval for the proposal is sought under Part 4 of the EP&A Act which includes provisions relating to State Significant Development
Environmental Planning and Assessment Regulation 2000	Primary piece of legislation that regulates land use planning and development assessment in NSW and supports the EP&A Act.	This EIS must be prepared in accordance with the SEARs and the requirements of Schedule 2 of the EP&A Regulation. Furthermore, the proposal would have to meet the principles of ecologically sustainable development (ESD) under clause 193 of the EP&A Regulation.
State Environmental Planning Policy (Transport and Infrastructure) 2021	This SEPP contains planning provisions for infrastructure in NSW	Development for the purpose of electricity generating works may be carried with consent on any land in a prescribed rural, industrial or special use zone. As the proposal area is zoned 'SP2 – Electricity generating work' under the Wollongong Local Environment Plan 2009, it is permissible with consent.
State Environmental Planning Policy (Planning Systems) 2021	This SEPP identifies developments that are SSD.	The proposal has an estimated capital investment value of approximately $39 million and is accordingly State Significant Development for the purposes of the Act. In accordance with section 4.12(8) of the EP&A Act, the application is therefore required to be accompanied by an EIS that meets the requirements of Part 8, Division 5 of the EP&A Regulation and any other relevant legislative requirements that relate to the EIS.

4.2.1 Environmental Planning and Assessment Act 1979 and Environmental Planning and Assessment Regulation 2021

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Environmental Planning and Assessment Regulation 2000 (the EP&A Regulation) provide the framework for land use planning and development control in NSW. The EP&A Act and EP&A Regulation are supported by a number of environmental planning instruments (EPIs), which include State Environmental Planning Policies (SEPPs) and Local Environment Plans (LEPs), which are described in the following sections.

Part 4 of the EP&A Act establishes the framework for assessing development that is permissible with consent. Section 4.36 of the EP&A Act includes the following:

1. *For the purposes of this Act, State significant development is development that is declared under this section to be State significant development.*
2. *A State environmental planning policy may declare any development, or any class or description of development, to be State significant development.*

In accordance with the above the following sections consider the relevant SEPPs.

4.2.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) aims to facilitate the effective delivery of infrastructure across the State.

Division 4 Clause 2.35 of the Transport and Infrastructure SEPP defines electricity generating works as development including the following:

(a) making or generating electricity,

(b) electricity storage.

Division 4 Clause 2.36 goes on to describe the following for development permitted with consent:

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

b. in any other case – any land in a prescribed non-residential zone.

4.2.3 State Environmental Planning Policy (Planning Systems) 2021

Clause 2.6(1) of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP) notes:

1. *Development is declared to be State significant development for the purposes of the Act if*
    a. *the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and*
    b. *the development is specified in Schedule 1 or 2.*

The proposal is specified in Schedule 1 (Clause 20) of the Planning Systems SEPP in that it is:

Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that-

a) has a capital investment value of more than $30 million, or

b) has a capital investment value of more than $10 million and is located in an environmentally sensitive area of State significance

The proposal has an estimated capital investment value of approximately $39 million and is accordingly SSD for the purposes of the Act.

In accordance with section 4.12(8) of the EP&A Act, the application is therefore required to be accompanied by an EIS that meets the requirements of Part 8, Division 5 of the EP&A Regulation and any other relevant legislative requirements that relate to the EIS.

4.3 Relevant Local Environment Policy

4.3.1 Wollongong Local Environment Plan 2009

The proposal meets the definition of 'electricity generating works' under the Wollongong Local Environmental Plan (LEP) 2009 (Wollongong LEP). These works are defined as:

"a building or place used for the purpose of—

- *Making or generating electricity, or*
- *Electricity storage."*

The proposal would be located on Lot 1092 DP1140369. The proposal would be undertaken within the Wollongong LGA on land zoned SP2 – Electricity generating works, under the Wollongong LEP 2009.

4.3.2 Wollongong Development Control Plan

The Wollongong Development Control Plan (DCP) was originally adopted by Wollongong City Council on the 15th December 2009 and came into effect on 3rd March 2010. The DCP provides detailed planning and design guidelines to support the planning controls in the Wollongong LEP.

The objectives of this DCP are:

- to provide detailed development controls within a single document which support the LEP
- to ensure appropriate information is submitted with Development Applications
- to ensure development conforms with the principles of Ecologically Sustainable Development
- to ensure that development contributes to the quality of the natural and built environments
- to encourage development that contributes to the quality of the public domain
- to ensure future development responds positively to the qualities of the site and the character of the surrounding locality
- to encourage the provision of development that is accessible and adaptable to meet the existing and future needs of all residents, including people with a disability
- to ensure development is of a high design standard and energy efficient
- to ensure new development is consistent with the desired future character for the area
- to ensure the threat of bushfire is assessed
- to protect areas of high scenic and aesthetic value
- to ensure new development contributes to safe and liveable environments.

The proposal would contribute to a number of the aims of the Wollongong DCP. The proposal would occur entirely within the existing footprint of the Tallawarra A power station, meaning the qualities of the site and the character of the surrounding locality would not be altered. Additionally, given the proposal would occur during a scheduled power station upgrade and would result in improved energy efficiency for the power station, the development would be energy efficient and would be to a high design standard. The proposal would also contribute to safe and liveable environments through the continued provision of reliable electricity to thousands of homes and businesses.

4.4 Other Relevant Legislation

4.4.1 Other legislation

Other environmental legislation and regulations that may be applicable to SSD projects are identified in Table 4-4.

Table 4-4: Summary of Other Applicable Legislation

Legislation	Requirement
Biodiversity Conservation Act 2016	The *Biodiversity Conservation Act 2016* (BC Act) seeks to conserve biological diversity, promote ecologically sustainable development (ESD), prevent extinction, promote the recovery of threatened species, populations and ecological communities and to protect areas of outstanding biodiversity value. A Biodiversity Development Assessment Report (BDAR) waiver was submitted on 25th July 2023. The BDAR waiver request has been accepted and approved for the proposal. Therefore, a BDAR is not required for the proposal. Refer to section 6.7.2 and Appendix F for further information.
Fisheries Management Act 1994	The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. Although Lake Illawarra is mapped as Key Fish Habitat, no aspects of the proposal are expected to trigger requirements under the FM Act.
Water Management Act 2000	The *Water Management Act 2000* (WM Act) aims to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. The WM Act is based on the principles of ESD, aiming to ensure the fundamental health of rivers, groundwater systems and associated wetlands, floodplains and estuaries are protected. No aspects of the proposal are expected to trigger requirements under the WM Act.
Contaminated Land Management Act 1997	The *Contaminated Land Management Act 1997* (CLM Act) outlines the circumstances in which notification of the NSW Environment Protection Authority (EPA) is required in relation to the contamination of land. No aspects of the proposal are expected to trigger requirements under the CLM Act.
Heritage Act 1977	The *Heritage Act 1977* (Heritage Act) is concerned with all aspects of conservation ranging from the most basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement. Matters protected under the Heritage Act include items listed on the State Heritage Register, the heritage schedules of local council LEPs, and the conservation registers (or section 170 Registers) of NSW State government agencies, as well as items subject to an Interim Heritage Order. No aspects of the proposal are expected to trigger requirements under the Heritage Act.
Protection of the Environment Operations Act 1997	The *Protection of the Environment Operations Act 1997* (POEO Act) aims to protect, restore and enhance the environment in NSW and to promote public access to information and involvement in environment protection. The proposal would be subject to compliance with the existing EPL for Tallawarra A power station (EPL 555).
National Parks and Wildlife Act 1974	The *National Parks and Wildlife Act 1974* (NP&W Act) provides for the management and conservation of land declared as national parks and conservation areas, as well as regulating the management of Aboriginal cultural heritage objects. No part of the proposal falls within land reserved under the *National Parks and Wildlife Act 1974* or NSW National Parks owned or managed lands. There are no known Aboriginal heritage items within the proposal area, meaning the NP&W Act is not applicable to the proposal.

Legislation	Requirement
Biosecurity Act 2015	The *Biosecurity Act 2015* (Biosecurity Act) manages biosecurity risks in Australia. The Biosecurity Act aims to protect natural resources from the adverse impact of pests, disease, weeds and contaminants on agricultural land, parks and reserves. Given the proposal would occur within the existing footprint of the Tallawarra A power station and no biosecurity risks are anticipated, this legislation is not applicable to the proposal.
Rural Fires Act 1997	The *Rural Fires Act 1997* (Rural Fires Act) regulates the suppression and management of bushfires. The Rural Fires Act details duties and requirements regarding the NSW Rural Fire Service (NSW RFS), Neighbourhood Safer Places, Fire Trails, and Bush Fire Prevention. The proposal would be consistent with existing operations and therefore provisions of the Rural Fires Act are unlikely to be triggered.
Waste Avoidance and Resource Recovery Act 2001	The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) was established to promote waste avoidance and resource recovery. The Act encourages the most efficient use of resources in order to reduce environmental harm. Waste management and resource use for the proposal would be carried out in accordance with the WARR Act.

4.5 Existing Tallawarra A approval

Operation of the Tallawarra A power station is currently authorised under development consent number 98/784 granted by Wollongong City Council under the EP&A Act on 2nd July 1999. The proposal would not require the existing Wollongong City Council consent to be surrendered. Upon completion of the upgrade, the operation of the power station would continue in accordance with the existing Wollongong City Council consent and in accordance with any additional requirements associated with this SSD.

4.6 Environmental protection licence

EnergyAustralia also holds an existing EPL for the Tallawarra A power station (EPL 555) issued under the POEO Act. The operation of the Tallawarra A power station post approval would continue to be licenced under EPL 555. The proposal is not expected to require or trigger any modification of EPL 555.

4.7 Summary and permissibility

The proposal meets the definition of 'electricity generating works' under the Wollongong LEP 2009, which are defined as:

"a building or place used for the purpose of—

- *making or generating electricity, or*
- *electricity storage."*

The proposal is located on land zoned SP2 (electricity generating works) under the Wollongong LEP 2009, which is defined in Division 4 Clause 2.36 of the Transport and Infrastructure SEPP (2021) as permissible with development consent.

The proposal is specified in Schedule 1 (Clause 20) of the Planning Systems SEPP as it would have a capital investment of more than $30 million and is accordingly State Significant Development. Therefore, in accordance with section 4.12(8) of the EP&A Act, the application is required to be accompanied by an EIS that meets the requirements of Part 8, Division 5 of the EP&A Regulation and any other relevant legislative requirements that relate to the EIS.

The proposal is permissible with consent in accordance with both the Transport and Infrastructure SEPP and the Wollongong LEP 2009.

5 Consultation and engagement

5.1 Consultation requirements

Table 5-1 lists the SEARs relevant to consultation and engagement, including where the requirements have been addressed in this EIS.

Table 5-1: SEARs related to consultation and engagement

General requirements	Where addressed
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.	Consultation undertaken prior to and during the preparation of this EIS is outlined in this chapter. Section 5.3 includes information relating to government consultation carried out and section 5.4 includes community and service provider consultation information.
The EIS must detail the engagement undertaken and demonstrate how it was consistent with the *Undertaking Engagement Guidelines for State Significant Projects*. The EIS must detail how issues raised and feedback provided have been considered and responded to in the project.	Section 5.2 outlines the objectives of the consultation carried out for the proposal, including the alignment of the consultation with the *Undertaking Engagement Guidelines for State Significant Projects* (DPE, 2022a). Sections 5.3 and 5.4 outline the consultation carried out with government and community stakeholders. No issues have been raised during the consultation to date; however consultation would continue during the EIS display period and during scheduled maintenance outage (construction) period.

5.2 Consultation overview

The overriding objectives of the proposal's consultation and engagement approach are to:

- provide timely information regarding the proposal, channels for providing feedback and the approvals pathway to interested and impacted parties
- build on existing relationships with stakeholders in the area
- encourage active stakeholder participation and facilitate feedback / inputs on the proposal
- demonstrate how community and stakeholder issues and feedback are being captured and used to inform proposal development and assessment.

The consultation carried out throughout the development of this EIS is outlined in the following sections. Consultation has been undertaken in accordance with the *Undertaking Engagement Guidelines for State Significant Projects* (DPE, 2022a). The alignment of consultation with these guidelines is included in Table 5-2.

Table 5-2: Alignment with the Undertaking Engagement Guidelines for State Significant Projects

Guidance	Alignment
Plan early	Early planning for consultation was carried out during the scoping phase of the proposal. Affected parties, including communities and government agencies, were identified and the level of consultation required was determined during this phase.
Engage as early as possible	Engagement with community and government began during the scoping phase. Consultation during the scoping phase included discussions with Wollongong City Council, Shellharbour City Council, NSW EPA, Department of Regional NSW, NSW DPE and the Office of Energy and Climate Change to understand support for or issues with the proposal, and to discuss the appropriate approval pathway. Scoping phase consultation has informed consultation undertaken during the development of the EIS.

Guidance	Alignment
Ensure engagement is effective	Engagement throughout the development of this EIS has been carried out in an effective way that has ensured affected parties have been kept informed and have been able to participate in the proposal development process. This has included the use of council meetings and the community liaison group for the Tallawarra A power station as established forums for community and government participation, as is outlined in sections 5.3 and 5.4.
Ensure engagement is proportionate to the scale and impact of the project	Given the upgrade of the Tallawarra A power station would be carried out during a scheduled maintenance period for the power station, and there would be no material change to total CO_2 and NO_x emissions as a result of the proposal, consultation has been limited to consulting with existing interested parties in the power station operations, including the community liaison group and government agencies. No extensive consultation with local residents has been carried out given it is anticipated that impacts to surrounding communities would be minimal.
Be innovative	Consultation for the proposal has utilised a variety of channels to communicate the features and anticipated minimal impacts of the proposal to all affected stakeholders. This has included meetings with government agencies and community members, as well as the use of digital materials such as fact sheets and other website publications. The level of consultation and the channels through which this has been undertaken have been deemed appropriate for the scale and impacts of the proposal.
Be open and transparent about what can be influenced	Given the proposal would occur entirely within the existing footprint of the Tallawarra A power station and is being carried out during a routine maintenance of the power station, there is limited scope for the community or government to influence the design, positioning or operations of the proposal. Consultation during the scoping and EIS development phases has been focused on informing the community and government of the development approval pathway and the anticipated minimal impacts of the proposal.
Implement the community participation objectives	The community participation objectives, as outlined in section 3.7 of the *Undertaking Engagement Guidelines for State Significant Projects*, have been adhered to throughout the consultation process. These have informed the overarching objectives of the proposal's consultation, as outlined in this section.

5.3 Government agency and stakeholder involvement

Table 5-3 outlines the consultation undertaken with various government agencies and stakeholders, including the outcomes of this consultation.

Table 5-3: Government agency and stakeholder consultation

Stakeholder	Date	Outcome
NSW Government	Prior to EIS Development Former Planning Minister's office 6th February 2023 Energy Minister 24th August 2023 Member for Shellharbour 24th August 2023 Member for Kiama 22nd June 2023	During the development of this EIS, EnergyAustralia has consulted with the NSW DPE through formal meetings with the former Planning Minister (in the previous Liberal/National Government) and the Energy Minister to discuss the proposal and its anticipated impacts. EnergyAustralia has also briefed local MPs on the project with the most recent briefing date recorded.
NSW DPE	During EIS development Formal meetings on: 7th November 2022, 6th July 2023, 5th October 2023	During the development of this EIS, EnergyAustralia has consulted with the NSW DPE through a number of formal meetings and informal conversations.

Stakeholder	Date	Outcome
NSW EPA	12th April 2023, 11th May 2023	The NSW EPA has been briefed on the proposal via a consultation meeting (online) and during an EPA visit to the Tallawarra A power station site. EPA provided no specific guidance during these briefings and provided no objection to any aspect of the proposal.
Wollongong City Council	Throughout scoping phase and during EIS development Formal meetings on: 21st March 2023, 30th March 2023	This consultation involved discussions around planning approval pathways, where Wollongong City Council advised their preferred option of the State Significant Development pathway. Through the EIS development phase, Wollongong City Council advised that no further consultation was required, but indicated that Council feedback may be provided during the public exhibition phase of the EIS.
Shellharbour City Council	15th August 2023	A meeting was held between EnergyAustralia and local councillors. No issues were raised about the proposal, however further information was requested about impacts to the plume rise from the Tallawarra A power station after the upgrade. This information can be found in section 6.5.4.
NSW Health	18th October 2023	Consultation with NSW Health was carried out on 18th October 2023. No concerns were raised about the proposal by NSW Health representatives.

5.4 Community involvement

EnergyAustralia hosts a Community Liaison Group (CLG) for the existing operations of the Tallawarra A power station. The CLG was established as the principal community liaison group for the Tallawarra A power station and Tallawarra B Project. The CLG has been designed to inform interested members of the local community about the proposal, the existing Tallawarra A power station operations and environmental performance matters. Regular updates are provided at the CLG meetings regarding all aspects of both the site operations and the proposal. CLG meetings are held quarterly at the Tallawarra power station offices and are independently chaired. The CLG includes members from the community and stakeholders such as:

- the amateur radio club
- local bird watching societies
- NSW EPA
- local high schools
- the local aboriginal land council
- Illawarra National Parks Association
- representatives from both Shellharbour and Wollongong City Councils.

A meeting was held 30th August 2023 with the CLG, during which EnergyAustralia provided a summary of the current operations of Tallawarra A power station as well as an update on key information for the upgrade. No issues or objections were raised about the proposal at the meeting. Additional consultation meetings with the CLG would be scheduled for early 2024.

Additional community consultation carried out for the proposal includes:

- EnergyAustralia's July 2023 community newsletter, which included information about the Tallawarra A upgrade in addition to the Tallawarra B project. A further newsletter is planned to coincide with the EIS being placed on public exhibition and will include details on where people can view the EIS and to advertise any consultation activities.
- proposal information published on EnergyAustralia's website (**Tallawarra A High Efficiency Upgrade | EnergyAustralia**)
- Tallawarra A High Efficiency Upgrade fact sheets – **Upgrade Factsheet** and **SSD Factsheet**.

5.5 Ongoing or future consultation

In accordance with the EP&A Act and the SSD approval pathway, the EIS would be placed on public exhibition for a minimum of 30 days. At the appropriate time there would be public advertisements as required to inform interested parties of the public exhibition, indicating where people can view the EIS and to advertise any consultation activities.

EnergyAustralia intends to host a community information drop-in session with dates and times to be confirmed following the EIS being placed on public exhibition.

Ongoing consultation would be carried out with the CLG, with the next meeting scheduled for early 2024. EnergyAustralia would continue to engage with the CLG members via the CLG chair. This engagement would include information on where people can view the EIS and to advertise any consultation activities.

A Community Liaison Management Plan has been prepared by EnergyAustralia to guide ongoing consultation with the community and other stakeholders throughout the upgrade and during the operation of the upgraded power station.

6 Assessment of impacts

This section outlines the anticipated impacts of the proposal. The construction and operational impacts as a result of the proposal have been considered, as well as the cumulative impacts of the proposal alongside other nearby projects in accordance with the SEARs and the SSD EIS guidelines.

Table 6-1 outlines the terminology used to categorise the environmental impacts of the proposal throughout this section. Terminology relates to the magnitude and duration of impacts.

Table 6-1: Impact categorisation

Impact	Category	Definition
Magnitude	No impact	The proposal would have no impact
	Negligible	The proposal would have very small and insignificant impacts
	Minor	The proposal would have small adverse impacts that could be minimised with appropriate safeguards
	Moderate	The proposal would have adverse impacts that could be minimised with appropriate safeguards
	Major	The proposal would have large and potentially irreversible impacts
Duration	Temporary	During construction or within one year of the completion of construction
	Short-term	One to five years after the completion of construction
	Long-term	Over five years after the completion of construction

6.1 Air quality

6.1.1 SEARs

The SEARs relevant to air quality impacts and where the requirements have been addressed in this EIS are outlined in Table 6-2.

Table 6-2: SEARs – Air Quality

General requirements	Where addressed
An assessment of any potential changes to the air emissions as a result of the construction and operation of the project in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022, or latest version).	Section 6.1.2 notes that the assessment of air quality impacts as a result of the proposal was carried out in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022). Section 6.1.4 outlines the potential changes to air emissions during construction from construction vehicles and commissioning of the new equipment, and during operation as a result of the recommencement of power station operations.
An assessment of the ability of the project 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 air quality assessment was conducted for the proposal and is included in Appendix B. The assessment included the findings of the proposals' compliance with the relevant regulatory framework. Findings of the assessment are outlined in section 6.1.4.

6.1.2 Methodology

An air quality impact assessment was prepared by Katestone Environmental Pty Ltd (Katestone, 2023a), in accordance with the updated *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*

(approved methods) (EPA, 2022), to determine the construction, operational and cumulative impacts of the proposal on air quality within the area. The assessment included:

- analysis of the existing environment to identify characteristics with the potential to influence the level of air pollutants at sensitive receivers
- analysis of the potential operational emissions of nitrogen oxides (NO_2), fine particles (PM_{10} and $PM_{2.5}$) and sulphur oxides (SO_x assumed to be 100% SO_2), as well as cumulative impacts associated with the operation of the Tallawarra B power station
- modelling of data for wind speed and direction from the Bureau of Meteorology (BoM) and the NSW DPE monitoring stations
- dispersion modelling to predict ground-level concentrations of NO_2, SO_2, PM_{10} and $PM_{2.5}$ for both Tallawarra A and Tallawarra B power stations
- screening assessment of the potential for the proposal to increase ozone formation.

Further details of the air quality impact assessment methodology are shown in Appendix B.

6.1.3 Existing environment

The proposal is located on the western bank of Lake Illawarra. The urban areas of Wollongong, Port Kembla, Shellharbour, and Albion Park are located to the northeast, east, southeast and south of the proposal respectively.

EPL 555 specifies a NO_x concentration limit of 25ppm from the stack for Tallawarra A power station. Current emissions from the operation of Tallawarra A power station are under this level. The EPL also specifies a total annual NO_x load limit of 900 tonnes per annum. This total load limit is a cumulative limit from both Tallawarra A power station and Tallawarra B power station. Compliance with this load limit has been achieved for every year of operation of the Tallawarra A power station.

Existing sources of air emissions within 20 km of the proposal include manufacturing, wastewater treatment, and mining. The other major source of emissions within the region are vehicles using the local road network. An analysis of the ambient air quality in the proposal was undertaken and considered data from the Albion Park South, Kembla Grange, and Wollongong DPE operated air quality monitoring stations. The locations of these monitoring stations are shown in Figure 6-1.

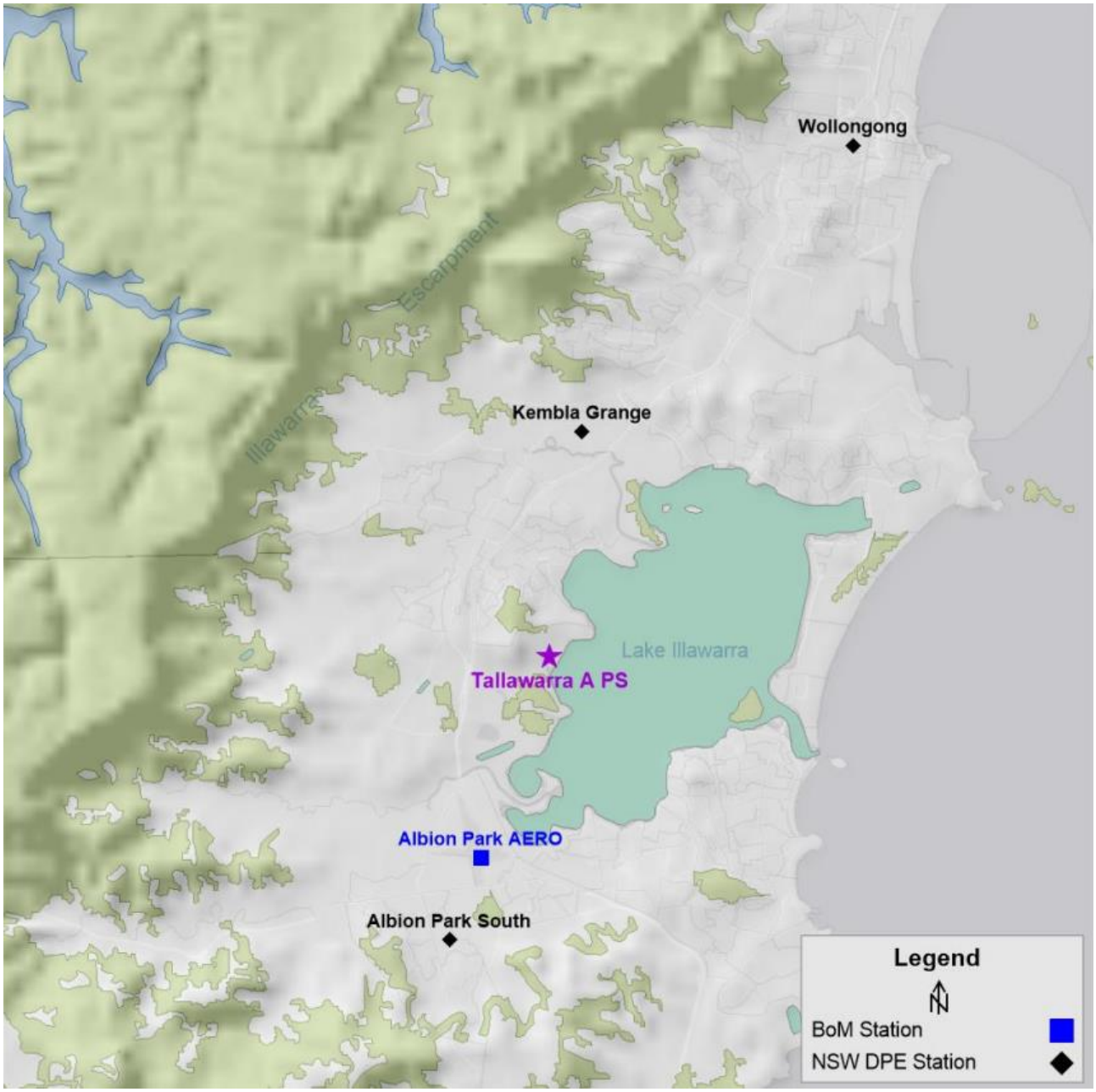

Figure 6-1: Nearby air quality monitoring stations (Katestone, 2023a)

Ambient concentrations of air pollutants NO_2, PM_{10}, $PM_{2.5}$, SO_2 and O_3 were identified between 2018 and 2022 in accordance with the approved methods. The impact assessment criteria used in accordance with the approved methods are shown in Table 6-3.

Table 6-3: Air quality criteria (Approved Methods, 2022)

Pollutant	Averaging period	Criteria (ug/m^3)
NO_2	1-hour	164
NO_2	Annual	31
PM_{10}	24-hour	50
PM_{10}	Annual	25
$PM_{2.5}$	24-hour	25
$PM_{2.5}$	Annual	8
SO_2	1-hour	286
SO_2	24-hour	57

Pollutant	Averaging period	Criteria (ug/m^3)
Photochemical oxidants (as O_3)	1-hour	214
Photochemical oxidants (as O_3)	4-hour	171

Analysis of ambient concentrations of air pollutants demonstrates the following outcomes:

- maximum 1-hour average and annual average concentrations of NO_2 were below the criteria for all sites in all years
- maximum 24-hour average concentrations of PM_{10} were recorded above the criteria by between one day and 21 days on individual years for several surrounding air quality monitoring stations including Albion Park South, Kembla Grange, and Wollongong
- annual average concentrations of PM_{10} were below the criteria for all sites and all years except Kembla Grange in 2019
- maximum 24-hour concentrations of $PM_{2.5}$ were above the criteria by between one day and 14 days for Albion Park South and Wollongong in 2018, and for all sites in 2019 and 2020
- annual average concentrations of $PM_{2.5}$ were below the criteria for all sites in years 2018 and 2020-2022. In 2019, all sites were above the criteria
- SO_2 1-hour and 24-hour averages were below the criteria for all sites in all years
- the 8-hour average concentration of O_3 was recorded above the criteria between one and 10 times on individual years at each of the sites.

The annual load of emissions to air from the Tallawarra A power station is variable, based largely on the capacity factor of the power station, which is the number of hours that the power station is operational in any given year expressed as a percentage. Over the last five years, the average capacity factor of the power station has been 30%.

The Tallawarra A power station variability in capacity factor, and accordingly variability in total annual emissions is demonstrated in Figure 6-2, which shows the annual NO_x, SO_x and PM_{10} emission loads from the power station over the last 10 years.

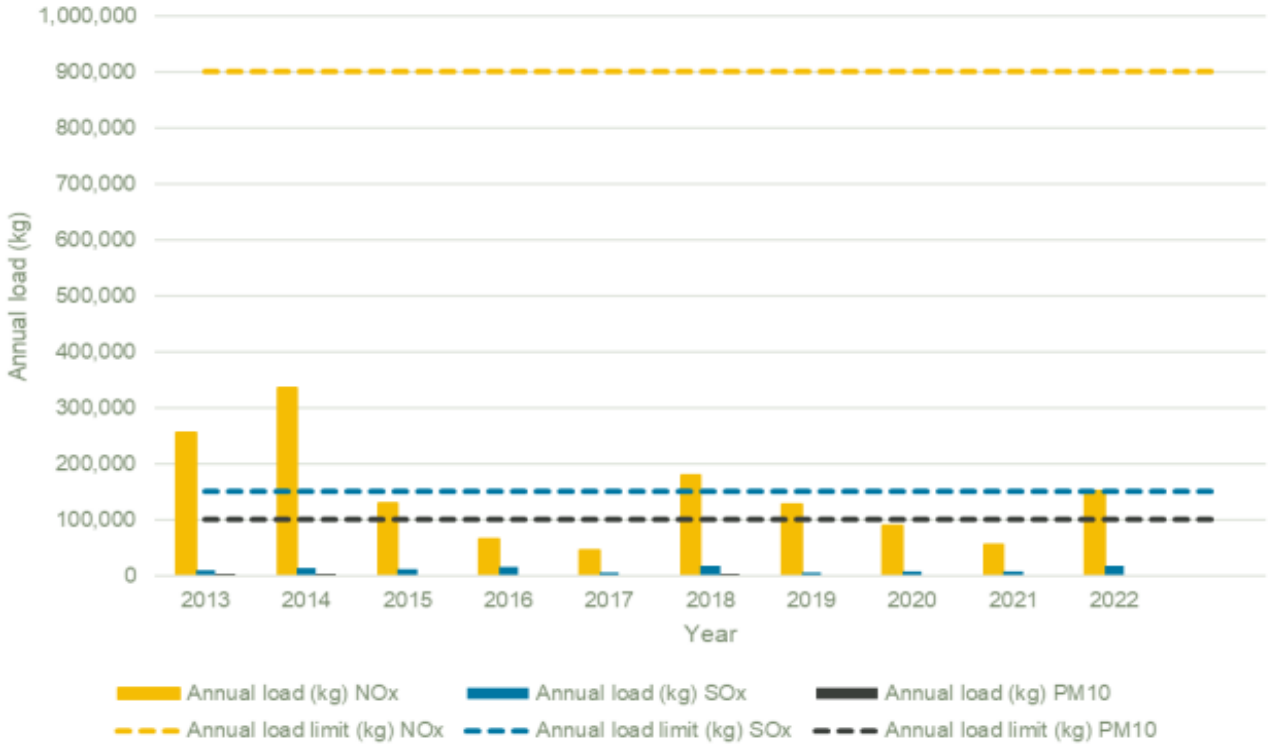

Figure 6-2: Tallawarra A power station annual emission loads

6.1.4 Impacts

Construction

During the upgrade, the proposal would contribute negligible emissions to air from delivery vehicles and from other fixed and mobile plant and equipment. Emissions from construction and delivery vehicles would be temporary, stopping with the completion of the upgrade. Emissions and dust control measures appropriate to the activities proposed would be implemented during the upgrade to minimise any potential impacts, including covering loads during transportation and switching off plant and equipment when not in use.

Commissioning of the new equipment installed as part of the proposal would require testing and optimisation. During commissioning of the new equipment, the power station would generate combustion emissions. These emissions would be consistent with the testing and optimisation period that follows all routine maintenance outages.

The overall construction air quality impacts of the proposal are anticipated to be temporary and negligible.

Operation

The proposal would alter the air emissions profile of the power station. Change in the air emissions profile can be expressed on an emission concentration basis from the Tallawarra A stack or at nearby sensitive receivers, on a total annual emission load basis, or on a cumulative emissions load basis.

The proposal is likely to result in slightly higher concentrations of stack emissions of air pollutants after the upgrade:

- NO_x stack emissions would increase from 28.1 g/s pre-upgrade to 28.6 g/s post-upgrade
- PM_{10} (and $PM_{2.5}$) stack emissions would increase from 5.5 g/s pre-upgrade to 5.6 g/s post-upgrade
- SO_x stack emissions would increase from 4.7 g/s pre-upgrade to 4.8 g/s post-upgrade.

These increased air pollutant emission rates would be associated with a higher generation of electricity. Accordingly, the overall emissions intensity of NO_x, PM_{10} (and $PM_{2.5}$) and SO_x per unit of electricity generated would be negligible. Given the proposal would not change the planned capacity factor (power station run-time), the total load of NO_x, PM_{10} (and $PM_{2.5}$) and SO_x is predicted to be unchanged compared to current operations.

The temperature and exhaust velocity of gases discharged from the stack of the Tallawarra A power station would reduce as a result of the upgrade. The resulting reduced buoyancy of the emissions plume would change the dispersion characteristics of air pollutants and would result in minor ground-level pollutant concentration changes at some sensitive receivers. Modelling of emissions from the Tallawarra A power station in isolation both pre- and post-upgrade demonstrated that these changes in concentrations as a result of the upgrade would be insignificant.

A comparison of emissions from the power station pre- and post-upgrade are shown Table 6-4. Contributions to annual average concentrations of NO_x, SO_2 and particulate matter, maximum 1-hour average concentrations of SO_2 and maximum 24-hour average concentrations of particulate matter are extremely small with or without the upgrade. Contributions to maximum 1-hour average NO_x concentrations are larger, however the assessment found that while the spatial footprint of the impacts of Tallawarra A power station shifts with the upgrade, any change as a result of the upgrade is insignificant.

Table 6-4: Comparison of NO_x, SO_2 and PM_{10} concentrations at receiver pre- and post-upgrade

Sensitive receptor	NO_x (ug/m^3)				SO_2 (ug/m^3)				PM_{10} (ug/m^3)			
	1 hr max		Annual average		1 hr max		24 hr max		24 hr max		Annual average	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
SE Dapto	15.1	19.2	0.1	0.1	2.5	3.2	0.4	0.6	0.5	0.7	<0.1	<0.1
South Dapto	69.9	71.3	0.3	0.3	11.7	11.9	1.1	1.3	1.3	1.5	0.1	0.1
Avondale	23.4	30.8	0.2	0.2	3.9	5.1	0.7	0.7	0.8	0.8	<0.1	<0.1
Yallah	21.3	35.0	0.3	0.4	3.5	5.8	0.6	0.7	0.7	0.8	0.1	0.1
Oak Flats	14.0	15.6	0.1	0.1	2.3	2.6	0.3	0.4	0.3	0.4	<0.1	<0.1
Mt Warrigal	25.0	30.3	0.1	0.1	4.2	5.1	0.8	1.0	1.0	1.2	<0.1	<0.1
Windang	17.6	21.9	0.2	0.3	2.9	3.7	1.2	1.3	1.4	1.5	<0.1	0.1
Barrack Heights	11.5	14.4	0.1	0.1	1.9	2.4	0.4	0.5	0.5	0.5	<0.1	<0.1
Primbee	16.0	19.2	0.2	0.3	2.7	3.2	1.4	1.5	1.6	1.7	<0.1	<0.1
Pt Kembla	10.6	12.1	0.1	0.1	1.8	2.0	0.4	0.5	0.5	0.6	<0.1	<0.1
Dapto	29	29.7	0.2	0.2	4.8	5.0	0.7	0.7	0.8	0.9	<0.1	<0.1
Horsley	22.5	23.8	0.2	0.2	3.8	4.0	0.7	0.7	0.8	0.9	<0.1	<0.1
Berkeley	12.4	18.8	0.1	0.1	2.1	3.1	0.4	0.5	0.5	0.6	<0.1	<0.1
Lake Heights	11.4	13.1	0.1	0.1	1.9	2.2	0.4	0.4	0.5	0.5	<0.1	<0.1
Unanderra	7.9	8.8	0.1	0.1	1.3	1.5	0.4	0.4	0.4	0.5	<0.1	<0.1
Wollongong	6.5	7.2	0.1	0.1	1.1	1.2	0.3	0.3	0.3	0.3	<0.1	<0.1
Shellharbour	11.1	12.2	0.1	0.1	1.8	2	0.6	0.6	0.6	0.7	<0.1	<0.1
Albion Park	18.0	16.6	0.1	0.1	3.0	2.8	0.2	0.3	0.3	0.4	<0.1	<0.1
Haywards Bay	17.5	36.7	0.1	0.2	2.9	6.1	0.3	0.4	0.4	0.5	<0.1	<0.1
Max on Domain	**70.6**	**71.5**	**0.5**	**0.6**	**11.8**	**11.9**	**2.1**	**2.4**	**2.4**	**2.8**	**0.1**	**0.1**

Cumulative concentrations of NO_2, SO_2, PM_{10} and $PM_{2.5}$, from the Tallawarra A power station, Tallawarra B power station and the background environment would be below the respective assessment criteria. Maximum 24-hour average PM_{10} concentrations would exceed the assessment criteria, due to contributions from the background environment, however this would occur with or without the upgrade. The operation of the Tallawarra A power station post-upgrade would not cause additional days of exceedance beyond those caused by background concentrations. Cumulative concentrations are shown in Table 6-5.

Table 6-5: Modelled cumulative concentrations

Receptor	NO_2 (ug/m^3)		SO_2 (ug/m^3)		PM_{10} (ug/m^3)		$PM_{2.5}$ (ug/m^3)	
	Maximum 1-hour average	Annual average	Maximum 1-hour average	Maximum 24-hour average	Maximum 24-hour average	Annual average	Maximum 24-hour average	Annual average
Albion Park	75.9	9.3	88.9	20.9	71.8	21.9	22.3	7.1
Avondale	75.9	9.5	88.7	20.9	71.8	21.9	22.7	7.1
Barrack Heights	76.7	9.2	88.7	20.9	71.9	21.9	22.4	7.1
Berkeley	75.9	9.3	88.7	20.9	71.9	21.9	22.5	7.1
Dapto	75.9	9.5	88.7	20.9	71.8	21.9	22.7	7.1
Haywards Bay	76.4	9.4	89.4	21.1	71.8	21.9	22.4	7.1
Horsley	75.9	9.5	88.7	20.9	71.8	21.9	22.7	7.1
Lake Heights	75.9	9.3	88.7	20.9	71.8	21.9	22.4	7.1
Mt Warrigal	78.6	9.3	88.7	20.9	71.9	21.9	23.1	7.1
Oak Flats	77.8	9.3	88.7	21.0	71.8	21.9	22.3	7.1
Primbee	75.9	9.6	88.7	20.9	71.8	21.9	23.6	7.1
Pt Kembla	75.9	9.3	88.7	20.9	71.8	21.9	22.5	7.1
SE Dapto	75.9	9.4	88.7	20.9	72.1	21.9	22.5	7.1
Shellharbour	76.3	9.2	88.7	20.9	71.8	21.9	22.6	7.1
South Dapto	77.2	9.7	88.7	20.9	71.8	21.9	23.4	7.2
Unanderra	75.9	9.2	88.7	20.9	71.8	21.9	22.4	7.1
Windang	76.1	9.6	88.7	20.9	71.9	21.9	23.3	7.1
Wollongong	75.9	9.2	88.7	20.9	71.8	21.9	22.2	7.1
Yallah	84.8	9.9	90.2	21.0	71.8	22.0	22.7	7.2
Max on Domain	161.3	10.3	90.6	21.3	72.4	22.0	24.7	7.2
Impact Assessment Criterion	**164**	**31**	**286**	**57**	**50**	**25**	**25**	**8**

6.1.5 Safeguards and mitigation measures

Given the minor and contained nature of the proposal and given the minimal changes that are predicted post-upgrade, no additional air quality management measures are required in addition to those currently specified in the Tallawarra A EMP and associated management plans, which would continue to apply during and following the upgrade.

6.2 Greenhouse gas

6.2.1 SEARs

The SEARs relevant to greenhouse gases (GHG) and where the requirements have been addressed in this EIS are outlined in Table 6-6.

Table 6-6: SEARs – Greenhouse gases

General requirements	Where addressed
An assessment of the likely greenhouse gas impacts of the project, having regard to the NSW EPA's Climate Change Policy and Climate Change Action Plan 2023–26 and the safeguard mechanism under the National Greenhouse and Energy Reporting Act 2007.	Section 6.2.2 notes that the GHG emission impact assessment was undertaken with regards to the NSW EPA's Climate Change Policy and the safeguard mechanism under the National Greenhouse and Energy Reporting Act 2007. The reformed Safeguard Mechanism was implemented on 1st July 2023. The changes require facilities with scope 1 emissions greater than 100 $ktCO_2$-e to reduce their emissions, declining to net zero by 2050. However, some scope 1 emissions are not covered, including emissions from the operation of a grid-connected electricity generator in a year covered by the sectoral baseline. This is because the electricity sector is treated differently, with the sector as a whole having an aggregated baseline. Facilities that fall in the electricity sector do not have individual baselines. The Tallawarra A power station is registered under the NEM, and therefore falls under this sectoral baseline. It is not expected that the power station would be impacted by the reducing baselines within the Safeguard Mechanism. Section 6.2.4 discusses the construction and operational impact of the proposal post upgrade.

6.2.2 Methodology

The GHG emissions impact assessment was undertaken with reference to the following documents:

- National Greenhouse Gas and Energy Reporting (NGER) (measurement) Determination 2008 under the NGER Act, and the data available from National Greenhouse Account Factors (NGAF) (Department of Climate Change, 2023).
- Greenhouse Gas Protocol (GHG Protocol), the World Business Council for Sustainable Development and the World Resources Institute
- ISO14064: Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals (The British Standards Institution, 2019a) and Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements (The British Standards Institution, 2019b)

The assessment includes Scope 1, Scope 2 and Scope 3 GHG emissions associated with the construction and operation of the upgrade. These are described as follows:

- Scope 1 emissions – direct GHG emissions 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) (GHG Protocol, 2013)
- Scope 2 emissions – Indirect GHG emissions associated with the import of energy from another source (examples include import of electricity from the grid, or heat) (GHG Protocol, 2013)
- Scope 3 emissions – Other indirect emissions, other than energy imports (above) which are a direct result of the operations of the organisation, but from sources not owned or operated by them and due to upstream or downstream activities (examples include indirect upstream emissions associated with the extraction, production, and transport of purchased construction materials; and business travel (by ship, air or rail)).

An illustration of these definitions is shown in Figure 6-3.

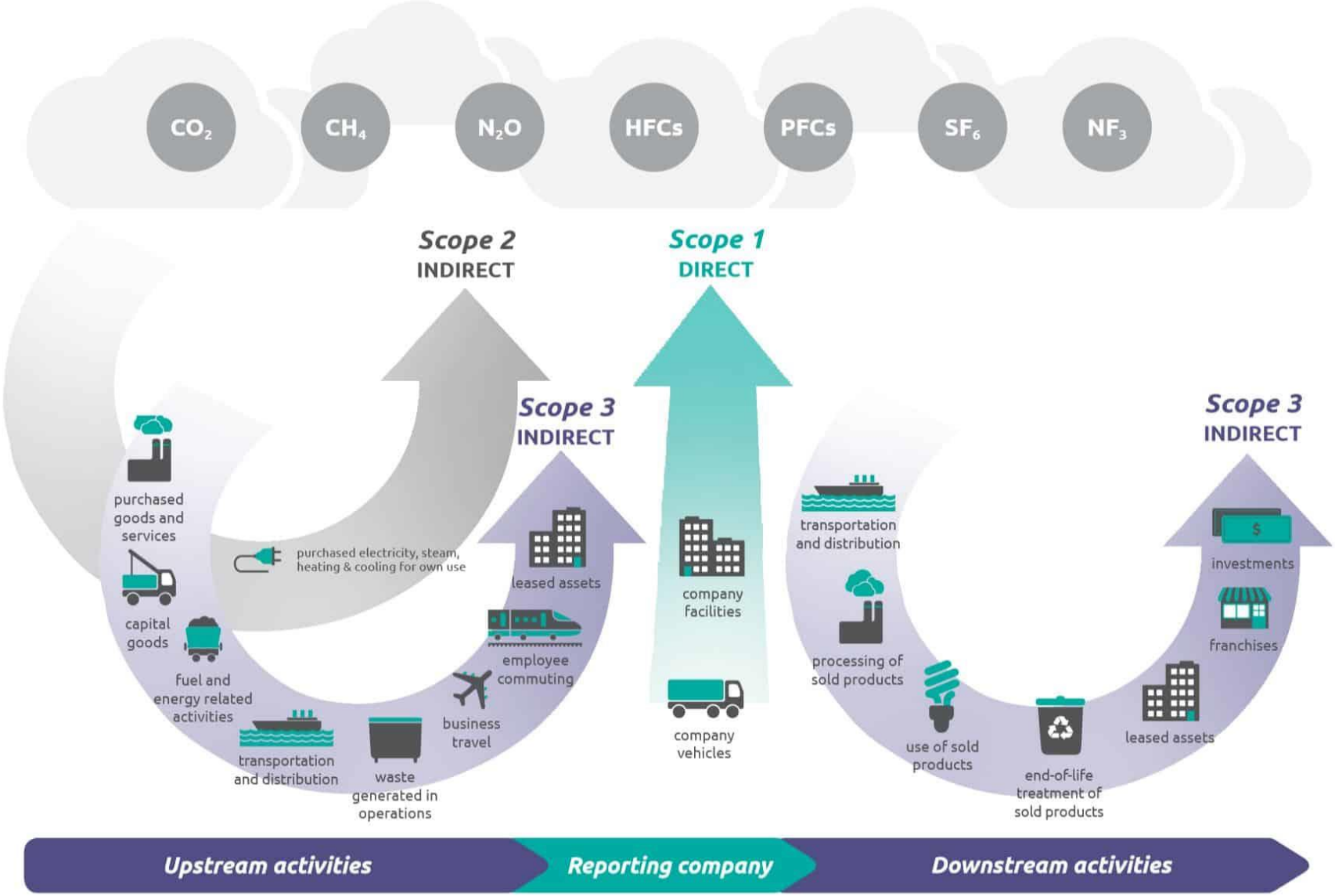

Figure 6-3: An illustration of the definitions of different emissions scopes (GHG Protocol, 2013)

The GHG assessment comprised of:

- an analysis of emissions from construction activities, such as:
  - freight shipping (round trip) of six containers with the turbine components from Hamburg, Germany to Port Botany, NSW.
  - transport of the twelve containers in standard trucks from Port Botany to the Tallawarra A power station.
  - use of a 220 tonne Manitowoc mobile crane and a 40 tonne mobile Franna crane to remove old equipment and install new equipment
  - round trip business flights taken during the early stages between NSW and Hamburg for two employees.
- an analysis of the GHG emissions between pre and post-upgrade scenarios. As per the information provided by EnergyAustralila, the turbine gas consumption in the pre-upgrade and post-upgrade scenarios remain unchanged. For the purpose of calculation, the conservative value of 16.9kg/s is considered, with turbine power output for pre- and post-upgrade being 440MW and 470MW respectively. The turbine is set to produce more power output with the same intake of gas, due to the new blade and vane design.

Key assumptions made for the assessment include:

- an operational annual average capacity factor (power station run-time) of 30% has been adopted for the proposal, based on the average of the last five-years of power station operation from 2018 to 2022
- the upgrade would utilise the existing lifting equipment in the turbine hall, where possible, which is typically used for routine maintenance at the power station. Apart from the existing equipment, a 220 tonne Manitowoc mobile crane would be used for a total of 16 hours and a 40 tonne mobile Franna crane for 96 hours.
- six containers of equipment would be shipped from the Hamburg port, Germany to Port Botany, NSW
- the total tonnage of the shipment would be approximately 52 tonnes
- the shipping vessel is assumed to be a Panamax New with a Deadweight Tonne (DWT) of 120,000 tonnes. A conservative value of 17 knots is considered as the shipping speed, based on the ship averaging the higher end of extra slow streaming
- equipment and parts removed from the power station after upgrade would be reclaimed by the manufacturer for refurbishment and reuse and would be shipped back to Germany. Refer to section 6.6 for anticipated waste impacts
- the trucks used to transport the six containers from Port Botany to the Tallawarra A power station are assumed to be 20 tonne Flatbed HIAB Trucks
- during the proposal development phase, one return flight was made to Germany. The flight details are assumed to be Sydney to Hamburg, round trip for two employees
- there would be no excavation or building construction required, and no areas of wooded vegetation are required to be removed during the upgrade
- no new site office buildings would be mobilised for the upgrade given existing buildings would be utilised
- sulfur hexafluoride (SF6) usage is confined to the generator circuit breaker only, which is not changed or impacted by the upgrade. All remaining switchgear utilises vacuum or air mechanisms.

Legislation and policy summary

A summary of the legislation and policy relevant to the GHG assessment for the proposal is outlined in Table 6-7.

Table 6-7: Legislation and policy associated with the GHG assessment

Policy / legislation	Description
National Greenhouse and Energy Reporting Act 2007 ('NGER Act'), and National Greenhouse and Energy Reporting (Measurement) Determination 2008	The NGER Act establishes the legislative framework for the NGER Scheme, which is a national framework for corporations to report Scope 1 and 2 GHG emissions, energy consumption and energy production. The NGER Act, its regulations and associated legislation applies to facilities that emit more than 25,000 tCO_2-e per year or consume or produce more than 100 TJ of energy per year. The NGER Determination describes the methods and criteria for reporting Scope 1 and 2 GHG emissions, energy consumption and energy production in accordance with the NGER Act. EnergyAustralia is required to report under the NGER Act.
National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 (NGER Rule)	The NGER Rule provides a mechanism to prevent Australia's major GHG emitters to increase their operational Scope 1 annual GHG emissions beyond a threshold and applies to facilities that emit more than 100 $ktCO_2$-e per year of Scope 1 emissions. However, the reformed Safeguard Mechanism was implemented on 1st July 2023. The changes require facilities with scope 1 emissions greater than 100 $ktCO_2$-e to reduce their emissions, declining to net zero by 2050. However, some scope 1 emissions are not covered, including emissions from the operation of a grid-connected electricity generator in a year covered by the sectoral baseline. This is because the electricity sector is treated differently, with the sector as a whole having an aggregated baseline. Facilities that fall in the electricity sector do not have individual baselines. The Tallawarra A power station is registered under the National Electricity Market (NEM) and falls under this sectoral baseline. It is not expected that Tallawarra A will be impacted by the reducing baselines within the Safeguard Mechanism.
NSW EPA's Climate Change Policy	The NSW Government has an objective to achieve a 50% reduction in emissions on 2005 levels by 2030, and to reach net zero emissions by 2050.
Climate Change Action Plan 2023–26	The NSW Government has an objective to achieve a 50% reduction in emissions on 2005 levels by 2030, and to reach net zero emissions by 2050. The action plan is structured around three key pillars: ■ Inform and plan: continually improving, providing support and report. ■ Mitigate: reducing greenhouse gas emissions. ■ Adapt: adapting and building resilience to a changing climate.
Climate Change Act 2022	Defines Australia's greenhouse gas emissions reduction targets of a 43% reduction from 2005 levels by 2030 and net zero by 2050; requires the minister to prepare and table an annual climate change statement; requires the Climate Change Authority to give the minister advice in relation to the annual statement and future greenhouse gas emissions reduction targets.
Paris Agreement	A legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12th December 2015 and entered into force on 4th November 2016. Its goal is to limit global warming to below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. Australia has committed to reducing its greenhouse gas emissions to 43% below 2005 levels by 2030.

6.2.3 Existing environment

The estimated Scope 1 and Scope 3 GHG emissions from the proposal area under existing conditions (i.e. the emissions from the 2006 GT26) are 488 $ktCO_2$-e, consuming 7,444,523 GJ of gas per year based on the facility operating 30% of the year. The operational emissions from the 2006 GT26 account for 2.1% of EnergyAustralia's total emissions in Australia in 2021-22, as per the National Greenhouse and Energy Reporting data published by the Clean Energy Regulator.

The context of the existing conditions for the GHG impact assessment is the current New South Wales (NSW) emissions profile. In the State and Territory Greenhouse Gas Inventories 2020 report, NSW's total

emissions were 132.4 million-tonnes of carbon dioxide equivalent (Mt CO2-e). Energy industries (i.e. direct combustion) accounted for 78.2% per cent of NSW's total emissions or 103.6 Mt CO2-e.

6.2.4 Impacts

Construction

During construction, there would be negligible emissions from transport vehicles within the site or from the use of mobile plant and equipment. Existing lifting equipment in the turbine hall and forklifts on site would be utilised for the upgrade, where possible. As is outlined in section 3.5.1, 12 vehicle movements, in addition to those required as part of the scheduled maintenance outage, would be required for the delivery of upgrade parts. This would result in negligible emissions.

Emissions from shipping the turbine parts from Germany to Port Botany, the transport of the parts from Port Botany to the Tallawarra A power station, the temporary equipment required to install the parts, and the business flight emissions during the proposal development phase are shown in Table 6-8.

Table 6-8: Summary of GHG emissions associated with the construction activities.

Type	Emission source	Emissions (tCO_2-e)
Shipping vessel	Fossil fuel	9.3
Standard trucks	Fossil fuel	1.5
Plant and equipment	Fossil fuel	22.2
Business flights	Fossil fuel	5.4
Total Emissions (tCO_2-e)		**38.4**

GHG emissions associated with the construction of the proposal are 0.038 kt CO_2-e. The GHG emissions from construction have been minimised through the use of existing equipment and infrastructure, where possible, with the only additional equipment being the two mobile cranes for a limited period of time. They are less than 0.01% of the emissions in operation and less than 0.0000013% of NSW's total GHG emissions in 2020. The impacts of construction are therefore short-term and considered to be negligible.

Operation

Table 6-9 summarises the estimated GHG emissions and the electricity generation from the operation of the power station both pre- and post-upgrade. Post-upgrade, the GHG emissions are expected to remain the same as the pre-upgrade scenario due to the same gas consumption of 16.9kg/s. The electricity output is expected to increase by 78,840 MWh, increasing from 1,156,320 MWh to 1,235,160 MWh.

Table 6-9: Summary of GHG emissions from plant operations pre and post-upgrade

	Gas consumption (kg/s)	Annual gas consumption (GJ)	Scope 1 Emissions (ktCO2-e /year)	Scope 3 Emissions (ktCO2-e /year)	Total Emissions ($ktCO_2$-e /year)	Electricity output (MWh/year)	Emissions intensity ($kgCO_2$-e/ kWh)
Pre-upgrade	16.9	7,444,523	384	104	488	1,156,320	0.422
Post-upgrade	16.9	7,444,523	384	104	488	1,235,160	0.395

As the gas consumption between the pre and post-upgrade scenarios is the same, there will be no increase in the GHG emissions from the operation of the turbine, however, the GHG intensity of the electricity generated would decrease by 6%, reducing the impact of the electricity supplied to the NEM.

No impact from operational GHG emissions is expected. Overall, the proposal would result in long-term positive operational impacts due to the reduction in emissions intensity.

6.2.5 Safeguards and mitigation measures

Given the minor greenhouse gas emissions that would occur during the upgrade, and given that post-upgrade greenhouse gas emissions would be consistent with pre-upgrade greenhouse gas emissions, no additional greenhouse gas management measures are required. The measures currently specified in the Tallawarra A EMP and associated management plans would continue to apply during and following the upgrade.

6.3 Socio-economic

This Chapter summarises the Social Impact Assessment (SIA) prepared for the proposal and addresses the social and economic component of the environmental assessment requirements for the Project including an assessment of the likely social and economic impacts and benefits of the project for the SIA study area, which spans the Shellharbour and Wollongong LGAs, and the broader Illawarra Shoalhaven region.

6.3.1 SEARs

The SEARs relevant to socio-economic impacts and where the requirements have been addressed in this EIS are outlined in Table 6-10.

Table 6-10: SEARs – Socio-economic

General requirements	Where addressed
A Social Impact Assessment prepared in accordance with the Social Impact Assessment Guideline for State Significant Projects.	A social impact assessment was prepared for the proposal in line with the Social Impact Assessment Guidelines for State Significant Projects and is included in Appendix D. The socio-economic impacts of the proposal are summarised in section 6.3.4.

6.3.2 Methodology

This SIA has been prepared for a ‘minor’ level assessment and as per the NSW Department of Planning and Environment (DPE) Social Impact Assessment Guidelines for State Significant Projects (SIA Guideline) (DPE, 2023). The minor level of assessment reflects the proposal scale and magnitude of potential impacts to the socio-economic environment.

In accordance with the NSW SIA Guideline, this assessment was prepared using the following methodology:

- Establish the socio-economic study area.
- Review statutory planning and legislative requirements, including a review of existing State and local government strategies relevant to the social and economic environment of the study area.
- Review community consultation for the proposal, including key community issues relevant to the socio-economic impact assessment. Limited community consultation requirements are required, as the proposal would occur entirely within the existing power station footprint.
- Prepare the social baseline, including an analysis of the existing socio-economic environment of the study area.
- Identify and assess the potential socio-economic impacts of the proposal’s construction and operation on local communities – including sensitive receivers and community assets, values and infrastructure.

- Identify management and mitigation measures to avoid, minimise, manage, or mitigate the proposal's impacts and enhance or maximise the proposal's benefits identified through the socio-economic impact assessment.

The SIA Guidelines include specific impact magnitude levels to describe the impacts of a project to communities, infrastructure, services and health. The magnitude levels outlined in the SIA Guidelines have been used in this section to describe the socio-economic impacts of the proposal. These levels are included in Table 6-11.

Table 6-11: SIA Guidelines defining magnitude levels for social impacts

Magnitude level	Meaning
Transformational	Substantial change experienced in community wellbeing, livelihood, infrastructure, services, health, and/or heritage values; permanent displacement or addition of at least 20% of a community.
Major	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area.
Moderate	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people.
Minor	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
Minimal	Little noticeable change experienced by people in the locality

The SEARs outlined in section 6.3.1 have been considered in this assessment. The following sections summarise the existing social environment within and surrounding the proposal area and the potential impacts of the proposal on these environments.

6.3.3 Existing environment

Study area

The SIA study area is bounded by the Princes Motorway from Berkeley to the north and Albion Park to the south. Warrilla Beach and Windang Beach make up the eastern boundary. The SIA study area has been defined with regard to the potential for visual and other impacts associated with the proposal to impact communities around Lake Illawarra and local surrounds.

Existing socio-economic conditions

The Tallawarra A power station is located on the fringes of Lake Illawarra in the Wollongong LGA. The area's appealing features, such as Lake Illawarra, the Illawarra Escarpment, picturesque coastlines, coves, estuaries, and national parks, have contributed to the expansion of the local tourism industry.

Due to its closeness to Sydney, the Illawarra Shoalhaven region has experienced swift population growth in recent years. The study area is connected to strategic regional economic centres such as Wollongong, Shellharbour and Kiama. An additional 100,000 people are expected to migrate from Sydney to the Illawarra Shoalhaven region by 2041. The swift growth of population poses challenges for infrastructure, jobs housing and transportation.

The Illawarra Shoalhaven Regional Plan 2041 has identified West Lake Illawarra as a strategic growth area and as a result released a large land parcel to cater to the increase of new residents seeking a sea change. Infrastructure Australia has highlighted the significance of expanding the region's economic base into value-added sectors like renewable energy to ensure future prosperity.

Population profile

This SIA has examined the current characteristics of the community based on ABS 2021 census data and projected resident population changes across the relevant LGAs. Key findings are identified below:

- the study area residents are mostly working aged adults
- the study area is mostly comprised of middle-income earners
- the predominant housing type is low-density separate houses, tenure is mixed
- English is the main language spoken at home
- the Socio-Economic Indexes for Areas (SEIFA) scores for the SIA study area are like those for Greater Sydney, with Shellharbour City being slightly higher, and Wollongong City slightly lower.

Population projections

The population of the study area is currently 143,750 and predicted to increase to 175,512 (22%) by 2041. This is a similar pattern of population growth to Wollongong LGA and Shellharbour LGA which are predicted to increase their population by 23% and 27% respectively.

Economic profile

The Illawarra Shoalhaven economy is heavily driven by Port Kembla, which provides a strategic economic hub providing major import and export capabilities for the region and NSW more broadly. Port Kembla directly and indirectly generates approximately 3,500 jobs and generates an annual contribution of $543 million to the regional economy.

The Australian Bureau of Statistics, Labour Force Survey (May 2023) reveals that the top three employment industries in the Illawarra region are now the health care and social assistance (17%), construction (11.9%) and retail trade (10.9%) industries.

Land uses and natural assets

Lake Illawarra is an important natural asset for the Illawarra region and is highly valued by the community. The lake is a barrier estuary, and its catchment covers an area of around 240 km^2.

Lake Illawarra is valued by local communities for its social, economic and recreational characteristics. The estuary supports tourism and commercial fishing industries and provides for a wide range of recreational activities.

Lake Illawarra contains areas of Aboriginal cultural significance from a long history of use of the lake and its surrounds. Aboriginal connection to Lake Illawarra is also a key input used to understand estuary health.

Traditional Dharawal clan groups and their people resided at several sites around Lake Illawarra including Berkeley and Hooka Creek. Other nation groups residing within the Illawarra region include, but are not limited to, the Yuin, Wiradjuri, Kamilaroi, Bundjalung, Dunghutti and Gumbayggir Nations.

Social infrastructure and areas of community interest

Lake Illawarra is a popular destination for recreational activities such as fishing, prawning and water sports, such as boating, kayaking and paddle boarding. Popular land-based recreation uses include bike riding, bush regeneration activities, bushwalking and birdwatching.

The lake provides a large variety of passive recreational facilities with many reserves, parks, picnic spots, cafes and restaurants. It is also surrounded by local heritage assets such as the Shellharbour City Museum, Illawarra Light Railway Museum and HARS Aviation Museum. Walking and biking are strongly promoted, especially with the recent completion of the Lake Illawarra Boardwalk and Art Trail.

Fire and Rescue Warrawong, NSW ambulance and Fire Rescue Dapto are to the north of the study area and within 15 minutes' drive.

To the south and within 15 minutes' drive of the study area are Shellharbour Hospital, Marine Rescue Port Kembla, NSW Rural Fire Service, Emergency Control Centre and Albion Park Police Station.

Community sentiment and perspectives

Consultation has been undertaken in accordance with the Undertaking Engagement Guidelines for State Significant Projects (DPE, 2022), as is outlined in section 5.

Wollongong City Council, NSW's Office of Energy and Climate Change (OECC), DPE and NSW EPA were supportive of the proposal. Regular briefings provided an opportunity for all parties involved to review the proposal's impacts, including at the community and regional level. The briefings also enabled the different stakeholders to consider impacts more holistically. Community engagement was primarily via the CLG established by EnergyAustralia.

Overall, media sentiments relating to the Tallawarra power station upgrade are positive.

6.3.4 Impacts

Construction

As the upgrade would be contained within the existing footprint of the Tallawarra A power station, social and human health impacts relating to dust, noise and visual impacts are not anticipated. Traffic impacts during construction would be negligible given access would be via Yallah Bay Road directly off the Princes Highway and only 12 vehicle movements would be required in addition to vehicle movements needed for the scheduled maintenance outage. Deliveries to the power station would not pass through local neighbourhoods or street networks and there would be no visible activities conducted outside the power station footprint for nearby visually sensitive receivers.

The construction socio-economic impacts would be minor to minimal in magnitude under the SIA Guidelines.

Operation

The proposal would not alter the surrounding environment of the Tallawarra A power station, meaning there would be no negative socio-economic impacts during the operation of the proposal.

The proposal would improve the maximum output capacity of the power station from 440 megawatts to 480 megawatts. This increase in the power station's maximum capacity would allow it to supply more electricity for homes and businesses across the NEM and EnergyAustralia would be able to produce more electricity while reducing annual gas consumption. The newer and more reliable components would improve electricity production, making the power station more efficient and reducing plant maintenance frequency from five to eight years. Ultimately, the decrease in maintenance frequency would reduce disruptions to energy supply.

The broader district and regional operational benefits of the upgrade of the Tallawarra A power station would include:

- improvements to the consistency of network voltage within established parameters across the NSW electricity grid
- enhanced power station efficiency by decreasing the consumption of natural gas
- minimised greenhouse gas emissions
- enhanced energy grid security and stability to mitigate episodes of variable renewable energy production
- increased resilience of the NSW electricity grid and the NEM to support the transition from coal power stations to renewable energy
- by making Tallawarra A hydrogen capable, the upgrade increases the potential customer base for hydrogen in the Illawarra region, supporting the creation of a hydrogen industry.

Overall, the proposal would result in long-term positive operational socio-economic impacts.

6.3.5 Safeguards and mitigation measures

Safeguards for the socio-economic impacts of the proposal area included in Table 6-12.

Table 6-12 Socio-economic safeguards and management measures

Impact	Mitigation measure	Responsibility	Timing
Community engagement	The Community Liaison Management Plan would be used prior to and during the upgrade maintenance outage to guide engagement with the local community and stakeholders about the proposal, and to outline complaints management and enquiries management processes.	EnergyAustralia	Pre-construction / construction

6.4 Noise and vibration

A construction noise assessment was carried out for the proposal by SLR Consulting Australia (2023) and is included in Appendix E. There would be no anticipated changes in the operational noise emissions at the Tallawarra A power station as a result of the upgrade. Accordingly, a qualitative assessment of operational noise impacts was carried out.

6.4.1 SEARs

The SEARs relevant to noise and vibration impacts and where the requirements have been addressed in this EIS are outlined in Table 6-13.

Table 6-13 SEARs – Noise and vibration

General requirements	Where addressed
Assessment of the likely construction noise impacts of the project under the Interim Construction Noise Guideline (DECCW, 2009).	Assessment of the potential upgrade (construction) noise impacts of the external activities of the proposal are outlined in section 6.4.5. Internal construction activities are anticipated to not have noise impacts on nearby sensitive receivers.
An assessment of the likely construction road noise impacts of the project under the NSW Road Noise Policy (EPA, 2011).	Assessment of the potential construction noise impacts of the proposal included noise from truck deliveries. These impacts are outlined in section 6.4.5.
Consideration of potential changes to the operational noise and vibration impacts of the existing Tallawarra Power Station.	Operational noise and vibration impacts are considered in section 6.4.5.

6.4.2 Methodology

The construction noise assessment included the use of a noise model of the proposal area to predict noise impacts from the upgrade (construction of the proposal) to surrounding receivers. Local terrain and structures at the existing power station site were digitised in the noise model to develop a three-dimensional representation of the construction site and surrounding areas. Noise model inputs included ground topography, receiver locations, construction noise sources, ground absorption and meteorological conditions.

As is outlined in section 3.5.1, construction of the proposal is anticipated to require the use of delivery vehicles, hand tools, power tools and a forklift. Existing lifting equipment inside the turbine hall would be utilised, where possible. A 220 tonne mobile crane will be required during the OTC installation due to the height required and 40 tonne mobile franna crane for the EGH removal and installation crane.

Internal installation activities are not expected to be highly noise producing and impacts are not expected at the nearest receivers. As such, the construction noise assessment only considered the potential peak noise

producing external activities, including at ancillary sites and from truck deliveries. The modelled noise source locations are shown in Figure 6-4.

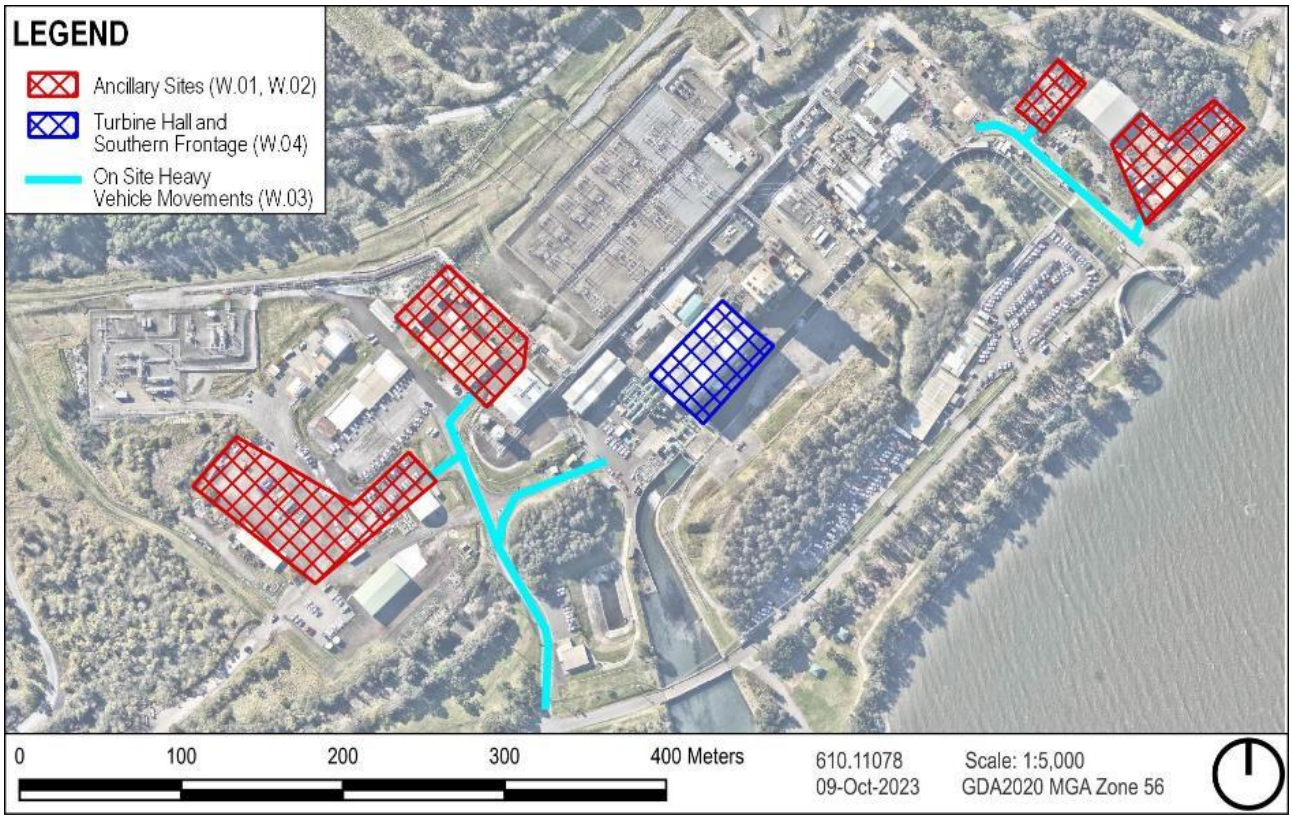

Figure 6-4: Construction noise source locations

The assessment of operational noise impacts utilised the noise impact assessment for the Tallawarra B power station modification (Benbow Environmental, 2020). This assessment included predicted noise levels from different upgrade scenarios at the Tallawarra B power station in combination with the existing noise from the Tallawarra A power station. The noise levels from both the Tallawarra A and Tallawarra B power stations have been used to inform the predicted operational noise levels for the proposal.

6.4.3 Existing environment

The planned maintenance outage to be undertaken in April and May 2024 is consistent with the previous four major outages completed since Tallawarra A was commissioned (previous outages occurred in 2011, 2014, 2017 and 2019). There were no complaints received from the community with regard to noise during these outages. Similarly, no noise complaints have been recorded during the construction of the adjacent Tallawarra B power station to date.

Historical operational noise monitoring undertaken at Tallawarra A power station for compliance with NSW Environment Protection Licence (EPL) 555 has also been within the approved limits. This shows that EnergyAustralia has undertaken work on a 24/7 basis at Tallawarra A power station, which has been very similar to the proposed upgrade, and has completed it without any adverse impacts on the community.

The assessment of construction noise impacts from the proposal used noise catchment areas (NCAs) to describe the different noise receiver areas surrounding the Tallawarra A power station. The NCAs for the assessment of construction noise from the proposal area are outlined in Table 6-14 and Figure 6-5.

Table 6-14: NCAs for the proposal

NCA	Location	Distance from the proposal	Direction
NCA01	Haywards Bay Drive, Haywards Bay	2 km	Southwest
NCA02	Carlyle Close and Coronet Place, Dapto	1 km	West
NCA03	Malonga Place, Koonawarra	1 km	Northwest

NCA	Location	Distance from the proposal	Direction
NCA04	Southeast of Lake Illawarra	3.5 km	Southeast

Figure 6-5: NCA locations relative to the proposal area

The Tallawarra A power station and the Tallawarra B power station (following completion of construction and commencement of operation in 2023-24) would be the main noise source that would contribute to background noise in the vicinity of the proposal area. The Tallawarra B power station modification noise impact assessment outlined the main sources of noise from the Tallawarra A power station, which included the turbine hall, exhaust vents, compressors and the stack casing. The assessment included an analysis of the noise levels from the power station at different receivers near to the proposal area in the existing environment, which determined that the power station is compliant with the relevant noise criteria outlined in the NSW Noise Policy for Industry (NpfI) (EPA, 2017). Predicted noise from the Tallawarra B power station in addition to the existing noise from the Tallawarra A power station was also determined to be compliant with the relevant noise criteria. Noise from the power station is within the limits specified in EPL 555.

Background noise surrounding the proposal area is generally low. No noise complaints have been received during the recent construction of the Tallawarra B power station, during previous maintenance outages for the Tallawarra A power station, or during general operations of the Tallawarra A power station.

6.4.4 Construction noise scenarios and criteria

Construction noise scenarios

The construction noise assessment used three construction noise scenarios to assess the noise impacts during different stages of the upgrade. The assessed construction noise scenarios are included in Table 6-15.

Table 6-15: Construction noise scenarios

ID	Scenario	Description
W.01	Ancillary site establishment and demobilisation	Establishment of ancillary sites at cleared and hardstand areas within the footprint of the existing power station.
W.02	Ancillary site operation	Laydown and storage of construction materials at the ancillary sites.
W.03	Heavy vehicle delivery	Delivery of equipment via Yallah Bay Road during standard daytime hours only. This work would use heavy vehicles but no OSOM vehicles would be required.
W.04	Equipment installation	The main work area for equipment installation would be within the existing turbine hall as far as possible. This work would include use of hand tools, existing internal lifting equipment, one 220 tonne crane, and one 40 tonne franna crane. The 220 tonne crane is expected to be used for 2 days, and the 40 tonne is expected to be used for 12 days. As a conservative approach, the louder 220 tonne crane has been adopted in the equipment list although only proposed to occur for two days. Although noise producing equipment would generally be inside the turbine hall, it has been modelled as an external source of noise to conservatively represent the need for open doors along the southern frontage of the turbine hall during the upgrade.

The modelled sound power levels of individual equipment during different work scenarios are shown in Table 6-16. This represents the realistic peak work scenarios that are anticipated as part of the proposal.

Table 6-16: Modelled sound power levels

ID	Scenario	Equipment	Estimated on-time in any 15 minutes	Sound Power Level[1] (dBA)		
				Maximum LAeq(15minute)		Maximum LAmax
				Individual Item	Activity	
W.01	Ancillary Site Establishment and Demobilisation	Forklift	10	106	107	114
		Hand Tools	15	104	107	114
		Light Vehicles	15	88	107	114
W.02	Ancillary Site Operation	Forklift	10	106	109	116
		Hand Tools	15	108	109	116
		Truck	5	108	109	116
W.03	Heavy Vehicle Deliveries	Truck	15	108	108	111
W.04	Equipment installation	Existing internal lifting equipment	15	98	114	121
		Hand tools	15	104		
		Mobile Crane (approx. 220 tonne)	15	113		

Noise management levels

The construction noise assessment for the proposal used the Interim Construction Noise Guideline (ICNG) (DECC, 2009) for the assessment of airborne noise impacts on sensitive receivers and the Road Noise Policy (RNP) (DECCW, 2011) for the assessment of construction traffic impacts.

The ICNG contains procedures for determining project-specific noise management levels (NMLs) for sensitive receivers based on the existing background noise in the area. The worst-case noise levels from the construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impacts. NMLs for residential receivers outlined in the ICNG are included in Table 6-17.

Table 6-17: ICNG noise management levels for residential receivers

Time of day	NML ($L_{Aeq(15\ minute)}$)
Standard construction hours: Monday to Friday 7:00am to 6:00pm Saturday 8:00am to 1:00pm No work on Sundays after 6am	Noise affected: Rated background level (RBL) 1 + 10dB
	Highly noise affected: 75 dBA
Outside standard construction hours	Noise affected: RBL + 5dB

The NMLs applicable at the nearest residential receivers to the proposal area have been adopted from the noise impact assessment for the Tallawarra B power station modification (Benbow Environmental, 2020). These are outlined in Table 6-18.

Table 6-18: Noise management levels for residential receivers near the proposal

NCA	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance (L_{Amax} – dBA)		Highly Noise Affected ($L_{Aeq(15min)}$ – dBA)
	Standard Construction (RBL + 10 dB)	Out-of-hours (RBL + 5 dB)			Screening Level (52 dBA or RBL + 15 dB, whichever is higher)	Awakening Reaction[2]	
		Daytime[1]	Evening	Night-time			
NCA01	45	40	40	39	52	65	75
NCA02	46	41	41	39	52	65	75
NCA03	46	41	39	35	52	65	75
NCA04	45	40	40	39	52	65	75

Note 1: Daytime out of hours is 7am to 8am and 1pm to 6pm on Saturday, and 8am to 6pm on Sunday and public holidays.

Note 2: Awakening reaction level is based on 55 dBA internal. A conservative 10 dB facade loss has been assumed to represent open windows.

Sleep disturbance

Where night work is located close to residential receivers, there is potential for sleep disturbance impacts. The most current method for assessing sleep disturbance in NSW policy and guidelines is contained in the NPfI. Although the NPfI sleep disturbance screening approach relates to industrial noise, it is also considered relevant for reviewing potential impacts from construction noise. The NPfI defined sleep disturbance criteria is 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is the greater.

The ICNG also refers to the NSW Environmental Criteria for Road Traffic Noise (ECRTN), which notes that to limit the level of sleep disturbance, the L_{Amax} should not exceed the existing L90 background noise level by more than 15 dB. The ECRTN has since been superseded by the RNP, which concludes the following regarding research on sleep disturbance:

- Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep. This equates to an upper acceptable range external noise level of 65 dBA when assuming a conservative 10 dB loss for open windows.
- One or two events per night with maximum internal noise levels of 65-70 dBA are not likely to affect health and wellbeing significantly.

The above guidance results in the following assessment requirements:

- The 'sleep disturbance screening level' of 52 dBA or RBL + 15 dB (external), which is used to identify receivers where there is potential for sleep disturbance.
- Where the sleep disturbance screening level is predicted to be exceeded, further assessment may be required to determine if the 'awakening reaction' level of L_{Amax} 55 dB (internal) is likely to be exceeded. The awakening reaction level is the level above which sleep disturbance is considered likely.

Construction traffic noise guidelines

The potential impacts from construction traffic associated with the proposal are assessed under the RNP. An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than two decibels as a result of construction traffic. Where this is considered likely, further assessment is required using the RNP base criteria, which is outlined in Table 6-19.

Table 6-19: RNP criteria for assessing construction traffic noise

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7am – 10pm)	Night-time (10pm – 7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

6.4.5 Impacts

Construction

A summary of the predicted construction noise levels as a result of the proposal at the potentially most affected receivers in each NCA is shown in Table 6-20.

Table 6-20: Predicted construction noise levels

NCA	Period	Noise level (dBA)					
		NML	Predicted LA_{eq}(15minute)				Predicted LA_{max}[1]
			W.01	W.02	W.03	W.04	
NCA01	Day	45	29	31	<20	36	43
	Day OOH	40	29	31	<20	36	43
	Evening	40	29	31	<20	36	43
	Night	39	29	31	<20	36	43
NCA02	Day	46	<20	20	<20	<20	27
	Day OOH	41	<20	20	<20	<20	27
	Evening	41	<20	20	<20	<20	27
	Night	39	<20	20	<20	<20	27
NCA03	Day	46	<20	<20	<20	<20	24
	Day OOH	41	<20	<20	<20	<20	24
	Evening	39	<20	<20	<20	<20	24
	Night	35	<20	<20	<20	<20	24
NCA04	Day	45	27	29	<20	35	42
	Day OOH	40	27	29	<20	35	42
	Evening	40	27	29	<20	35	42
	Night	39	27	29	<20	35	42

Note 1: The predicted LA_{max} is the maximum level in the NCA for all assessed work scenarios.

The assessment of predicted construction noise levels shows that these are less than the NMLs for all assessment periods. Maximum noise levels at night are also predicted to be below the sleep disturbance screening level.

Assessment of construction noise from vehicle movements for delivery has taken into account the anticipated twelve vehicle movements, as is outlined in section 3.5.1. Since there are no sensitive receivers adjacent to Yallah Bay Road and the construction traffic volumes are low compared to existing traffic volumes on the Princes Highway, no construction traffic noise impacts are anticipated as a result of the proposal.

Operation

Following the upgrade changes to the operational noise of the Tallawarra A power station are not expected due to:

- the new equipment being of a consistent size and scope to the existing equipment
- the new equipment being positioned in the same location as replaced equipment within the existing turbine hall and equipment enclosures
- the operational regime of the upgraded equipment being consistent with current operations.

Given there are no anticipated changes to the operational noise environment of the Tallawarra A power station as a result of the proposal, the noise levels that are outlined in the Tallawarra B power station noise impact assessment would be consistent with the noise levels after the upgrade. The upgraded power station would continue to comply with operational noise limits specified in the NSW Noise Policy for Industry and in EPL 555.

6.4.6 Safeguards and mitigation measures

The construction noise assessment concluded that there would be no exceedance of the relevant NMLs, no sleep disturbance impacts and no construction traffic noise impacts as a result of the proposal. Additional construction noise management strategies are required, as outlined in Table 6-21.

No operational noise impacts are anticipated as a result of the upgrade.

Table 6-21: Noise and vibration safeguards and mitigation measures

Impact	Mitigation measure	Responsibility	Timing
Construction noise impacts	Best practice work strategies will be applied during the upgrade maintenance outage to minimise potential noise emissions in accordance with the ICNG. Work practices will include: ■ site inductions and worker training to promote awareness of noise generating activities and the locations of nearby sensitive receivers ■ scheduling noisy works during standard daytime hours where reasonable and feasible ■ providing a readily accessible contact point for community feedback or complaints ■ locating any stationary noisy plant away from nearby sensitive receivers and maximising shielding from intervening structures where possible.	Contractor	Construction

6.5 Hazard and risk

6.5.1 SEARs

The SEARs relevant to hazard and risk impacts and where the requirements have been addressed in this EIS are outlined in Table 6-22.

Table 6-22: SEARs - Hazard and risk

General requirements	Where addressed
An assessment of the risks associated with the transport, handling and use of any hazardous or dangerous goods.	An assessment of the dangerous goods risks associated with the proposal is included in section 6.5.4.
An assessment of potential changes to the aviation risk from the existing Tallawarra Power Station, including any proposed measures and/or monitoring to mitigate aviation risk.	The aviation risk of the proposal was assessed in the Tallawarra A upgrade – Aviation Risk Assessment included in Appendix C. The results of this assessment are included in section 6.5.4. The assessment concluded that no mitigation measures or monitoring would be required for aviation risk.

6.5.2 Methodology

This section provides details on the methodologies used to assess the potential general hazards and risks associated with the proposal.

Hazardous materials

A review of hazardous material reports for the Tallawarra A power station, including the Tallawarra Power Station Final Hazardous Materials Site Report (EHS Solution, 2011), was carried out to determine if any dangerous goods were stored within the proposal area. A review of the Tallawarra Power Station 2019-C-3 Major Outage Execution Plan (EnergyAustralia, 2019) was also undertaken to determine management procedures if hazardous materials are found during the works.

Bushfire risk assessment

An assessment of the bushfire hazard of the local area was carried out. This included a review of NSW spatial data to determine the location of different vegetation categories near the proposal area. Additionally, the existing Bushfire Management Plan for the Tallawarra Power Station (EnergyAustralia, 2022) was reviewed to understand the bushfire risk of the power station's location and how the construction and operational activities of the proposal could influence this.

Aviation risk assessment

An aviation risk assessment has been carried out for the proposal and is included in Appendix C (Katestone, 2023b). The assessment referenced the Aviation Impact Assessment (AIA) prepared for the Tallawarra B power station (Aviation Projects, 2020) which also included appropriate Tallawarra A power station consideration. The aviation risk assessment applied a cumulative assessment approach by considering how the Tallawarra B power station vertical plume velocity would be induced by combining with the Tallawarra A power station plume. The assessment used the recommendations of the Civil Aviation Safety Authority (CASA) for assessing potential hazard to aviation resulting from exhaust plumes.

6.5.3 Existing environment

Hazardous materials

Dangerous goods at the proposal area include transformer oil, natural gas, lubricating oil, pesticides and miscellaneous cleaning chemicals. The proposal area is not classified as a major hazard facility. If any dangerous goods are encountered during works, management measures would be undertaken in accordance with EnergyAustralia procedures including TQMS11-AMT-PO22 – Management of Dangerous Goods and Hazardous Substances (EnergyAustralia, 2019).

Bushfire risk

A review of the bushfire risk of the proposal area and its surrounds revealed the presence of vegetation category 1 land (vegetation with the highest combustibility and likelihood of forming fully developed fires) located around 250 metres southwest of the proposal area. This vegetation is surrounded by vegetation buffers, which include Yallah Bay Road and Lake Illawarra near Yallah Bay Wharf. The presence of this vegetation buffer acts to minimise the bushfire risk to the proposal area. Vegetation category 1 is also mapped around 700 metres to the northwest of the proposal area. This vegetation is also surrounded by a vegetation buffer in the form of cleared lands used for transmission infrastructure. This buffer and the distance between the bushfire prone land and the power station acts to minimise the bushfire risk to the proposal area. Information contained in the Bushfire Management Plan shows that a major bushfire has not occurred within five kilometres of the proposal area in the last 50 years.

Aviation risk

The proposal is located approximately five kilometres from Shellharbour Airport. CCGT power stations are associated with low temperature and low velocity exhaust plumes and are not typically identified as contributing to aviation risk. Accordingly, the original EIS completed for the Tallawarra A power station in 1998 did not identify any aviation risks or risk management measures associated with plume rise.

The AIA for the Tallawarra B power station (Aviation Projects, 2020) included an assessment of the Tallawarra B power station vertical plume velocity, including an assessment of how the Tallawarra B power station plume would be induced by combining with the Tallawarra A power station plume. This assessment determined that the vertical height of plumes from the Tallawarra A power station were 356 feet, which falls well below CASA's recommended height of 1031 feet.

A plume rise assessment was completed for Modification 2 of the Tallawarra B open cycle gas turbine power station (Katestone, 2020). This assessment considered the exhaust plumes from both Tallawarra A and

Tallawarra B power stations, inclusive of a plume dispersion device on the Tallawarra B power station stack. The assessment concluded that the design and operation of the Tallawarra A and Tallawarra B power stations would be consistent with the approved aviation impact assessment, and that there would be an acceptably low-level risk to aviation safety from the concurrent operation of the Tallawarra A and Tallawarra B power stations. As such, the existing aviation risk from plume rise from the Tallawarra A power station is low. The AIA for the Tallawarra B power station included an assessment of the vertical velocity induced by the Tallawarra A power station in the existing scenario. This assessment determined that the vertical height of plumes from the Tallawarra A power station were 356 feet, which falls well below CASA's recommended height of 1031 feet.

6.5.4 Impacts

Construction

Hazardous materials

Any dangerous goods associated with the upgrade would be transported, stored and used in accordance with relevant Australian Standards and legislation. They are anticipated to largely relate to fuels and lubricants. It is anticipated that the risks associated with the dangerous goods would be appropriately mitigated and managed with the application of standard environmental controls and practices that are outlined in the Project Execution Plan and the power station's existing EMP and associated management plans. As such, the risks associated with hazardous materials are anticipated to be temporary and minimal.

Bushfire

Bushfire hazard is not anticipated to increase as a result of the construction of the proposal. Although vegetation category 1 land is located within 250 metres of the proposal area, this is surrounded by vegetation buffers and construction activities are not expected to impact this land. Potential construction activities that have the potential to increase bushfire risk, as outlined in the Bushfire Management Plan, include:

- sparks generated from hot works
- construction worker actions, such as:
  - smoking outside of designated smoking areas
  - electrical testing near gas pipelines
  - grass/ground maintenance activities
- malfunctioning of equipment
- vehicle fires.

Although these activities could increase the chances of fire, the risk of bushfire as a result of the proposal's construction is anticipated to be minimal and temporary. This is due to the buffers between the proposal area and bushfire prone land, as well as the fact that construction works would occur within the existing footprint of the Tallawarra A power station, meaning works would often be enclosed within the existing turbine halls.

Aviation risk

As the power station would be undergoing routine maintenance during the upgrade, it would not be operational and therefore there would be no aviation risk during construction from plume rise.

During construction, a 220-tonne crane would be positioned outside the power station for two days. It is anticipated that this would not pose a risk to aviation given the crane height would not exceed that of the Tallawarra A power station stack and therefore would not enter prescribed air space.

Operation

The volume and nature of fuel and hazardous materials stored and used during operation of the proposal would be consistent with current power station operations. Additionally, the operation of the proposal is not anticipated to increase the bushfire risk to the proposal area or surrounding land given operational activities would be largely consistent with current operations. As such, there would be no impact to hazardous materials or bushfire risk during the proposal's operation.

No instances of aviation risk associated with the operation of the Tallawarra A power station have been identified. The Tallawarra A power station has operated safely since its commissioning in 2009. There is potential for minimal aviation risk from plume rise compared to open cycle gas turbines, which typically produce a hotter exhaust plume that rises further and faster. However, during operation, the proposal would result in a decrease in exhaust temperature compared to current operations, and a decrease in flow rate of exhaust emissions from the stack. Therefore, operation of the proposal would not worsen aviation risk compared to existing operating conditions.

The proposal is anticipated to change the exhaust characteristics of the plume from the Tallawarra A power station slightly. The proposal would result in reduction in the Tallawarra A power station exhaust temperature, reduction in exhaust velocity and reduction in the volumetric flow rate of emissions. This is anticipated to reduce the vertical velocity of the plume at all heights, assessed on a cumulative basis with Tallawarra A and Tallawarra B power stations operating concurrently. As such, it is anticipated that the proposal would reduce aviation risk.

6.5.5 Safeguards and mitigation measures

Given there would be no hazard and risk impacts associated with the proposal, no additional hazard and risk mitigation measures are required. Given aviation risk is reduced as a result of the proposal, there are no additional mitigation measures or monitoring required to address aviation risk. The existing Tallawarra A EMP and associated management plans provide appropriate procedures and measures to manage risks from hazardous materials, asbestos, fuel spills and bushfire during and following the upgrade.

6.6 Waste

6.6.1 SEARs

The SEARs relevant to waste impacts and where the requirements have been addressed in this EIS are outlined in Table 6-23.

Table 6-23: SEARs - Waste

General requirements	Where addressed
Identification, quantification and classification of the likely waste stream to be generated during construction and operation of the project in accordance with the EPA Waste Classification Guidelines, and a description of the measures to be implemented to manage, reuse, recycle and safely dispose of waste generated by the project.	Section 6.6.2 outlines the approach to classify and quantify waste generated from the proposal in line with the NSW EPA Waste Classification Guidelines. Section 6.6.4 includes measures for the reuse, recycling or disposal of these materials. Further safeguards for waste generated from the proposal area included in section 6.6.5.

6.6.2 Methodology

A qualitive desktop assessment was carried out to estimate the waste streams, potential impacts of waste and appropriate waste management measures for the proposal, including:

- reviewing relevant legislation and guidelines in relation to waste management
- identifying potential waste generating activities during construction and operation of the proposal

- estimating the likely waste streams and quantities including wastewater and demolition materials where possible
- classifying the identified waste streams in accordance with the relevant legislation and guidelines
- describing the proposed management and handling for key waste streams
- identifying licensed waste management facilities that can lawfully accept particular waste streams/types within the Wollongong LGA.

Waste types identified in the EIS are indicative and have been identified for the purpose of determining potential waste management measures.

The NSW EPA Waste Classification Guidelines (2014) sets out a six-step process for establishing the classification of waste as set out in clause 49 of Schedule 1 of the POEO Act. It is expected that waste associated with the proposal would comprise of turbine packaging, removed turbine/compressor blades and vanes, and maintenance waste.

Building and demolition wastes are pre-classified as 'general solid waste (non-putrescible)' if they are unsegregated material (other than material containing asbestos waste or liquid waste) that results from the construction, replacement, repair or alteration of infrastructure development such as electricity infrastructure.

Segregation of waste is permitted to facilitate reuse, recycling or recovery. The following waste types listed in the NSW EPA Waste Classification Guidelines have been identified for this proposal:

- glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal
- paper or cardboard
- wood waste
- building and demolition waste.

6.6.3 Existing environment

Waste generated from the current operation of the power station is associated with servicing and repairs of the power station, and general use of on-site facilities. This includes:

- waste metal components from maintenance or repair activities
- waste oil from on-site plant and equipment maintenance
- clean up materials used in accordance with emergency response procedures for accidental spillages
- waste sewage and other wastewater
- general domestic waste generated by operational and maintenance workers.

6.6.4 Impacts

Construction

As noted in section 6.6.2, waste generated by the proposal would include decommissioned equipment such as removed turbine / compressor vanes and blades, packaging materials associated with any new equipment deliveries, and general maintenance waste. Table 6-24 outlines the estimated quantities of waste anticipated to be generated by the proposal.

Table 6-24: Waste generated from the proposal

Description	Materials	Classification	Estimated quantities (tonnes)
Turbine components	Steel (from turbines)	General solid waste (non-putrescible)	No steel waste generated by the proposal. Turbine components are to be removed from site for refurbishment and reuse.

Description	Materials	Classification	Estimated quantities (tonnes)
Packaging	Clean pallets, dunnage and other wood waste	General solid waste (non-putrescible)	Less than one tonne
	Composite wood packaging	General solid waste (non-putrescible)	Less than one tonne
	Plastic packaging	General solid waste (non-putrescible)	Less than one tonne
	Plastic wrap	General solid waste (non-putrescible)	Less than one tonne
Maintenance waste	Consistent with existing maintenance and not proposed to be handled separately.		

Where practical, waste generated by the proposal would be reused or recycled. All waste generated as part of the proposal would be managed in accordance with NSW EPA Waste Classification Guidelines and / or resource recovery orders or exemptions under the POEO Act. Table 6-25 includes a summary of the waste management plan for the proposal. The overall waste impacts of the proposal are anticipated to be minimal.

Table 6-25: Summary of waste materials and management plan

Description	Materials	Recycling or reuse options
Turbine components	Steel (from turbines)	Turbine components to be removed from site for refurbishment and reuse
Packaging	Clean pallets, dunnage and other wood waste	Reused for transporting old turbine components for refurbishment and reuse
	Composite wood packaging	Reused for transporting old turbine components for refurbishment and reuse
	Plastic packaging	Recycled where practicable
	Plastic wrap	Recycled where practicable

Operation

No additional waste would be generated during the operation of the proposal compared to current operations. The key activities with the potential to generate waste during operation of the proposal would be consistent with current operational waste. As such, there would be no operational waste impacts.

6.6.5 Safeguards and mitigation measures

Safeguards for the management of waste impacts during the upgrade maintenance outage are included in Table 6-26.

Table 6-26: Waste safeguards and mitigation measures

Impact	Mitigation measure	Responsibility	Timing
Storage and transport of waste	All waste will be assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014).	Contractor	Construction

6.7 Biodiversity

6.7.1 SEARs

The SEARs relevant to biodiversity impacts and where the requirements have been addressed in this EIS are outlined in Table 6-27.

Table 6-27: SEARs - Biodiversity

General requirements	Where addressed
An assessment of the likely biodiversity impacts of the development, in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report, and a strategy to offset any residual impacts of the development in accordance with the rules under the Biodiversity Offsets Scheme, unless the Planning Secretary and the Environment Agency Head determine that the proposed development is not likely to have any significant impacts on biodiversity values with the issuing of a BDAR waiver.	A BDAR waiver request was prepared due to there being no likely impacts to biodiversity as a result of the proposal. The BDAR waiver was submitted to DPE Biodiversity and Conservation Division and received by the Department on 4th August 2023. The requirements for a BDAR waiver are included in section 6.7.2. On 25th August 2023, it was determined that the proposal is not likely to have any significant impact on biodiversity values and therefore a BDAR is not required. The BCD determination for the proposal has been included in Appendix F.
An assessment of the likely impacts of the development on aquatic ecology, including aquatic biodiversity and key fish habitats.	Section 6.7.5 includes the aquatic biodiversity impacts of the proposal.

6.7.2 Biodiversity Development Assessment Report Waiver

It is a requirement, under section 7.9 of the BC Act, that all SSD proposals be accompanied by a Biodiversity Development Assessment Report (BDAR) prepared by an Accredited Assessor in accordance with the Biodiversity Assessment Method (BAM) (2020), unless a waiver to this requirement has been approved. For the purpose of deciding whether the requirement for a BDAR can be waived, a proposed development could be considered as unlikely to have any significant impact on biodiversity values if it:

- would not clear or remove native vegetation other than:
  - a few single trees with no native understorey in an urban context
  - planted native vegetation that is not consistent with a PCT known to occur in the same Interim Biogeographic Regionalisation of Australia (IBRA) subregion (e.g., street trees, trees in carparks, landscaping)
- would have negligible adverse impacts on threatened species or ecological communities, considering habitat suitability, abundance and occurrence, habitat connectivity, movement and water sustainability including consideration of any non-natural features, non-native vegetation and human-built structures
- would have negligible adverse impacts on protected animals because of impacts to flight path integrity.

The proposal aligns with these BDAR waiver requirements and accordingly a BDAR waiver for the proposal has been approved (refer to Appendix F).

6.7.3 Methodology

Given a BDAR waiver has been approved for the proposal, only an assessment of potential impacts to aquatic biodiversity has been carried out, in line with the SEARs.

A desktop assessment of aquatic biodiversity near the proposal area was carried out. This included a review of biodiversity communities in Lake Illawarra and a qualitative assessment of anticipated impacts to these ecosystems.

6.7.4 Existing environment

Lake Illawarra is located directly east of the proposal. The Tallawarra A power station utilises lake water as part of operations and discharges water to the lake above ambient lake temperature. Throughout operation of the power station, environmental monitoring of sea grass communities around the power station has been undertaken in accordance with EPL 555. This monitoring has consistently demonstrated that the power station has no negative impact on sea grass communities.

6.7.5 Impacts

Construction

Given the power station would not be operational during the upgrade, no discharges to Lake Illawarra would occur. Additionally, given the upgrade would occur entirely within the existing footprint of the Tallawarra A power station, there would be no impacts to aquatic ecology, including key fish habitat and aquatic biodiversity, as a result of water runoff or erosion.

As such, there would be no impacts to biodiversity as a result of the construction of the proposal.

Operation

The proposal would result in no change to the water discharges made to Lake Illawarra, including to discharge temperature or velocity. Accordingly, there would be no impacts to aquatic ecology, including aquatic biodiversity and key fish habitat, as a result of the operation of the proposal.

As such, there would be no impacts to biodiversity as a result of the operation of the proposal.

6.7.6 Safeguards and mitigation measures

No additional safeguards for biodiversity or aquatic ecology are required given there would be no impacts to terrestrial or aquatic environments from the proposal. Monitoring of the seagrass communities in Lake Illawarra would continue to be undertaken in compliance with the requirements of EPL 555.

6.8 Traffic and transport

6.8.1 SEARs

The SEARs relevant to traffic and transport impacts and where the requirements have been addressed in this EIS are outlined in Table 6-28.

Table 6-28: SEARs - Traffic and transport

General requirements	Where addressed
A qualitative assessment of the potential construction traffic and transport impacts of the project including consideration of how traffic vehicle numbers compare to a typical maintenance outage.	The construction related traffic impacts of the proposal in addition to the construction vehicle numbers associated with a typical maintenance outage are included in section 6.8.4.
Details of the number, frequency and type of construction related vehicle movements, key transport routes, proposed site access, parking arrangements and any oversize over mass movements.	These requirements are addressed in the construction section of section 6.8.4.
Details on whether the project would require any upgrades to the existing grid connection and/or existing transmission infrastructure external to the site that would require upgrades to the classified road network.	This requirement is addressed in the construction section of section 6.8.4.

6.8.2 Methodology

A qualitative assessment of traffic and transport potential impacts has been carried out to determine the construction and operational traffic and transport impacts of the proposal. This assessment included review of the environmental assessment (TRUenergy, 2007) and Traffic Management Plan (EnergyAustralia, 2022a) prepared for the Tallawarra B Power Station project. This was relevant because the construction and operation of the proposal would occur on the same lands as this development and the traffic and access conditions would be of a similar nature for both developments. This approach represented a conservative approach given that the scope of the Tallawarra B project far exceeded the scope and nature of traffic generation compared the proposal. Anticipated impacts and management approaches for the Tallawarra B project were used to inform the assessment of traffic and transport impacts of this proposal.

6.8.3 Existing environment

The proposal would involve access through the existing main access security gate from Yallah Bay Road off the Princes Highway, Wollongong. Yallah Bay Road is a two-way road with a speed limit of 80 km per hour (km/h) with varying carriageway widths. The speed limit becomes 40 km/h closer to the proposal site. Direct access to the power station from Yallah Bay Road is via an unnamed internal two-way road. Yallah Bay Road connects to the Princes Highway to the west, which has two lanes in each direction and is classified as a regional road between Unanderra and the junction with the F6 southern freeway at Yallah (Transport, 2022).

Given the industrial nature of the existing site, public and active transport options are limited within the vicinity of the proposal. There is no noted active transport access or public transport routes at the site entrance.

6.8.4 Impacts

Construction

No new access from the public road network is anticipated to be required as a result of the proposal. Site access would be via existing power station access gates on Yallah Bay Road. The key transport route to access the site would be via the Princes Highway and then Yallah Bay Road.

A typical maintenance outage at the Tallawarra A power station requires around 150 additional staff which would result in up to 360 vehicle movements per day when combined with the vehicle movements of the 30 operational power station staff. These vehicle movement numbers are expected to apply each day during the morning (AM) and evening (PM) peak periods for the duration of the two-month planned maintenance outage period.

During the upgrade, there would be a temporary increase in the number of heavy vehicles accessing the site which would be associated with the delivery of equipment needed for the proposal during the day. It is anticipated that only twelve vehicle movements would be required for the proposal in addition to the vehicle movements required for a typical maintenance outage. This would include six containers of equipment that would need to be transported to site from Port Botany and up to six container loads of equipment that would leave site following the upgrade. These containers would be transported by standard sized trucks, meaning OSOM deliveries would not be required. The trucks used to transport the six containers from Port Botany to the Tallawarra A power station are assumed to be 20 tonne Flatbed HIAB trucks.

Given the low number of vehicle movements that would be required in addition to the vehicle movements needed for the planned maintenance outage, the impacts associated with the delivery of equipment for the proposal are anticipated to be negligible.

Sufficient designated parking areas are available for all workers and for all truck movements within the proposal area, including at ancillary site 2.

Yallah Bay Road does not provide access to any residential or commercial properties. As such, overall traffic impacts as a result of minor increases in heavy and light vehicles are anticipated to be negligible as local delays would not be experienced and access to properties and local roads would not be impacted.

The proposal would not require any upgrades to the existing grid connection and/or existing transmission infrastructure external to the site. In addition, upgrades to the classified road network would not be required.

Overall traffic impacts during the construction of the proposal would be temporary and negligible.

Operation

No new access to the public road network would result from proposal operation. Vehicle movements at the proposal site would return to normal operational numbers for the power station. There would be no increase in traffic at the power station as a result of the proposal during operation. No impacts to traffic are anticipated during operation.

6.8.5 Safeguards and mitigation measures

Given the negligible impacts associated with the delivery of equipment and materials needed during the upgrade maintenance outage and given that there would be no impacts to the existing road network or nearby properties due to traffic during the operation of the proposal, no additional safeguards or mitigation measures are proposed for traffic and transport. The specifications for vehicles entering and exiting the site as outlined in the original EIS would continue to apply during the upgrade maintenance outage and subsequent continued operation of the power station.

6.9 Other impacts

This section includes qualitative assessments undertaken for the water resources, soils and contamination, visual amenity, Aboriginal heritage and non-Aboriginal heritage impacts of the proposal in accordance with the SEARs. The SEARs relevant to these impact areas are included in Table 6-29.

Table 6-29: SEARs - Other impacts

General requirements	Where addressed
A qualitative assessment of potential impacts to Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity, soils and contamination and cumulative impacts.	Qualitative assessments of the potential impacts to Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity, and soils and contamination are included in this section. The cumulative impacts of the proposal alongside other nearby projects are included in section 6.10 .

6.9.1 Aboriginal heritage

It is anticipated that there would be no impacts to Aboriginal heritage as a result of the proposal due to the following:

- The upgrade would be carried out within the existing turbine hall of the Tallawarra A power station, which is disturbed land and does not contain any potential for known Aboriginal sites. In addition, the upgrade would utilise an existing gravel based carparking area, existing hard-stand areas around office buildings and existing laydown areas that are fenced and have a concrete base. No soil disturbance would occur as part of the proposal. In the absence of clearing or ground disturbance activities, there would be no potential for impacts to Aboriginal heritage, including archaeological objects, as a result of the proposal's construction.
- Following the upgrade, normal power station operations would resume, which would involve activities within existing disturbed areas in addition to power station workers driving to and from site. As such, no impacts to Aboriginal heritage are anticipated as a result of the operation of the proposal.

As such, there would be no impacts to Aboriginal heritage as a result of the construction or operation of the proposal.

6.9.2 Non-Aboriginal heritage

There are no anticipated impacts to non-Aboriginal heritage due to the following:

- The upgrade would be carried out within the existing power station turbine hall, on an existing gravel based carparking area, on existing hard-stand areas around office buildings and on existing construction laydown areas that are fenced and have a concrete base. No soil disturbance would occur as part of the proposal. In the absence of clearing or ground disturbance activities, there would be no potential for impacts to historic heritage items. Additionally, any local or State listed heritage item is at least one kilometre away from the proposal area, meaning impacts to these items are not anticipated as a result of the proposal's construction.
- Given the upgrade would occur entirely within the existing footprint of the Tallawarra A power station, no additional safeguards or management measures are required.

As such, there would be no impacts to non-Aboriginal heritage as a result of the construction or operation of the proposal.

6.9.3 Water resources

There are no anticipated impacts to water resources as a result of the proposal due to the following:

- During the upgrade there would be no requirement for vegetation removal or earthworks. As such, there would be no potential for the proposal to result in erosion impacts to surface water. All hazardous substances would be stored and used in contained, bunded or hardstand areas to prevent the pollution of water or groundwater in the event of a spill.
- During the last maintenance outage for the Tallawarra A power station, the onsite wastewater treatment plant adequately catered for about 200 maintenance staff. As such, the onsite wastewater treatment plant would be able to cater for the anticipated maximum 150 maintenance personnel during the upgrade.
- Flooding of the proposal area is unlikely during the maintenance activities. All hazardous substances would be located and stored during the upgrade to prevent the pollution of water or groundwater in the event of a flood.
- Water would continue to be discharged into Lake Illawarra during operation, with no change to discharged water temperature or water quality.

As such, there would be no impacts to water resources as a result of the construction or operation of the proposal.

6.9.4 Visual amenity

It is anticipated that there would be no impacts to visual amenity as a result of the proposal due to the following:

- Works would mostly occur within the current power station footprint, meaning views of the power station and its surrounding landscape would not be altered during construction of the proposal.
- Temporary occupation of areas near the proposal during the upgrade is anticipated however this would largely be limited to the storage of equipment and general maintenance activities. This would only be visible to maintenance staff during the proposal's construction and would be consistent with normal scheduled maintenance periods.
- Works outside the turbine hall would include the use of the 220-tonne crane, however this would not be material to visual amenity. The crane has a maximum reach of 68 metres, which would be well below the height of the aviation lights on the existing Tallawarra A power station stack. As is outlined in section 6.5.4, the crane would not enter prescribed air space. Given that the distance to nearby receivers is around one kilometre, that the crane would only be in use for two days, and that the crane would not exceed the height of the existing stack, there are no anticipated visual impacts to sensitive receivers as a result of the use of the crane.

- During operation, the landscape character of the area surrounding the proposal area and views of the power station would not be altered as upgrades would be contained within the existing power station. Ancillary facilities would return to their previous uses, meaning the presence of upgrade materials and maintenance personnel would not affect the visual landscape during operation.

As such, there would be no visual impacts as a result of the construction or operation of the proposal.

6.9.5 Soils and contamination

There would be no impacts to soils and contamination as a result of the proposal due to the following:

- The upgrade would only involve activities being undertaken in existing cleared and previously disturbed areas. The proposal would not involve any excavation or disturbance of soils. Therefore, the proposal would present no risk of disturbance of contamination, hazardous materials, erosion of soils, generation of salinity, or any other soil-based impacts.
- The power station would resume normal operations following the upgrade, which would involve no disturbance to soils.

As such, there would be no impacts to soils or impacts as a result of contamination from the construction or operation of the proposal.

6.9.6 Safeguards and mitigation measures

Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity, and soils and contamination would not have the potential to be affected during the upgrade maintenance outage. The subsequent operation of the power station would be consistent with the current risks to these environmental aspects. No additional safeguards or mitigation measures are proposed for the management of Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity, or soils and contamination. The Tallawarra A EMP and associated management plans contain safeguards and mitigation measures that would continue to apply during and following the upgrade.

6.10 Cumulative impacts

6.10.1 SEARs

The SEARs relevant to cumulative impacts and where the requirements have been addressed in this EIS are outlined in Table 6-30.

Table 6-30: SEARs - Cumulative impacts

General requirements	Where addressed
A qualitative assessment of cumulative impacts.	A qualitative assessment of cumulative impacts from the proposal is included in section 6.10.4.

6.10.2 Methodology

In accordance with the requirements of the '*Cumulative Impact Assessment Guidelines for State Significant Projects'* (DPE, 2022b), the potential for cumulative impacts across all environmental topics assessed have been considered for the proposal.

Such cumulative impacts could arise as a result of successive, incremental, or combined effects of an activity or proposal when added to other past, current, planned, or reasonably anticipated future impacts. The resulting impact could be a greater area of impact, an increased duration of impact, or an increased magnitude of impact as a result of multiple projects occurring in parallel.

The cumulative impacts of the proposal and surrounding developments have been assessed by searching databases such as Wollongong City Council's Council Projects website and the NSW Planning Portal.

A combined aviation risk assessment (Katestone, 2023b) was carried out for the Tallawarra A and Tallawarra B power stations (Appendix C) to determine the potential cumulative plume rise from the two power stations operating concurrently pre- and post-upgrade.

6.10.3 Existing environment

Projects and developments that are considered to have the potential for cumulative impacts alongside the construction and operation of the proposal are outlined in Table 6-31. As is outlined in section 3.3, construction of the proposal is anticipated to commence in April 2024 during a scheduled routine maintenance outage. The proposal is anticipated to take two months to complete.

Table 6-31: Projects and developments with the potential for cumulative impacts

Project name	Project status	Project description	Relationship to the Tallawarra A power station upgrade
Tallawarra B Power Station MOD 2 – Consolidated Project Approval	The consolidated project approval for the Tallawarra B power station was determined on 07/12/2020. Construction is currently underway, with the power station anticipated to be operational by the Summer of 2023-24. As such, the project is anticipated to be complete prior to the commencement of the upgrade of the Tallawarra A power station.	The Tallawarra B project is the development of a fast-start open cycle power station, which in peak periods will deliver reliable power to an additional 150,000 New South Wales homes. Its construction will create 250 jobs. Tallawarra B will be Australia's first peaking power station to be powered by a blend of gas and green hydrogen with direct emissions offset.	The Tallawarra B power station is located within the same lot as the Tallawarra A power station on Yallah Bay Road, Yallah NSW. The Tallawarra B power station would be subject to the same EPL as the Tallawarra A power station (EPL 555).
Tallawarra B Power Station MOD 3 - Green Hydrogen Fuel Mix	A modification report has been prepared for MOD 3 – Green hydrogen fuel mix. This was submitted to DPE on 26th September 2023 to be put on public exhibition.	The project would provide the ability to use up to 5% green hydrogen into the fuel mix for Tallawarra B power station and to construct the associated infrastructure on site.	The Tallawarra B power station is located within the same lot as the Tallawarra A power station on Yallah Bay Road, Yallah NSW. The Tallawarra B power station would be subject to the same EPL as the Tallawarra A power station (EPL 555).
West Dapto Urban Release Area	The West Dapto Vision has been published via the Wollongong City Council projects website. This includes details of the neighbourhoods that would be built as part of this development. Stages 1 and 2 of the vision are underway. Rezoning is being carried out for Stages 3, 4 and 5 so that development can proceed in the future. As such, there would be overlap between the West Dapto development and the construction and operation of the proposal.	Wollongong City Council estimates the West Dapto Urban Release Area will provide about 19,500 dwellings and an additional population of about 56,500 people once fully developed over 50-plus years. As well as being a key source of new housing for the Illawarra in the coming decades, the West Dapto Urban Release Area will establish designated employment lands and support the growth of Port Kembla. Planning will include measures to conserve and protect the Illawarra Escarpment and the quality of waterways which feed into Lake Illawarra.	The West Dapto Urban Release Area would be located west of the Tallawarra A power station. The project covers a large area ranging from Kembla Grange in the north to Marshall Mount in the south, with the closest point to the Tallawarra A power station being around three kilometres west in Avondale.

Project name	Project status	Project description	Relationship to the Tallawarra A power station upgrade
Tallawarra Lands Project	The Bridgehill Group is progressing the approvals required for the subdivision of the balance of the land surrounding the power station, with the intention of acquiring a further 97 hectares north of Yallah Bay Road, which would then be developed in line with the NSW Government concept approval (last modified in November 2020).	In January 2020, EnergyAustralia sold approximately 21 hectares of land near the Tallawarra power station to a property development company, the Bridgehill Group. The concept approval for the project allows for the development of up to 1,257 lots. EnergyAustralia believes the land redevelopment would deliver long-term social and economic benefits for the community through the provision of affordable housing, improved local amenities and new employment opportunities.	The Tallawarra Lands Project would be located to the southwest and northeast of the Tallawarra A power station. 'Environmental lands' are included as part of plans to create a buffer between the Tallawarra Lands Project and the power station and to contain land to be managed for environmental enhancement.

6.10.4 Impacts

Construction

Cumulative construction impacts as a result of the proposal's proximity to the Tallawarra B project would be negligible given the works for both developments would occur within the existing power station footprint, which is a heavily disturbed area. Additionally, the Tallawarra B power station project would be completed prior to the upgrade of the Tallawarra A power station, meaning any impacts would not overlap. The negligible impacts of the Tallawarra B project on the water quality and aquatic habitats of Lake Illawarra and its related creeks would mean that no additional water quality impacts would occur as a result of both developments. Other construction impacts from both developments, including impacts to traffic, noise, the visual landscape, soils and heritage are anticipated to be negligible.

Cumulative construction impacts as a result of the proposal and the West Dapto Urban Release Area are anticipated to be negligible. The West Dapto development is located around three kilometres west of the Tallawarra A power station and the two developments are separated by the Princes Highway and urban areas. The West Dapto development would result in construction impacts to biodiversity through clearing, impacts to soils through excavations, traffic and transport impacts, and visual impacts through alterations to the existing landscape of the area. However, noting the distance between the West Dapto development and the proposal, and that the proposal would not result in impacts to biodiversity, soils or the visual landscape during construction, there are no anticipated cumulative biodiversity, soils or visual impacts as a result of the two developments. In addition, it is anticipated that there would be negligible cumulative construction traffic impacts as a result of the two developments, given the proposal would result in negligible construction traffic impacts and would not result in delays on the road network alongside vehicle movements from the West Dapto development.

It is not anticipated that there would be cumulative construction impacts as a result of the proposal's proximity to the Tallawarra Lands Project. Given the Tallawarra Lands Project is still in the planning phase, its construction would not coincide with that of the Tallawarra A power station upgrade, meaning no impacts would occur.

Operation

Ongoing water quality and aquatic habitat monitoring in Lake Illawarra would confirm the anticipated negligible operational impacts of the Tallawarra A and Tallawarra B developments. Additionally, ongoing air quality monitoring would confirm that the air quality impacts of both developments are minimal and are in line with relevant air quality goals and approvals, including EPL 555. As is outlined in section 6.1.4, cumulative concentrations of NO_2, SO_2, and $PM_{2.5}$ from the Tallawarra A power station, Tallawarra B power station and the background environment would be below the respective assessment criteria. Maximum 24-hour average PM_{10} concentrations would exceed the assessment criteria, due to contributions from the background environment. The operation of the Tallawarra A power station post-upgrade would not cause additional days of exceedance beyond those caused by background concentrations. There are no other anticipated operational impacts that would occur as a result of the proposal's proximity to the Tallawarra B project.

An assessment of cumulative aviation risk from plume rise at the Tallawarra A and Tallawarra B power stations (Appendix C) was undertaken by Katestone (2023b). Aviation risk from the Tallawarra A power station would be reduced by the proposal due to reductions in the temperature, exhaust velocity and volumetric flow rate of emissions from the upgraded Tallawarra A stack, as is outlined in section 6.5.4. This would result in a 25% reduction in the initial buoyancy flux of the Tallawarra A power station plume and a 6% reduction in the initial momentum flux, which would in turn result in reduced vertical velocity of the plume at all heights. The assessment therefore concluded that there would be no cumulative increase in aviation risk due to plume rise from the Tallawarra A and Tallawarra B power stations. The upgrade would reduce aviation risk.

The West Dapto development is an ongoing development, meaning the proposal is anticipated to be completed first. The West Dapto development would result in land use changes and improved socio-economic outcomes through local housing and employment benefits, however no cumulative land use or

socio-economic impacts would result alongside the upgrade of the Tallawarra A power station. As such, there are anticipated to be no operational cumulative impacts associated with the West Dapto development.

Once completed, the Tallawarra Lands Project is anticipated to provide socio-economic benefits to the Illawarra-Shoalhaven region through increased housing supply. The increased efficiency and reliability of the Tallawarra A power station as a result of the proposal would provide a benefit to nearby future housing precincts. It is not anticipated that there would be any negative cumulative impacts associated with the proximity of the proposal to the Tallawarra Lands Project. The visual appearance of the Tallawarra A power station would not be altered by the upgrade and there would be no ongoing traffic, noise or air quality impacts that are additional to the existing scenario.

6.10.5 Safeguards and mitigation measures

Given there would be negligible cumulative impacts as a result of the proposal during the upgrade maintenance outage and during subsequent power station operation, no specific cumulative impact management measures are required.

7 Management and mitigation

7.1 Existing management arrangements

7.1.1 Environmental management system and plan

EnergyAustralia maintains an Environmental Management System (EMS) that is ISO14001 certified. The Tallawarra A power station currently operates under the EMS. The existing Tallawarra A EMP and associated management plans have been prepared within the framework of the EnergyAustralia EMS.

The existing Tallawarra A EMP and associated plans have been prepared to address best-practice environmental management for the operation of the Tallawarra A power station and they take into account the requirements of the existing Tallawarra A power station development consent.

Existing management plans associated with the Tallawarra A EMP include:

- Water Quality Management Plan
- Asbestos Management Plan
- Noise Management Plan
- Operational Stormwater Management Plan
- Fish, Prawn and Jellyfish Monitoring Plan
- Air Quality Management Plan.

During and following the upgrade, the Tallawarra A power station would continue to operate under the EnergyAustralia EMS, the existing Tallawarra A EMP and the associated management plans.

7.1.2 Existing development consent requirements

Operations at the Tallawarra A power station are subject to its existing development consent number 98/784 granted by Wollongong City Council. The consent includes various environmental management requirements related to water and wastewater management, dust control, contamination management, air quality and emissions management, and noise management. The existing Tallawarra A EMP and the associated management plans take into account the requirements from the original development consent, meaning these requirements would continue to apply during and following the upgrade.

7.1.3 Original EIS environmental requirements

The existing development consent requires that the safeguards and management measures of the original EIS for the Tallawarra A power station (Pacific Power, 1998) be applied during the construction and operation of the power station. These original EIS safeguards and management measures address the management of land use, water, terrestrial biodiversity, cultural heritage, soils, contamination, the socio-economic environment, and traffic. The existing Tallawarra A EMP and the associated management plans take into account the safeguards and management measures from the original EIS, meaning these would continue to apply during and following the upgrade.

7.1.4 EPL requirements

The operation of the Tallawarra A power station must comply with the conditions in EPL 555. EPL 555 outlines a range of conditions including identification of licenced discharge points for air and water emissions, and includes monitoring requirements and limits for discharges at these locations. The EPL conditions also provide for the management of dust, wastewater treatment and application, water management, waste management, and provides for the management and monitoring of operational noise.

During and following the upgrade, the Tallawarra A power station would continue to operate in compliance with EPL 555. The EPL does not need to be amended for the proposal.

7.2 Additional safeguards and mitigation measures

Given the proposal would result in negligible and positive environmental impacts compared to the existing approved power station, minimal additional safeguards and management measures are required. Where impacts from the proposal are expected to be consistent with the existing power station approval, the existing safeguards and management measures would be adopted. Accordingly the Tallawarra A EMP and associated management plans would continue to be applied during and following the upgrade.

Additional safeguards and mitigation measures associated with the proposal are included in Table 7-1.

Table 7-1 Proposed safeguards and mitigation measures

Aspect	Safeguards and mitigation measures
General	EnergyAustralia will comply with its environmental obligations under existing approvals and authorisations for the Tallawarra A power station during the upgrade maintenance outage and throughout the subsequent operation of the power station.
General	The Tallawarra A Upgrade Outage Execution Plan would be prepared to include an environmental management framework that provides for environmental management guidance during the upgrade maintenance outage. The framework will: ■ identify how existing planning approvals and authorisations will be applied ■ identify the additional safeguards and mitigation measures that will be applied ■ define roles and responsibilities for environmental management ■ detail the environmental management requirements to be applied during the upgrade.
Air quality	Given the minor and contained nature of the proposal and given the minimal changes that are predicted post-upgrade, no additional air quality management measures are required in addition to those currently specified in the Tallawarra A EMP and associated management plans which would continue to apply during and following the upgrade.
Greenhouse gas	Given the minor greenhouse gas emissions that would occur during the upgrade, and given that post-upgrade greenhouse gas emissions would be consistent with pre-upgrade greenhouse gas emissions, no additional greenhouse gas management measures are required. The measures currently specified in the Tallawarra A EMP and associated management plans would continue to apply during and following the upgrade.
Socio-economic	The Community Liaison Management Plan would be used prior to and during the upgrade maintenance outage to guide engagement with the local community and stakeholders about the proposal, and to outline complaints management and enquiries management processes.
Noise and vibration	Best practice work strategies will be applied during the upgrade maintenance outage to minimise potential noise emissions in accordance with the ICNG. Work practices will include: ■ site inductions and worker training to promote awareness of noise generating activities and the locations of nearby sensitive receivers ■ scheduling noisy works during standard daytime hours where reasonable and feasible ■ providing a readily accessible contact point for community feedback or complaints ■ locating any stationary noisy plant away from nearby sensitive receivers and maximising shielding from intervening structures where possible.
Noise and vibration	Given operational noise is expected to be unchanged by the proposal, no additional operational noise management measures are required. Noise management and noise monitoring requirements specified in the original development consent, EPL 555 and taken into account in the Tallawarra A EMP and associated management plans would continue to apply following the upgrade.

Aspect	Safeguards and mitigation measures
Hazard and risk	Given there would be no hazard and risk impacts associated with the proposal, no additional hazard and risk mitigation measures are required. Given aviation risk is reduced as a result of the proposal, there are no additional mitigation measures or monitoring required to address aviation risk. The existing Tallawarra A EMP and associated management plans provide appropriate procedures and measures to manage risks from hazardous materials, asbestos, fuel spills and bushfire during and following the upgrade.
Waste	All waste generated during the upgrade maintenance outage will be assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014).
Biodiversity	No additional safeguards for biodiversity or aquatic ecology are required given there would be no impacts to terrestrial or aquatic environments from the proposal. Monitoring of the seagrass communities in Lake Illawarra would continue to be undertaken in compliance with the requirements of EPL 555.
Traffic and transport	Given the negligible impacts associated with the delivery of equipment and materials needed during the upgrade maintenance outage and given that there would be no impacts to the existing road network or nearby properties due to traffic during the operation of the proposal, no additional safeguards or mitigation measures are proposed for traffic and transport. The specifications for vehicles entering and exiting the site as outlined in the original EIS would continue to apply during the upgrade maintenance outage and subsequent continued operation of the power station.
Other impacts	Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity, and soils and contamination would not have the potential to be affected during the upgrade maintenance outage. The subsequent operation of the power station would be consistent with the current risks to these environmental aspects. No additional safeguards or mitigation measures are proposed for the management of Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity, or soils and contamination. The Tallawarra A EMP and associated management plans contain safeguards and mitigation measures that would continue to apply during and following the upgrade.
Cumulative impacts	Given there would be negligible cumulative impacts as a result of the proposal during the upgrade maintenance outage and during subsequent power station operation, no specific cumulative impact management measures are required.

8 Conclusion

8.1 Justification

In April 2024, the Tallawarra A power station is scheduled for servicing during a scheduled maintenance outage. During this two-month planned maintenance event, EnergyAustralia propose to replace several internal components of the power station, including gas turbine and compressor blades and vanes. The proposal would increase the nominal output of the Tallawarra A power station to 440 MW and maximum capacity up to 480 MW. Due to improvements in technology, the upgraded power station would operate more efficiently with improved reliability and would produce a lower intensity of carbon emissions without using additional fuel.

The benefits of the proposal, including the more efficient operation of the Tallawarra A power station, improved reliability in the NEM and the lower intensity of carbon emissions without the need for additional fuel, are considered to outweigh the minor adverse impacts associated with the proposal's construction and operation. While there are some minor environmental impacts, these would be minimised or avoided through the mitigation measures outlined throughout this EIS.

8.1.1 Social factors

The proposal supports the overall objectives outlined in the 2022 ISP, in the NSW Electricity Infrastructure Roadmap and in Council strategic planning documents through the improved reliability and efficiency of the Tallawarra A power station.

As is outlined in section 6.3.4, the proposal would have minor to minimal social impacts during construction (assessed under the SIA Guideline). As the upgrade would be contained within the existing footprint of the Tallawarra A power station, social and human health impacts relating to dust, noise and visual impacts are not anticipated. Additionally, only 12 vehicle movements would be required during construction in addition to the vehicle movements required for the planned maintenance outage. As such, traffic impacts are anticipated to be negligible.

The proposal would have long-term positive social benefits for the communities surrounding the Tallawarra A power station and for NSW. Social benefits would include:

- improvements to the consistency of network voltage within established parameters across the NSW electricity grid
- enhanced power station efficiency by decreasing the consumption of natural gas
- minimised greenhouse gas emissions
- enhanced energy grid security and stability to mitigate episodes of variable renewable energy production
- increased resilience of the NSW electricity grid and the NEM to support the transition from coal power stations to renewable energy
- by making Tallawarra A hydrogen capable, the upgrade increases the potential customer base for hydrogen in the Illawarra region, supporting the creation of a hydrogen industry.

Continued consultation would be carried out by EnergyAustralia with government and the community, which would include discussions on the social benefits and impacts of the proposal.

8.1.2 Biophysical factors

The proposal does not involve any clearing or ground disturbance and no impacts to threatened fauna or flora species or endangered ecological communities would result from the proposal. During the upgrade there would be no requirement for vegetation removal or earthworks. As such, there would be no potential for the proposal to result in impacts to biodiversity, soils or surface water. All hazardous substances would

be stored and used in contained, bunded or hardstand areas to prevent the pollution of water or groundwater in the event of a spill.

The proposal is likely to result in slightly higher concentrations of air pollutants at some sensitive receivers due to the likelihood of the temperature and exhaust velocity of gases discharged from the stack of the Tallawarra A power station to be reduced after the upgrade. Modelling of emissions from Tallawarra A power station in isolation both pre- and post-upgrade demonstrated that changes in ground-level pollutant concentrations at sensitive receivers as a result of the upgrade would be insignificant.

As is outlined in section 6.2.4, GHG emissions associated with the upgrade (construction) of the proposal are 0.038 kt CO_2-e. The post-upgrade operational emissions for the proposal are expected to remain the same as the pre-upgrade scenario at consistent annual capacity factors (power station run-time). As a result, there will be no increase in the GHG emissions from the operation of the turbine, assuming it operates for the same amount of time as the previous unit. The GHG intensity of the electricity generated would decrease by 6%, reducing the impact of the electricity supplied to the NEM. No impact from operational GHG emissions is expected. Overall, the proposal would result in long-term positive operational impacts due to the reduction in emissions intensity.

8.1.3 Economic factors

The estimated total capital investment value for the upgrade is approximately $39 million. This figure includes the gas turbine upgrade parts, feasibility studies, design costs, and upgrades to existing power station features. There would be economic flow on benefits as a result of the proposal due to the improved reliability and efficiency of the Tallawarra A power station, which would lead to improved security in the NEM and reduced emissions per unit of electricity produced.

8.1.4 Public interest

The proposal represents a cost-efficient private investment in energy generation that would maximise the long-term social and economic benefits, while minimising the long-term negative impacts on communities and the environment. The upgrade would result in increased efficiency of the Tallawarra A power station and improved reliability in public energy infrastructure, which would provide an overall benefit to the public, especially when considered against the minimal environmental impacts associated with the upgrade. The carrying out of the upgrade during a planned maintenance outage would minimise disruptions to the community and would mean that any environmental impacts during construction would occur concurrently and be temporary. Additionally, the proposal would make the Tallawarra A power station capable of using hydrogen as a fuel in the future, subject to separate approval, which would align with the aims of the 2022 ISP.

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

8.2 Objects of the EP&A Act

The objects of the EP&A Act and how the proposal aligns with these are outlined in Table 8-1.

Table 8-1: Objects of the Environmental Planning and Assessment Act 1979

Object	Response
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would allow for more efficient and reliable energy generation from the Tallawarra A power station. This would improve energy security in the grid and contribute to climate change outcomes in NSW. The improved energy reliability in the NEM would improve social outcomes for the people of NSW, while environmental outcomes would be improved through the lower intensity of carbon emissions produced without using additional fuel. This would result in improved natural resource management.

Object	Response
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development has been considered throughout the proposal, with the legislative context of matters of national environmental significance and greenhouse gas emissions considered in section 4, and the impact of the proposal considered in detail in section 6. Feedback from community groups and government agencies has also contributed to decision making about the proposal. This is outlined in section 5. Mitigation measures are proposed in section 6 which aim to minimise the direct and indirect impacts of the proposal, including impacts to the natural and socio-economic environments.
1.3(c) To promote the orderly and economic use and development of land.	The proposal is required to improve the efficiency and reliability of energy generation at the Tallawarra A power station. The existing footprint of the power station, including surrounding laydown areas, would be utilised for the proposal. No land use changes would be required for the proposal.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	As the proposal would be carried out entirely within the existing footprint of the Tallawarra A power station, no impacts to threatened ecological communities or native vegetation is anticipated. No soil disturbance, including the removal of vegetation, would be required, meaning impacts to ecological communities in the nearby Lake Illawarra are anticipated to be negligible. The Tallawarra A power station utilises water from Lake Illawarra for its operation. This water enters the power station through a constructed inlet canal and is returned to Lake Illawarra with a temperature that is elevated above ambient temperature. Monitoring of discharge water temperature and seagrass communities in Lake Illawarra has been undertaken throughout the operation of the power station. Monitoring would continue after the upgrade.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	There would be no impact to known Aboriginal heritage items or built heritage items during construction of the proposal. An unexpected finds procedure would be put in place during construction should any sites/items be identified. No impacts to built or Aboriginal heritage items are anticipated during the operation of the proposal.
1.3(g) To promote good design and amenity of the built environment.	As the proposal would occur entirely within the existing Tallawarra A power station, adjustments to the built environment would be limited to the internal power station components. No adjustments would be required to the external site at the power station. Upgrades to power station components would occur during a routine maintenance period and would allow the power station to produce energy more efficiently and reliably.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	The upgrade of the Tallawarra A power station would occur during a routine maintenance period. As such, the proposal would allow for the continual maintenance of the power station, while also improving efficiency and reliability. All construction and maintenance staff would be required to follow relevant health and safety protocols, including proposal specific safety procedures, during construction.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	The proposal has involved consultation with Wollongong City Council and Shellharbour City Council around the development approval pathway and the potential impacts to the environment and local communities. Additionally, consultation between EnergyAustralia and various State government agencies, including NSW DPE and the NSW EPA, was carried out to understand the requirements during the scoping and EIS phases.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	The community liaison group for the Tallawarra A power station were consulted about the upgrade to provide any input into the proposed upgrade. Further, updates were posted on EnergyAustralia's website to inform the wider community about the benefits and impacts of the proposal.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the proposal.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed in the following sections.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

The proposal would occur entirely within the existing footprint of the Tallawarra A power station. As such, impacts would be negligible in most cases. Detailed assessments were carried out to understand the air quality, greenhouse gas, noise and vibration, and socio-economic impacts of the proposal. No major adverse impacts were identified by these assessments.

Safeguards have been proposed to minimise potential impacts and to respond to stakeholder concerns and areas of scientific uncertainty. These safeguards are identified by the EIS and would be implemented during construction and operation of the proposal. No safeguards have been postponed as a result of lack of scientific certainty or as a result of a lack of information.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The proposal would not result in any impacts that would adversely affect the health, diversity or productivity of the environment for future generations. The proposal would lead to improved energy security in the market and would allow the Tallawarra A power station to produce less carbon emissions without the need for additional fuel. The proposal would also allow the power station to use hydrogen as a fuel in future (subject to separate approval), which would improve climate change and energy security outcomes for future generations.

Conservation of biological diversity and ecological integrity

The proposal would occur entirely within the existing Tallawarra A power station, meaning impacts to biological diversity and ecological integrity would be negligible. No impacts to surrounding natural vegetation are anticipated and no soil disturbance would occur that could lead to reduced water quality for aquatic ecological communities in Lake Illawarra. Although water is discharged from the power station at a higher temperature than ambient lake temperature, monitoring of discharge water temperature and seagrass communities in Lake Illawarra would continue after the upgrade. Negligible changes in air quality would result from the proposal, meaning no adverse air quality impacts to ecosystems are anticipated.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by the carrying out of a project, including air, water, land and living things.

This EIS has examined the environmental consequences of the proposal and identified safeguards and management measures to manage the potential for adverse impacts. The requirement to implement these safeguards and management measures would result in an economic cost to EnergyAustralia.

The implementation of safeguards and management measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation. The upgrade would take place with an objective of minimising potential impacts on the surrounding environment. This indicates that the proposal is being developed with an environmental objective in mind.

8.3 Conclusion

The proposal is SSD subject to assessment under Part 4 of the EP&A Act. This EIS has been prepared to address the SEARs and reflects the form and content requirements of the EP&A Regulations. This has included consideration of the objects of the EP&A Act.

The proposal as described in the EIS best meets the proposal objectives resulting in negligible changes in environmental impacts from the continued operation of the Tallawarra A power station. The objectives of the proposal are to:

- increase the efficiency in the power station
- minimise natural gas consumption
- improve the reliability of the Tallawarra A power station
- increase the maximum energy generation capacity of the Tallawarra A power station to provide network stability during the transition to renewable energy supply in NSW.

The proposal would improve the reliability, efficiency and security of electricity supply to NSW at a time when large thermal generators are being progressively retired. The proposal would increase the maximum energy generating capacity of the Tallawarra A power station from 440 megawatts to 480 megawatts, which would improve network stability during the transition to renewable energy in NSW. This increase in capacity would be achieved alongside a reduction in annual gas consumption.

The proposal is consistent and compliant with the relevant statutory requirements, including local and State strategic planning documents. The proposal would result in negligible changes to the operating conditions at the Tallawarra A power station, meaning the safeguards and management plans already in place at the power station would continue to apply post-upgrade. Additional management measures have been identified in section 7.2 to address any additional impacts as a result of the proposal.

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Appendix A: SEARs compliance table

Table A 1 details the response to requirements detailed in the SEARs (SSD-60938959).

Table A 1 Secretary's Environmental Assessment Requirements cross-reference

General requirements	Where addressed
The EIS must meet the minimum form and content requirements as prescribed by Part 8 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) and must have regard to the State Significant Development Guidelines.	This EIS has been prepared in accordance with Part 8 of the EP&A Regulation. Section 190 of the EP&A Regulation outlines the form and content requirements for an EIS. This EIS includes all information specified in this section. In addition, the EIS has been prepared in accordance with the *State Significant Development Guidelines* (DPIE, 2022) and the *Registered Environmental Assessment Practitioner Guidelines* (DPIE, 2022).
Notwithstanding the key issues specified below, the EIS must include an environmental risk assessment to identify the potential environmental impacts associated with the development. Where relevant, the assessment of key issues below, and any other significant issues identified in the risk assessment, must include: ■ Adequate baseline data ■ Consideration of the potential cumulative impacts due to other developments in the vicinity (completed, underway or proposed); and ■ Measures to avoid, minimise and if necessary, offset predicted impacts, including detailed contingency plans for managing any significant risks to the environment.	Section 6 of this EIS includes an assessment of the various potential environmental impacts associated with the proposal's construction and operation. The assessment chapters include details of the existing environment, potential construction and operational impacts, and safeguards to avoid, minimise and, if necessary, offset anticipated impacts. Section 6.10 includes the cumulative impacts associated with the proposal and other nearby developments, including safeguards to minimise these anticipate cumulative impacts.
The EIS must also be accompanied by a quantity surveyor report for capital investment value (CIV) and employment, providing: ■ A detailed calculation of the estimated CIV of the development, prepared by a AIQS certified quantity surveyor or RICS chartered quantity surveyor in accordance with *Planning Circular PS 21-020: Calculation of capital investment value*. The calculation of the estimated CIV is to be accurate at the date of application and include details of all components and assumptions from which it is derived; and ■ An estimate of the retained and new jobs that would be created during the construction and operational phases, including details of the methodology to determine the figures provided.	CIV Report provided separately to DPE. Section 3.5.1 identifies the number of construction workers required for the proposal while Section 3.5.2 discusses the number of existing and new jobs during operation and maintenance.
An assessment of any potential changes to the air emissions as a result of the construction and operation of the project in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022, or latest version).	An air quality assessment was conducted for the proposal and is included in Appendix B. Section 6.1.2 notes that the assessment of air quality impacts as a result of the proposal was carried out in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022). Section 6.1.4 outlines the potential changes to air emissions during construction from construction vehicles and commissioning of the new equipment, and during operation as a result of the recommencement of power station operations.

General requirements	Where addressed
An assessment of the likely greenhouse gas impacts of the project, having regard to the NSW EPA's Climate Change Policy and Climate Change Action Plan 2023–26 and the safeguard mechanism under the National Greenhouse and Energy Reporting Act 2007.	Section 6.2.2 notes that the GHG emissions impact assessment was undertaken with regards to the NSW EPA's Climate Change Policy and the safeguard mechanism under the *National Greenhouse and Energy Reporting Act 2007* The reformed Safeguard Mechanism was implemented on 1st July 2023. The changes require facilities with scope 1 emissions greater than 100 $ktCO_2$-e to reduce their emissions, declining to net zero by 2050. However, some scope 1 emissions are not covered, including emissions from the operation of a grid-connected electricity generator in a year covered by the sectoral baseline. This is because the electricity sector is treated differently, with the sector as a whole having an aggregated baseline. Facilities that fall in the electricity sector do not have individual baselines. Tallawarra A is registered under the National Electricity Market (NEM), and falls under this sectoral baseline. It is not expected that Tallawarra A will be impacted by the reducing baselines within the Safeguard Mechanism. Section 6.2.4 discuss the construction and operational impact of the turbine post upgrade.
An assessment of the ability of the project 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 air quality assessment was conducted for the proposal and is included in Appendix B. The assessment included the findings of the proposals' compliance with the relevant regulatory framework for air quality. In addition the relevant regulatory framework and statutory context is included in Chapter 4.
An assessment of the risks associated with the transport, handling and use of any hazardous or dangerous goods.	An assessment of the dangerous goods risks associated with the proposal is included in section 6.5.4.
An assessment of potential changes to the aviation risk from the existing Tallawarra Power Station, including any proposed measures and/or monitoring to mitigate aviation risk.	The aviation risk of the proposal was assessed in the Tallawarra A upgrade – Aviation Risk Assessment included in Appendix C. The results of this assessment are included in section 6.5.4. The assessment concluded that no mitigation measures or monitoring would be required for aviation risk.
Assessment of the likely construction noise impacts of the project under the Interim Construction Noise Guideline (DECCW, 2009).	A construction noise assessment is provided in Appendix E. Assessment of the potential construction noise impacts of the external activities of the proposal are outlined in section 6.4.5. Internal construction activities are anticipated to not have noise impacts on nearby sensitive receivers.
An assessment of the likely construction road noise impacts of the project under the NSW Road Noise Policy (EPA, 2011).	A construction noise assessment is provided in Appendix E. Assessment of the potential construction noise impacts of the proposal included noise from truck deliveries. These impacts are outlined in section 6.4.5.
Consideration of potential changes to the operational noise and vibration impacts of the existing Tallawarra Power Station.	Operational noise and vibration impacts are considered in section 6.4.5.
A qualitative assessment of the potential construction traffic and transport impacts of the project including consideration of how traffic vehicle numbers compare to a typical maintenance outage.	The construction related traffic impacts of the proposal in addition to the construction vehicle numbers associated with a typical maintenance outage are included in section 6.8.4.

General requirements	Where addressed
Details of the number, frequency and type of construction related vehicle movements, key transport routes, proposed site access, parking arrangements and any oversize over mass movements.	These requirements are addressed in the construction section of section 6.8.4.
Details on whether the project would require any upgrades to the existing grid connection and/or existing transmission infrastructure external to the site that would require upgrades to the classified road network.	This requirement is addressed in the construction section of section 6.8.4.
Identification, quantification and classification of the likely waste stream to be generated during construction and operation of the project in accordance with the EPA Waste Classification Guidelines, and a description of the measures to be implemented to manage, reuse, recycle and safely dispose of waste generated by the project.	Section 6.6.2 outlines the approach to classify and quantify waste generated from the proposal in line with the NSW EPA Waste Classification Guidelines. Section 6.6.4 includes measures for the reuse, recycling or disposal of these materials. Further safeguards for waste generated from the proposal area included in section 6.6.5.
A Social Impact Assessment prepared in accordance with the Social Impact Assessment Guideline for State Significant Projects.	A social impact assessment was prepared for the proposal in line with the Social Impact Assessment Guidelines for State Significant Projects and is included in Appendix D. The socio-economic impacts of the proposal are summarised in section 6.3.4.
An assessment of the likely biodiversity impacts of the development, in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report, and a strategy to offset any residual impacts of the development in accordance with the rules under the Biodiversity Offsets Scheme, unless the Planning Secretary and the Environment Agency Head determine that the proposed development is not likely to have any significant impacts on biodiversity values with the issuing of a BDAR waiver.	As is outlined in section 4.4.1, a BDAR waiver request was submitted to DPE due to there being no likely impacts to biodiversity as a result of the proposal. The requirements for a BDAR waiver are included in section 6.7.2. On 25th August 2023, it was determined that the proposal is not likely to have any significant impact on biodiversity values and therefore a BDAR is not required. The BCD determination for the proposal has been included in Appendix F.
An assessment of the likely impacts of the development on aquatic ecology, including aquatic biodiversity and key fish habitats.	Section 6.7.5 includes the aquatic biodiversity impacts of the proposal.
A qualitative assessment of potential impacts to Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity, soils and contamination and cumulative impacts.	Section 6.9 includes qualitative assessments of the anticipated impacts of the proposal to Aboriginal heritage, non-Aboriginal heritage, water resources, visual amenity and soils and contamination. Given the upgrade would be carried out entirely within the existing footprint of the Tallawarra A power station, the proposal is anticipated to have no impacts to each of these areas. Cumulative impacts of the proposal alongside other nearby developments are discussed in section 6.10.
The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Part 8 of the Regulation. Provide these as part of the EIS rather than as separate documents. In addition, the EIS must include high quality files of maps and figures of the subject site and proposal.	The relevant documentation, including environmental assessments, have been included as appendices to this EIS. High quality maps and figures of the subject site and proposal have been included in section 1.
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.	Consultation undertaken prior to and during the preparation of this EIS is outlined in chapter 5. Section 5.3 includes information relating to government consultation carried out and section 5.4 includes community and service provider consultation information.

General requirements	Where addressed
The EIS must detail the engagement undertaken and demonstrate how it was consistent with the *Undertaking Engagement Guidelines for State Significant Projects*. The EIS must detail how issues raised and feedback provided have been considered and responded to in the project.	Section 5.2 outlines the objectives of the consultation carried out for the proposal, including the alignment of the consultation with the *Undertaking Engagement Guidelines for State Significant Projects* (DPIE, 2022). Sections 5.3 and 5.4 outline the consultation carried out with government and community stakeholders. No issues were raised during consultation, however consultation would continue during the EIS display period and during construction.
If you do not lodge a development application for the development within 2 years of the issue date of these SEARs, your SEARs will expire. If an extension to these SEARs will be required, please consult with the Planning Secretary 3 months prior to the expiry date.	The SEARs were issued on 25th August 2023. The 2 year period has not expired.
The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this proposal. In the event of any guidelines being updated, the latest version must be applied, subject to any transitional arrangements and subject to timing of lodgement of the EIS.	Relevant guidelines, policies, and plans have been considered in developing this EIS. Section 4 outlines the statutory context relevant to the proposal. The technical assessments in Appendices B to F also discuss the relevant guidelines, policies, and plans per impact assessment.

Appendix B: Air quality assessment

Tallawarra A Power Station Upgrade: Air Quality Assessment

Prepared for:

Aurecon Australasia Pty Ltd

August 2023

Final

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Document Control

Deliverable #:	D22064-5
Title:	Tallawarra A Power Station Upgrade: Air Quality Assessment
Version:	1.0 (Final)
Client:	Aurecon Australasia Pty Ltd
Document reference:	D22064-5 Tallawarra A Power Station Upgrade Air Quality Assessment.docx
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Reviewed by:	Ricky Gellatly
Approved by:	 Ricky Gellatly 31 August 2023

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Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
°C	degrees Celsius
K	Kelvin
g/s	grams per second
g/kg	grams per kilogram
kPa	kilopascals
m	metres
m/s	metres per second
m^2	square metres
m^3	cubic metres
m^3/s	cubic metres per second
Nm^3/s	normalised cubic metres per second
Nomenclature	**Definition**
CO	carbon monoxide
N_2O	nitrous oxide
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
SO_2	sulphur dioxide
VOC	volatile organic compounds
Abbreviations	**Definition**
Air NEPM	National Environmental Protection (Ambient Air Quality) Measure
BoM	Bureau of Meteorology
CSIRO	The Commonwealth Scientific and Industrial Research Organisation
DEM	Digital Elevation Model
EPA	Environment Protection Authority
ERA	Environmentally Relevant Activity
IOA	index of agreement
NEPC	National Environment Protection Council
NPI	National Pollutant Inventory database
NSW	New South Wales
RMSE	root mean square error
TAPM	The Air Pollution Model

EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd was commissioned by Aurecon Australasia Pty Ltd on behalf of Energy Australia to conduct an air quality assessment of the Tallawarra A Power Station Upgrade Proposal. The air quality assessment has quantified the changes in predicted emission rates and air quality impacts from Tallawarra A pre- and post- upgrade, the cumulative impacts from the post-upgrade Tallawarra A Power Station in conjunction with the Tallawarra B Power Station and ambient background concentrations, and examined the incremental change in regional ozone resulting from the upgrade. This assessment will form part of the Environmental Impact Assessment required for approval.

The Tallawarra A Power Station is a combined cycle gas turbine power station located approximately 13 kilometres southwest of central Wollongong, New South Wales. Energy Australia proposes to upgrade internal components of the Power Station's gas turbine in April 2024 during a scheduled routine maintenance outage. The upgrade will increase the nominal output to 440 megawatts and increase maximum capacity up to 480 megawatts due to increased efficiency. Following the upgrade, power station operations shall resume consistent with the existing operating strategy of the power station. No additional natural gas fuel is to be used in the power station following the upgrade. Associated benefits as part of the upgrade include a reduction in emissions intensity on a per MW basis and projected benefits to carbon emissions with the new technology making the power station 'hydrogen capable'.

Regarding emissions from Tallawarra A Power Station in isolation, pre- and post-upgrade, the modelling has demonstrated that, in general, changes in concentrations as a result of the upgrade will be negligible. Contributions to annual average concentrations of NOx, SO_2 and PM_{10}, maximum 1-hour average concentrations of SO_2 and maximum 24-hour average concentrations of particulates are insignificant, with or without the upgrade. The contribution to the maximum 1-hour average NOx concentration anywhere in the model domain increases very slightly (from 70.6 µg/m^3 to 71.5 µg/m^3, an increase of just 1.3%, or 0.6% of the 164 µg/m^3 assessment criterion for NO_2), reflecting the finding that while the spatial footprint of the impacts of Tallawarra A Power Station shifts with the upgrade, the absolute magnitude of those impacts changes only very slightly. It should be noted that these are NOx concentrations; the contributions to NO_2 concentrations, and changes in NO_2 concentrations, will be much smaller (likely around 30%). Most sensitive receptors will experience a small increase in NOx concentrations, although some will experience a decrease. The change in NOx concentration at the sensitive receptor with the highest contribution (South Dapto – increase from 69.9 µg/m^3 to 71.3 µg/m^3) is just 0.9% of the 164 µg/m^3 assessment criterion for NO_2, while the largest change at any sensitive receptor (Haywards Bay – increase from 17.5 µg/m^3 to 36.7 µg/m^3) is 11.7% of the 164 µg/m^3 assessment criterion for NO_2, but the total contribution is still small and the proportion that is NO_2 will be much smaller.

Regarding cumulative total concentrations of NO_2, SO_2 and $PM_{2.5}$, incorporating the contributions of Tallawarra A Power Station post-upgrade, Tallawarra B Power Station (in the case of NO_2) and background, the assessment has demonstrated that all concentrations will be below their respective assessment criteria. Maximum 24-hour average PM_{10} concentrations exceed the assessment criterion as a result of the background contribution, however, a contemporaneous assessment in accordance with the NSW Environmental Protection Agency's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022)* demonstrates that the operation of Tallawarra A Power Station causes no additional days of exceedance beyond those caused by background concentrations. The cumulative total results indicate that no material change in impacts of any pollutant is expected due to the Tallawarra A Power Station Upgrade Proposal.

The dispersion modelling outputs will be conservative, as they assume continuous operation at full load throughout the year. Tallawarra A Power Station is limited to emitting no more than 900 tonnes/year of NOx, with or without the upgrade. This limit also applies to the combined emissions of Tallawarra A Power Station and Tallawarra B Power Station. Using the NOx emission rates modelled for every hour of the year, annual NOx emissions from Tallawarra A Power Station (post-upgrade) would be 901 tonnes, while those from Tallawarra B

Power Station would be 1,125 tonnes. The total, 2,026 tonnes, is 2.3 times the load limit of 900 tonnes/year. As such, modelled annual average contributions from the power stations are likely at least 2.3 times higher than will actually occur, and it is very likely that short-term maximum concentrations are over-predicted. It is anticipated that TAPS will operate with a capacity factor of less than 50%, while TBPS is anticipated to operate with a capacity factor of approximately 9.1%, which together will result in annual NOx emissions well below the 900 tonnes/year limit.

A level 1 screening assessment for ground-level ozone impacts has demonstrated that the incremental change in ozone concentrations will be well below the 1 ppb screening thresholds, thus no further assessment is required.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by Aurecon Australasia Pty Ltd (Aurecon) on behalf of Energy Australia (EA) to conduct an air quality assessment of the Tallawarra A Power Station Upgrade Proposal (the Project). The air quality assessment will form part of the Environmental Impact Assessment (EIS) required for approval.

The Tallawarra A Power Station (TAPS) is a combined cycle gas turbine (CCGT) power station located approximately 13 kilometres south of Wollongong, New South Wales. EA proposes to upgrade internal components of the TAPS gas turbine in April 2024 during a scheduled routine maintenance outage. The upgrade will increase the maximum capacity from 440 MW to 480 MW due to increased efficiency. As a consequence, the nominal output will increase to 440 MW from 400 MW. Following the upgrade, power station operations shall resume consistent with the existing operating strategy of the power station. No additional natural gas fuel will be used in the power station following the upgrade.

Katestone has previously completed air quality, greenhouse gas and plume rise assessments for the Tallawarra B Power Station (TBPS), which is currently being constructed directly beside TAPS and is scheduled for completion in 2023. TBPS is an approved peak load gas-fired power station with a nominal output of up to 450 MW. This assessment has included the TBPS to account for potential cumulative air quality impacts alongside TAPS.

This report details an air quality assessment of the TAPS Upgrade Proposal, prepared in accordance with the updated *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (EPA, 2022). The assessment aims to quantify the effect of the TAPS upgrade on air quality using site representative data and information, as well as cumulative impacts through inclusion of both TBPS and ambient background concentrations of air pollutants. The assessment has been undertaken for the following air pollutants:

- Potential impacts on local air quality:
    - NO_x as nitrogen dioxide (NO_2)
    - Solid particles as PM_{10} and $PM_{2.5}$
    - Sulphur dioxide (SO_2)
- Potential impact on regional air quality:
    - Ozone (O_3) (includes consideration of emissions of carbon monoxide (CO) and volatile organic compounds (VOCs)).

2. PROJECT DESCRIPTION

TAPS is an existing CCGT power station commissioned in 2009 that is owned and operated by EA. The station currently operates with a maximum generation capacity of 440 MW, sufficient to supply electricity for up to 200,000 homes. EA proposes to increase the maximum potential output to 480 MW, through the replacement of several internal components of the power station during a scheduled maintenance outage in April 2024.

Specific features of the upgrade include:

- Replacement of existing compressor blades and vanes
- Upgrade of the clutch between the gas turbine generator and the steam turbine
- Overhauling the steam turbine valves, steam turbine sealing and installing updated safety valves
- Replacement of components within the existing gas turbine hall, including the exhaust gas housing and secondary environmental burner slot.

The proposed upgrade will contribute to increasing the efficiency and reliability of TAPS. Newer technology and upgraded materials will increase power generation efficiency, as well as improving network stability. Major outage intervals would increase from 5 to 8 years, whilst the likelihood of unplanned downtime would reduce.

In recovering additional energy, the upgrade will result in some changes to stack emission parameters for TAPS. The emissions will have a lower temperature and will thus be less buoyant and will have a lower volume flow rate and exit velocity. These changes will affect the dispersion of emissions from the stack at TAPS, as well as changing the pollutant emission rates slightly (when applying the concentrations limits from the facility's license – see Section 3.4).

The impact assessment criteria in the Approved Methods were revised in 2022, providing stricter criteria for relevant pollutants.

Dispersion modelling for TAPS pre- and post- the proposed upgrade was performed to assess the likely changes in predicted ground-level concentrations of air pollutants.

The previous air quality assessment of TBPS (Katestone report D19105-5, 2020), which included cumulative assessment of both TBPS and TAPS with ambient backgrounds and considered the impacts from installation of a modified plume dispersion device (PDD), showed no predicted exceedances of the relevant impact assessment criteria. Since that initial report, EA has selected a preferred supplier of the TBPS gas turbine and PDD. EA's preferred supplier produced an optimised design of the PDD ensuring that the vertical velocity of the plume meets the requirements of the Civil Aviation Safety Authority (CASA). The redesigned PDD was assessed via dispersion modelling (Katestone report D22061-1, 2023) and the outcomes compared to those of the previous air quality assessment of TBPS (Katestone report D19105-5, 2020).

Nitrogen oxides (NOx) is the only pollutant for which an emissions limit is applied to TBPS, thus modelling of emissions from TBPS focussed on NOx emissions, and resultant nitrogen dioxide (NO_2) concentrations. The revised modelling determined that cumulative ground-level concentrations of NO_2 due to TBPS and TAPS would be broadly in line with the results of the previous assessment and would comply with the relevant air quality standards for NO_2. TBPS has been included in this assessment of TAPS for cumulative NO_2 based upon the recent modelling carried out by Katestone.

3. LEGISLATIVE FRAMEWORK FOR AIR QUALITY

3.1 Overview

The regulation of air pollution in NSW is provided for in the *Protection of the Environment (Operations) Act 1997* (POEO Act), which is underpinned by a number of regulatory instruments that address air quality including:

- *Protection of the Environment Operations (Clean Air) Regulation 2022* (Clean Air Regulation) – imposes generic operational requirements for activities and plant.
- Environmental Protection Licence (EPL) – A licence held by the operator of a scheduled activity that details the activities that may be carried out at the premises and the conditions that must be met to retain that permission.
- Approved Methods for Modelling – provides statutory requirements for the assessment and modelling of air emissions from a premises.
- *Approved Methods for Sampling and Analysis of Air Pollutants in NSW* (Approved Methods for Sampling) – provides statutory requirements for the measurement of air emissions from a premises.
- Load-based licensing (LBL) – an incentive-based scheme where license fees are linked to pollutant loads.

3.2 Protection of the Environment (Operations) Act 1997

The POEO Act provides a framework for the:

- Licensing and imposition of licence conditions by NSW EPA in relation to activities that are defined under Schedule 1 of the POEO Act
- Development of Protection of the Environment Policies
- Definition of offences and penalties in relation to air pollution under Sections 124-129
- Definition of offences relating to licensing and conditions
- Development of regulations and guidelines that promulgate impact assessment criteria and emission standards for industry
- Provision of a mechanism for public participation in the environmental assessment of activities that may be licensed by NSW EPA, in conjunction with the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The management of air pollution in NSW is dealt with in *Part 5.4* (sections 124-135) of the POEO Act. This includes the general requirement that non-residential premises do not cause air pollution by failing to operate or maintain plant, carry out work or deal with materials in a proper and efficient manner (sections 124-126).

Section 128 of the POEO Act requires each premises to comply with any air emission standards prescribed by applicable regulations; where standards are not prescribed for a particular air impurity, all practical means must be taken to prevent or minimise air pollution. The Clean Air Regulation specifies emission standards that are relevant to Section 128 of the POEO Act.

3.3 Clean Air Regulation

Section 128 of the POEO Act relates to standards of concentration that apply to point sources:

> *128 Standards of air impurities not to be exceeded*
>
> *(1) The occupier of any premises must not carry on any activity, or operate any plant, in or on the premises in such a manner as to cause or permit the emission at any point specified in or determined in accordance with the regulations of air impurities in excess of:*
>
> *(a) the standard of concentration and the rate, or*
>
> *(b) the standard of concentration or the rate,*
>
> *prescribed by the regulations in respect of any such activity or any such plant.*

The Clean Air Regulation prescribes standards of concentration for certain activities and plant in NSW. The standards of concentration are in-stack emission limits and are the maximum emissions permissible from prescribed activities anywhere in NSW. Limits are based on levels that are achievable through the application of reasonably available technology and good environmental practices. The standard of concentration depends on the Group, which is defined by Section 32 of the Clean Air Regulation. The following Group is relevant to the subject premises:

> *(f) belongs to Group 6 if it commenced to be carried on, or to operate, on or after 1 September 2005, as a result of an environment protection licence granted under the Protection of the Environment Operations Act 1997 pursuant to an application made on or after 1 September 2005.*

The Clean Air Regulation defines standard fuels as follows:

> *standard fuel means any unused and uncontaminated solid, liquid or gaseous fuel that is:*
>
> *(a) a coal or coal-derived fuel (other than any tar or tar residues), or*
>
> *(b) a liquid or gaseous petroleum-derived fuel, or*
>
> *(c) a wood or wood-derived fuel, or*
>
> *(d) bagasse.*

While the Clean Air Regulation prescribes a minimum level of performance for plant and equipment, stricter limits can be applied by the EPA through the conditions of an EPL.

The Clean Air Regulation standards of concentration for electricity generation for Group 6 activities are summarised in Table 1. The Clean Air Regulation standards of concentration apply at all times except during start-up and shutdown. Whilst regulations in other jurisdictions (e.g., Industrial Emissions Directive 2010/75/EU) allow exceedances to occur for short time periods, the Clean Air Regulation does not allow exceedances to occur. Other than during start-up and shutdown.

Table 1 Clean Air Regulation standards of concentration for electricity generation for Group 6 Activities relevant to the Project

Air impurity	Activity or plant	Standard of concentration
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 [a] mg/m³
Table note: [a] Reference conditions are dry, 273K, 101,3kPa, 15% O_2		

3.4 Environmental Protection License

An EPL permits the holder of the licence to undertake an activity that is included in Schedule 1 of the POEO Act. The EPL specifies the intensity of the activity that can be undertaken and the conditions that must be met whilst the activity is undertaken with respect to regulating the activity's environmental impact.

EA operates TAPS under EPL 555 (2021) which includes the following in relation to air quality:

- Identification of discharge points for setting emission limits and monitoring requirements
- Limit conditions that specify the maximum concentration that may be emitted from a discharge point
- Load limits that specify the maximum annual pollutant discharge allowed from the premises
- Operating conditions that, for activities utilising standard fuels, tend to reflect the requirements to maintain plant and equipment and deal with materials in a proper and efficient manner
- Monitoring conditions that specify the frequency and method required to monitor emissions of air pollutants from discharge points
- Reporting conditions.

Load limits and discharge concentration limits as specified in EPL 5555 have been reproduced in Table 2 and Table 3 EPL 555 Concentration limits, respectively.

Table 2 EPL 555 Load limits

Assessable Pollutant	Load limit (kg)
Nitrogen Oxides (Air)	900,000
Fine particles (Air)	100,000
Sulphur oxides (Air)	150,000

Table 3 EPL 555 Concentration limits

Pollutant	Unit of measure	100th percentile concentration limit	Ref. Conditions	Oxygen correction	Averaging period
Nitrogen Oxides	ppm	25	Dry, 273K, 101.3 kPa	15%	1 hour block
Sulphur Oxides	ppm	3	Dry, 273K, 101.3 kPa	15%	1 hour block
Solid Particles	mg/m³	10	Dry, 273K, 101.3 kPa	-	1 hour minimum

TBPS was given approval by the NSW Government Minister for Planning under the *Tallawarra B Gas Turbine Power Station Consolidated Project Approval* (2020) and was declared on 20 November 2018 to be a critical State significant infrastructure (SSI) project. The Approval specifies the same concentration limit for nitrogen oxides as EPL 555 and that the combined load limit from TBPS and TAPS must not exceed 900 tonnes/year of nitrogen oxides.

3.5 Approved Methods for Modelling

In NSW, air quality impact assessments of new activities or amendments to existing activities are carried out in accordance with the Approved Methods for Modelling, which lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources. The Approved Methods for Modelling is subordinate legislation under Part 4 of the Clean Air Regulation.

The Approved Methods for Modelling lists the statutory methods for modelling and assessing emissions of air pollutants from major projects in NSW. The Approved Methods for Modelling is referred to in:

- Conditions attached to statutory instruments including environmental assessment requirements under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act)
- Part 5: Air Impurities Emitted from Activities and Plant in the Clean Air Regulation.

In general, the Approved Methods for Modelling includes information and methods for the following:

- Preparation of emissions inventory data
- Preparation of meteorological data
- Accounting for background concentrations and dealing with elevated background concentrations
- Dispersion modelling
- Interpretation of dispersion modelling results
- Impact assessment criteria for:
    - Sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), $PM_{2.5}$, PM_{10}, carbon monoxide (CO) and hydrogen fluoride (HF)
    - Individual and complex mixtures of toxic air pollutants
    - Individual and complex mixtures of odorous air pollutants
- Modelling of chemical transformation
- Procedures for developing site-specific emission limits, including hydrogen sulfide.

The Approved Methods was updated in 2022 to incorporate recent changes to the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) with regards to ambient standards for nitrogen dioxide, sulphur dioxide and ozone.

This air quality assessment has been conducted in accordance with the Approved Methods for Modelling. Impact assessment criteria that are relevant to the assessment are presented in Table 4.

Table 4 Impact assessment criteria (Approved Methods for Modelling)

Pollutant	Averaging period	Impact assessment criterion (µg/m³)
NO_2	1-hour	164
	Annual	31
PM_{10}	24-hour	50
	Annual	25
$PM_{2.5}$	24-hour	25
	Annual	8
SO_2	1-hour	286[a]
	1-hour	215[b]
	24-hour	57

Table notes:
[a] This impact assessment criterion applies to assessments prepared before 1 January 2025
[b] This impact assessment criterion applies to assessments prepared after 1 January 2025, included for future reference

The Approved Methods for Modelling requires that an air quality assessment addresses the potential for cumulative impacts with existing activities by the addition of site specific or site representative background concentrations of specific air pollutants; those relevant to this assessment are NO_2, $PM_{2.5}$, PM_{10}, and SO_2. However, in reality, the key pollutant of concern from the combustion of natural gas is NOx; emissions of particulates and SO_2 tend to be negligible in comparison. This is reflected in the Tallawarra B Consolidated Project Approval, which sets an emission concentration limit and combined load limit for NOx only.

3.6 Secretary's Environmental Assessment Requirements (SEARs)

SEARs for the Project were received on 25 August 2023 (SSD-60928959). The SEARs stipulate the following requirements for the EIS with respect to air quality:

1) An assessment of any potential changes to the air emissions as a result of the construction and operation of the project in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022, or latest version)

2) An assessment of the likely greenhouse gas impacts of the project, having regard to the NSW EPA's *Climate Change Policy and Climate Change Action Plan 2023–26* and the safeguard mechanism under the *National Greenhouse and Energy Reporting Act 2007*

3) An assessment of the ability of the project 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).*

This assessment has addressed the requirements stipulated in the SEARs as follows:

- SEARs Air quality requirement 1: Changes in emissions due to the operation of the Project are discussed in Section 6 and Section 7. The assessment has followed the approach described in the Approved Methods for Modelling.
- SEARs Air quality requirement 2: Addressed separately in Chapter 6 of the EIS.
- SEARs Air quality requirement 3: The air quality assessment has evaluated the Project's compliance with the air quality criteria defined in the Approved Methods for Modelling which is subordinate to the Clean Air Regulation, with the outcomes discussed in Section 7 and Section 8.

4. AIR QUALITY ASSESSMENT METHODOLOGY

4.1 Existing environment

The assessment includes an analysis of the characteristics of the existing environment (Section 5) in the dispersion modelling domain of 36 x 36 km, roughly centred on the Project, that are important for the dispersion of air pollutants and that may influence the level of air pollutants at sensitive receptors. Characteristics include terrain features, regional land uses, existing sources of emissions, existing ambient pollutant concentrations and the locations of sensitive receptors relative to the sources.

4.2 Operational emissions

Emissions have been characterised for the TAPS and TBPS exhaust stacks based on operational information provided by Aurecon and EA, and EPL limits. EPL 555 for TAPS specifies load and concentration limits for nitrogen oxides, fine particles (PM_{10} and $PM_{2.5}$) and sulphur oxides (SO_x assumed to be 100% SO_2). The upgrade will not cause TAPS to emit any other air pollutants. Therefore, this assessment has focused on quantifying emissions of these pollutants from the TAPS stack and their potential impacts in terms of concentrations at ground-level. The assessment has also considered cumulative impacts associated with contributing emissions of NO_x from the TBPS stack, and ambient background concentrations for NO_2, PM_{10}, $PM_{2.5}$ and SO_2.

Emissions parameters for TAPS (with and without upgrade) and TBPS including combustion mass flow rate, exhaust temperature, stack gas moisture and oxygen contents, stack height, stack internal diameter and coordinates have been provided by Aurecon and EA.

Flow rates were normalised to standard temperature and pressure (STP) (273.15 K, 101.3 kPa) and corrected to zero percent moisture and 15% oxygen content. Emission rates in grams/second were then calculated by multiplying the normalised and corrected flow rate for each stack by the respective EPL concentration limits (in mg/Nm^3) for each pollutant. $PM_{2.5}$ was conservatively assumed to equal 100% of PM_{10}.

Emissions from the stack sources have been modelled to occur for every hour of the year in order to quantify potential impacts under all possible meteorological conditions over a 12-month period. Considering the NOx load limit that applies to both TAPS and TBPS, and their anticipated capacity factors of approximately 50% and 35%, respectively, this represents a worst-case assumption.

A detailed emissions inventory including all stack characteristics and emission rates is provided in Section 6.

4.3 Meteorology

A site representative three-dimensional meteorological wind field was developed using the TAPM model, in accordance with Level 2 requirements stipulated in the Approved Methods for Modelling.

Meteorological data for the period 2018 – 2022 from the Bureau of Meteorology's (BoM) Albion Park station and the NSW Department of Planning and Environment (DPE) monitoring station at Kembla Grange and Wollongong were examined to determine a suitably representative year for modelling purposes. Years 2018 and 2021 were identified as suitable representative years. Initial screening level modelling was performed to examine ground-level concentrations of air pollutants from TAPS for both meteorological years. 2018 was found to predict higher ground-level concentrations at sensitive receptors compared to 2021, and so was adopted as the representative year for modelling, lending further conservatism to the modelling predictions. Appendix A1.1 describes the analytical process undertaken to determine a meteorological year for modelling.

Observational hourly meteorological data for wind speed and wind direction from the Albion Park, Kembla Grange, and Wollongong monitoring stations was incorporated into the TAPM modelling. Details of the TAPM configuration are provide in Appendix A1.2.

A summary of the site-specific meteorology derived using TAPM is detailed in Section 5.5.

4.4 Dispersion modelling

Dispersion modelling was conducted using TAPM to predict ground-level concentrations of NO_2, SO_2, and PM (as PM_{10} and $PM_{2.5}$) across a 36 x 36 km model domain centred on TAPS. Predicted ground-level concentrations of each pollutant were then extracted for each grid point within the modelling domain, with concentrations at sensitive receptors being represented by the nearest grid point. Dispersion modelling was performed for TBPS and TAPS pre- and post- the proposed upgrade so that both cumulative impacts and changes in impacts following the upgrading of TAPS can be determined.

The TAPM dispersion model configuration and method for extracting and generating results, both in isolation and cumulatively, are detailed in Appendix A2.

4.5 Nitric oxide to nitrogen dioxide conversion

NO_x in exhaust plumes is made up of both nitric oxide (NO) and nitrogen dioxide (NO_2). Typical NO/NO_2 ratios at the point of release to the atmosphere are 90%:10%. Once in the atmosphere NO can undergo chemical transformation to form NO_2. The rate at which this conversion occurs depends on the reactivity of the atmosphere and time since release from the source.

NO_2 is more toxic than NO and this is the reason why NO_2 has air quality assessment criteria, rather than NO. As NO_x emitted from TAPS is primarily NO, it is important to adequately quantify the transformation of NO to NO_2 for comparison with the assessment criteria.

The Approved Methods for Modelling has a tiered methodology for quantifying the NO/NO_2 reactions. In this assessment Method 2 has been used, that is; conversion of NO to NO_2 using hourly ground-level model predictions of NO_x alongside hourly background concentrations of NO_2 and O_3 within the ozone limiting method (OLM) calculation:

$$[NO2]total = \{0.1 \times [NOx]pred\} + MIN\{(0.9) \times [NOx]pred \text{ or } (46/48) \times [O3]bkgd\} + [NO2]bkgd$$

Where:

- [NO2]total = the predicted concentration of NO2 in µg/m^3
- [NOx]pred = the dispersion model prediction of the ground-level concentration of NOx in µg/m^3
- MIN = the minimum of the two quantities within the braces
- [O3]bkgd = the background ambient O3 concentration in µg/m^3
- (46/48) = the molecular weight of NO2 divided by the molecular weight of O3 in µg/m^3
- [NO2]bkgd = the background ambient NO2 concentration in µg/m^3

Timeseries of 1-hour average ground-level concentrations of NO_x were extracted from the TAPM model for all grid points within the domain and the OLM method was applied to concentrations predicted at each grid point. Concurrent background concentrations were derived from the NSW DPE Kembla Grange monitoring station for 2018 for NO_2 and O_3. Concentrations in parts per hundred million (pphm) were converted to µg/m^3 at 0 ˚C and 1 atmosphere, using the conversion factors from the Approved Methods for Modelling.

The OLM method has been applied to calculate cumulative total concentrations; for the comparison of results for TAPS in isolation pre- and post-upgrade, total modelled NOx concentrations are presented, which is equivalent to the very conservative assumption that 100% of NOx is converted to NO_2.

4.6 Cumulative impacts

The Approved Methods for Modelling requires that assessments account for cumulative impacts at sensitive receptors, including both contributions from the assessment site, surrounding industries when possible, and an ambient background. This assessment has examined cumulative impacts of the TAPS (post-upgrade) stack emissions through inclusion of NO_x emissions associated with TBPS in the TAPM dispersion model and addition of ambient background concentrations to TAPM predicted ground-level concentrations for NO_2, PM_{10}, $PM_{2.5}$, and SO_2.

The assessment of cumulative ground-level concentrations of NO_2, SO_2, and PM_{10} has been conducted using the Level 2 assessment methodology outlined in the Approved Methods for Modelling, that is; the hourly average background concentration is added to the hourly dispersion model predictions for the modelled calendar year (2018) (contemporaneous assessment). A Level 1 assessment methodology from the Approved Methods for Modelling has been adopted for assessing $PM_{2.5}$ concentrations, applying the maximum ambient background to the maximum concentration at a sensitive receptor predicted by the model.

Background data considered in the assessment is discussed in more detail in Section 5.4.2.

4.7 Ozone impacts

Ozone is a secondary air pollutant formed in the atmosphere from reactions of NOx, CO and VOCs with sunlight. Assessment of the potential for the TAPS upgrade to increase ozone formation has been conducted through a level 1 screening assessment. The level 1 screening assessment has been conducted in accordance with the *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources* (Environ Australia Pty Ltd, 2011) (Tiered Ozone Procedure) using the *Level 1 Screening Procedure Tool for Estimating Ground-Level Ozone Impacts from Stationary Sources in the NSW Greater Metropolitan Region v3.0*.

The level 1 screening assessment estimates the incremental change in ozone due to a new emission source and the cumulative ozone concentrations due to the new emission source in conjunction with existing sources within the Sydney Greater Metropolitan Region (GMR) Airshed.

The tool requires the user to enter:

- Source region (Newcastle, Sydney Central/East/West or Wollongong)
- Daily emissions of NOx, CO and VOCs
- VOC input options (default reactivities or users specified)
- Whether the source in an ozone attainment or non-attainment area.

The assessment criteria that determine whether a level 2 ozone assessment is required are as follows:

- Maximum allowable increment (1-hour average) – 1 ppb
- Maximum allowable increment (4-hour average) – 1 ppb.

Pre-upgrade, the NOx emission rate from TAPS is 28.1 g/s (Table 13), or 2.424 tonnes/day if operating at full load for the full 24 hours. The NOx emission rate from TAPS post-upgrade is 28.6 g/s (Table 13), or 2.470 tonnes/day if operating at full load for the full 24 hours. The difference between these two daily values, 0.045 tonnes/day (or 1.87%), has been entered into the tool as the incremental change in NOx emissions as a result of the upgrade.

The increase in emissions of CO and VOCs as a result of the upgrade has been assumed to also be 1.87%. Reported NPI emissions data for 2018/2019 for TAPS for these pollutants (73,151 kg of CO and 10,236 kg of VOCs) has been multiplied by 1.87% to determine the incremental change in emissions of these pollutants, equating to 0.01 tonnes/day of CO and 0.001 tonnes/day of VOCs.

4.8 Limitations and uncertainty

A limitation of this study is that it relies on the accuracy of a number of data sets that feed into the dispersion model. These data sets have been sourced from the following:

- Meteorological monitoring observations from the Bureau of Meteorology and NSW DPE
- Air quality monitoring observations from the NSWDPE
- Synoptic and surface information datasets from CSIRO
- Land-use from aerial imagery
- Computational fluid dynamics modelling outputs provided for the modified PDD.

It is also important to note that numerical models are based on an approximation of governing equations and will inherently be associated with some degree of uncertainty. The more complex the physical model, the greater the number of physical processes that must be included. There may be physical processes that are not explicitly accounted for in the model and, in general, these approximations tend to lead to an overprediction of air pollutant levels.

The dispersion modelling assessment has also incorporated a number of worst-case assumptions, which are likely to have resulted in an over-prediction of pollutant concentrations, including:

- No conversion of NO_x to NO_2 applied for TAPS results presented in isolation (as in Section 7.1)
- Assumed emission rates of $PM_{2.5}$ equal to 100% of PM_{10}
- Utilisation of EPL 555 emission concentration limits. These are 1-hour average absolute limits which are not to be exceeded. As such, TAPS can be expected to consistently emit pollutant concentrations below these limits.
- Modelling of emissions from TAPS and TBPS assuming continuous operation at 100% load throughout the year. As discussed in Section 6, this will overstate annual NOx emissions by at least a factor of 2.3. It is also likely to result in an over-prediction of maximum short-term impacts.

5. EXISTING ENVIRONMENT

5.1 Climate

A summary of climate statistics from the closest Bureau of Meteorology (BoM) weather station to TAPS, Albion Park Airport (4km south), is provided in Table 5.

The Illawarra region is classed as having a temperate climate with warm summers and cool winters. This is shown in the Albion Park Airport data (1999-2023) with January being the warmest month with a mean maximum temperature of 27.0°C. July is the coldest month with a mean minimum temperature of 6.3°C. Rainfall occurs all year round, but greatest in November to March, and the annual average total rainfall is almost 1 m, with 123 days of rain, on average.

Table 5 Climate statistics from BoM Albion Park (1999-2023)

Climate Summary	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (°C)	27.0	26.3	25.2	23.3	20.6	18.1	17.7	18.9	21.3	23.0	24.0	25.6	22.6
Mean minimum temperature (°C)	17.1	17.2	15.7	12.2	9.0	7.3	6.3	6.6	8.6	11.0	13.4	15.3	11.6
Mean daily solar exposure MJ/(m*m)	21.7	18.8	16.0	13.2	10.1	8.3	9.6	12.8	16.5	19.2	20.3	21.9	15.7
Mean rainfall (mm)	82.6	152.5	152.3	74.8	64.9	85.1	73.2	57.7	44.8	76.1	80.8	63.2	998.1
Mean number of days of rain	11.5	12.2	13.2	10.9	8.3	9.8	7.6	7.7	8.4	10.5	12.0	11.3	123.4

5.2 Local terrain and land-use

The proposed development is located approximately 13 km southwest of central Wollongong, on the western shore of Lake Illawarra. The area has a distinct geography, with the Pacific Ocean to the east and the Illawarra Escarpment to the west, running roughly north-south.

The Escarpment has a peak elevation of 750 m and rises sharply. A coastal strip separates the escarpment and the Pacific Ocean and is where the urban areas of Wollongong, Port Kembla, Shellharbour and Albion Park are located. These areas are to the northeast, east, southeast and south of TAPS, respectively.

To the northwest, west and southwest of TAPS are areas of shrubland and agricultural lands leading to the foothills of the Escarpment. A number of small hills (< 100 m elevation) are located throughout the coastal strip along with the Lake Illawarra saltwater lagoon.

A map of the elevation in the region surrounding TAPS is shown in Figure 1.

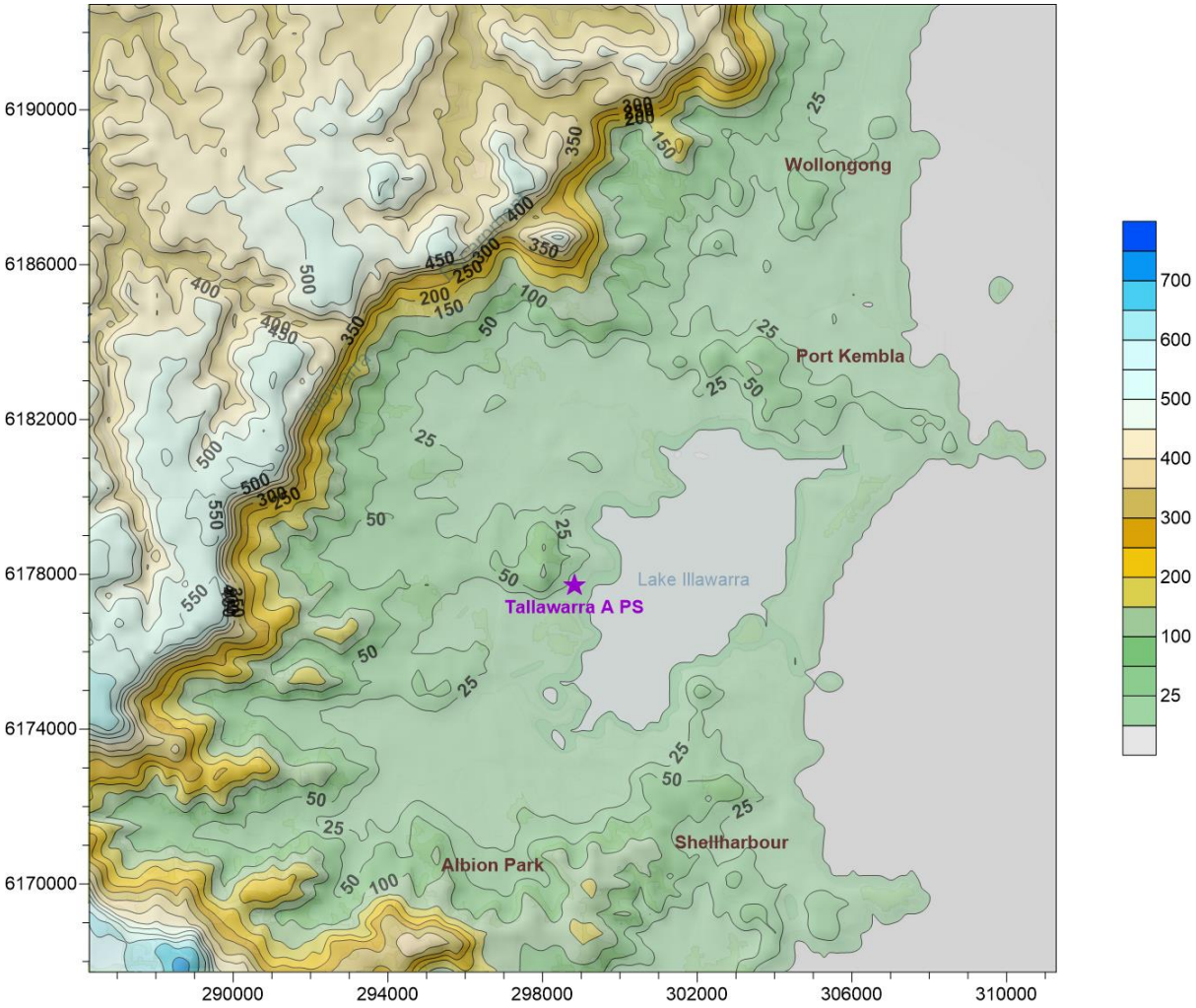

Figure 1 Terrain of the study area

5.3 Sensitive receptors

Sensitive receptor locations within the assessment domain are detailed in Table 6 and are shown in Figure 2. Concentrations of air pollutants have been predicted at these sensitive receptor locations to determine the potential air quality impacts from the TAPS upgrade. The receptors represent the surrounding residential and industrial areas of the Illawarra region.

Table 6 Nearest sensitive receptors to TAPS

Sensitive Receptor	Description	Easting (m)	Northing (m)	Distance (km) and direction from TBPS	
Albion Park	Residential	296051	6171146	7.1	S
Avondale	Residential	292500	6178500	6.4	WNW
Barrack Heights	Residential	303400	6173600	6.2	SE
Berkeley	Residential	301742	6182021	5.2	NE
Dapto	Residential	298312	6180462	2.8	N
Haywards Bay	Residential	297805	6175901	2.1	S
Horsley	Residential	296246	6180890	4.1	NW
Lake Heights	Residential	304198	6181670	6.7	NE

Sensitive Receptor	Description	Easting (m)	Northing (m)	Distance (km) and direction from TBPS	
Mt Warrigal	Residential	301663	6175568	3.6	SE
Oak Flats	Residential	299699	6174298	3.5	SSE
Primbee	Residential	305000	6179700	6.5	ENE
Pt Kembla	Industrial	306388	6182309	8.8	NE
SE Dapto	Residential	299500	6178500	1.0	NNE
Shellharbour	Residential	303379	6170406	8.6	SE
South Dapto	Residential	297604	6178064	1.3	WNW
Unanderra	Residential	302522	6185451	8.6	NE
Windang	Residential	304029	6177337	5.2	ESE
Wollongong	Residential	305562	6187244	11.7	NE
Yallah	Residential	297000	6175785	2.8	SW

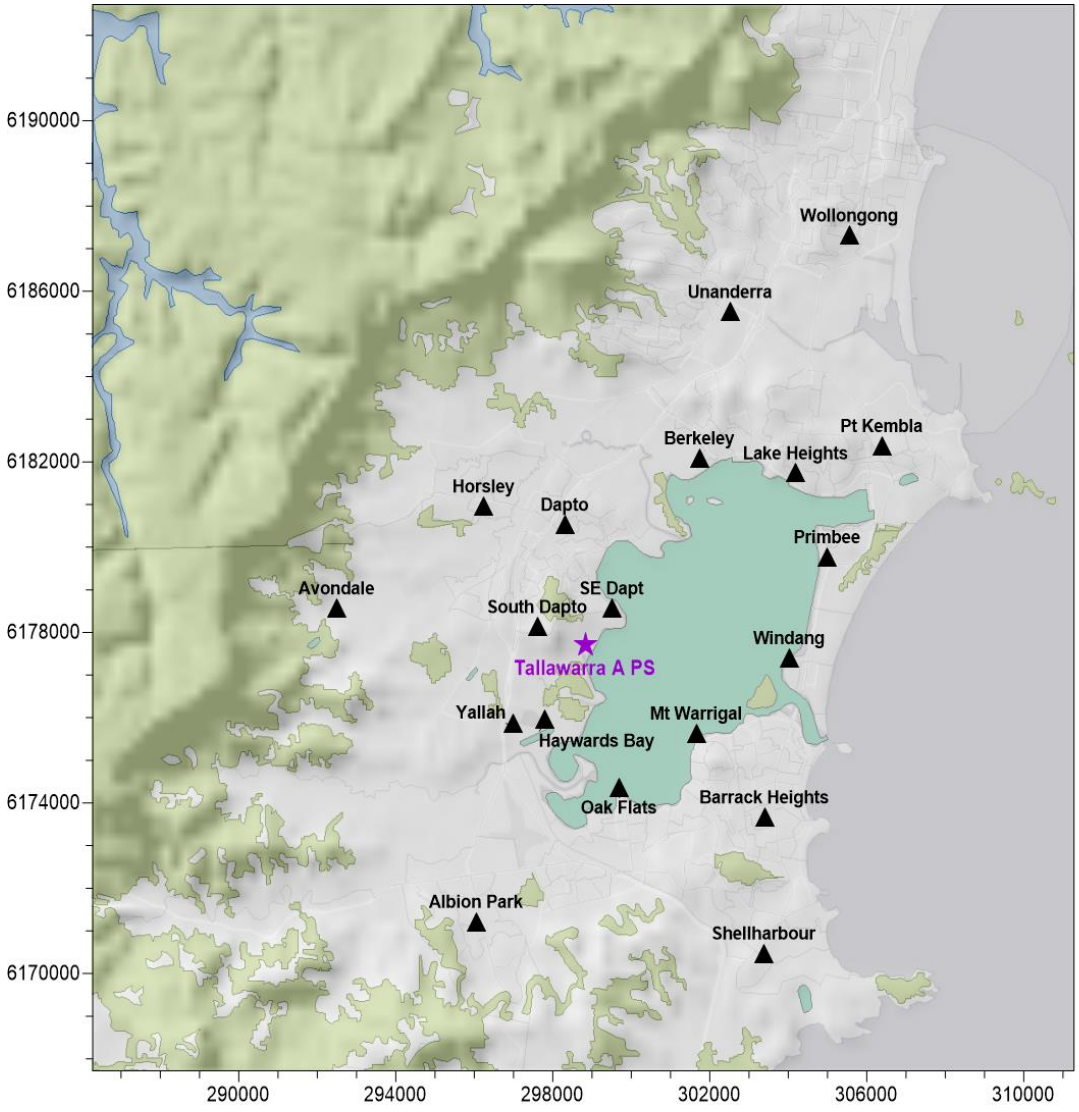

Figure 2 **Location of sensitive receptors considered in the TAPS air quality assessment (coordinates: UTM metres z56S)**

5.4 Existing air quality

5.4.1 Existing sources of emissions

Existing sources of emissions to air in the area surrounding TAPS have been identified through a review of the National Pollutant Inventory (NPI) for the 2021-2022 reporting year. Facilities within 20 km of TAPS that reported emissions of pollutants relevant to this assessment are summarised in Table 7. Existing sources include manufacturing, wastewater treatment and mining. The other major source of emissions in the region are vehicles using the local road network. These existing sources have not been modelled explicitly, rather they have been accounted for in the cumulative assessment though the use of background monitoring data.

Table 7 Emissions to air from facilities within 20 km of TAPS, as reported to the NPI for the 2021/2022 reporting year

Facility name	Main activity	Distance and direction from TAPS	NOx (kg/yr)	PM_{10} (kg/yr)	$PM_{2.5}$ (kg/yr)	SO_2 (kg/yr)
Albion Park Quarry	Construction material mining	6 km, S	69,381	565,427	4,736	43
BANZ, Manufacturing - Springhill	Basic ferrous metal manufacturing	9 km, NE	46,404	3,756	3,755	23,589
Bass Point Quarry	Construction material mining	10 km, SE	61,385	129,412	4,326	40
Bisalloy Steels Unanderra	Basic ferrous metal manufacturing	9 km, NE	4,305	319	319	48
BlueScope Steel Port Kembla Steelworks	Basic ferrous metal manufacturing	10 km, NE	6,077,385	1,099,911	185,575	5,939,243
BOC Gases Port Kembla	Basic chemical manufacturing	9 km, NE	901	67	67	10
Boral Asphalt Port Kembla	Petroleum and coal product manufacture	9 km, NE	1,039	1,756	32	0
Boral Dunmore Quarry	Construction material mining	10 km, SE	21,083	116,385	1,652	14
Dendrobium Mine	Coal mining	10 km, N	59,395	36,853	4,587	33
IXOM Port Kembla Site	Basic chemical manufacturing	10 km, NE	2,199	135	98	25,022
Kembla Grange Asphalt Plant	Petroleum and coal product manufacture	6 km, N	2,843	249	92	98
LMS Whytes Gully	Landfill gas flaring	7 km, N	2,712	445	445	871
Port Kembla Milling	Cement, lime, plaster & concrete manufacture	10 km, NE	20,250	17,228	984	2,049
Shellharbour Sewage Treatment System	Water supply, sewerage and drainage services	7 km, SE	306	171	171	57

Facility name	Main activity	Distance and direction from TAPS	NOx (kg/yr)	PM_{10} (kg/yr)	$PM_{2.5}$ (kg/yr)	SO_2 (kg/yr)
Sydney Trains Bombo Quarry	Construction material mining	15 km, SE	11,241	2,583	957	6
Wollongong Sewage Treatment System	Water supply, sewerage and drainage services	12 km, NE	14,400	426	426	5,919

5.4.2 Existing ambient air quality

DPE is responsible for undertaking ambient air quality monitoring in New South Wales. Each monitoring station is located for a specific purpose such as measuring air quality near industry, measuring air quality at roadside or to demonstrate compliance with the requirements of the Air NEPM.

DPE operates three air quality monitoring stations in the Illawarra region, namely Albion Park South, Kembla Grange and Wollongong. The locations of these monitoring stations are shown in Figure 3. All three sites measure ambient concentrations of NO_2, PM_{10}, $PM_{2.5}$ and O_3, while the Albion Park South and Wollongong sites also measure SO_2. Concentrations of NO_2, PM_{10}, $PM_{2.5}$, SO_2, and O_3 recorded between 2018 and 2022 at each DPE site have been analysed and are summarised in Table 8 to Table 12.

The data show the following:

- Maximum 1-hour average and annual average concentrations of NO_2 were below the impact assessment criteria for all sites in all years (Table 8)
- Maximum 24-hour average concentrations of PM_{10} exceeded the impact assessment criteria at all sites in the years 2018, 2019 and 2020, and for Kembla Grange in 2021 (Table 9)
- The number of days on which concentrations of PM_{10} exceeded the impact assessment criterion were as follows:
    - Albion Park South: 2 days in 2018, 14 days in 2019 and 10 days in 2020
    - Kembla Grange: 10 days in 2018, 21 days in 2019, 19 days in 2020 and 1 day in 2021
    - Wollongong: 5 days in 2018, 16 days in 2019 and 11 days in 2020
- Exceedances of the assessment criterion in the region are due to regional sources such as bushfires, dust storms and hazard reduction burns. Because the maximum 24-hour average concentrations of PM_{10} exceed the assessment criterion a contemporaneous assessment is required (per the Approved Methods for Modelling).
- Annual average concentrations of PM_{10} were below the impact assessment criterion for all sites and all years except Kembla Grange in 2019 (Table 9)
- Maximum 24-hour concentrations of $PM_{2.5}$ were above the impact assessment criterion for Albion Park South and Wollongong in 2018, and for all sites in 2019 and 2020 (Table 10)
- The number of days on which concentrations of $PM_{2.5}$ exceeded the impact assessment criterion were as follows:
    - Albion Park South: 1 day in 2018, 11 days in 2019 and 10 days in 2020
    - Kembla Grange: 12 days in 2019 and 11 days in 2020

    - Wollongong: 3 days in 2018, 14 days in 2019 and 11 days in 2020
- Annual average concentrations of $PM_{2.5}$ were below the impact assessment criterion for all sites in years 2018 and 2020-2022. In 2019, all sites were above the impact assessment criterion (Table 10)
- SO_2 1-hour and 24-hour averages were below the impact assessment criterion for all sites in all years (
-
-
- Table 11)
- The number of times that the 8 hour average concentration of O_3 exceeded the 8 hour average impact assessment criterion were as follows (Table 12):
    - Albion Park South: 7 times in 2020 and once in 2022
    - Kembla Grange: 9 times in 2019 and 7 times in 2020
    - Wollongong: 10 times in 2019 and 2 times in 2020

The cumulative assessment of TAPS includes the addition of ambient background concentrations derived from the monitoring data. The dispersion modelling has considered the 2018 calendar year and, therefore, an hourly average background concentration for the relevant pollutants for 2018 has been used. The selection of the 2018 calendar year is discussed in Section A1.1.

Data from the Kembla Grange monitoring site have been used to represent background conditions in the study area. Kembla Grange is the closest of the monitors to TAPS and the majority of sensitive receptors.

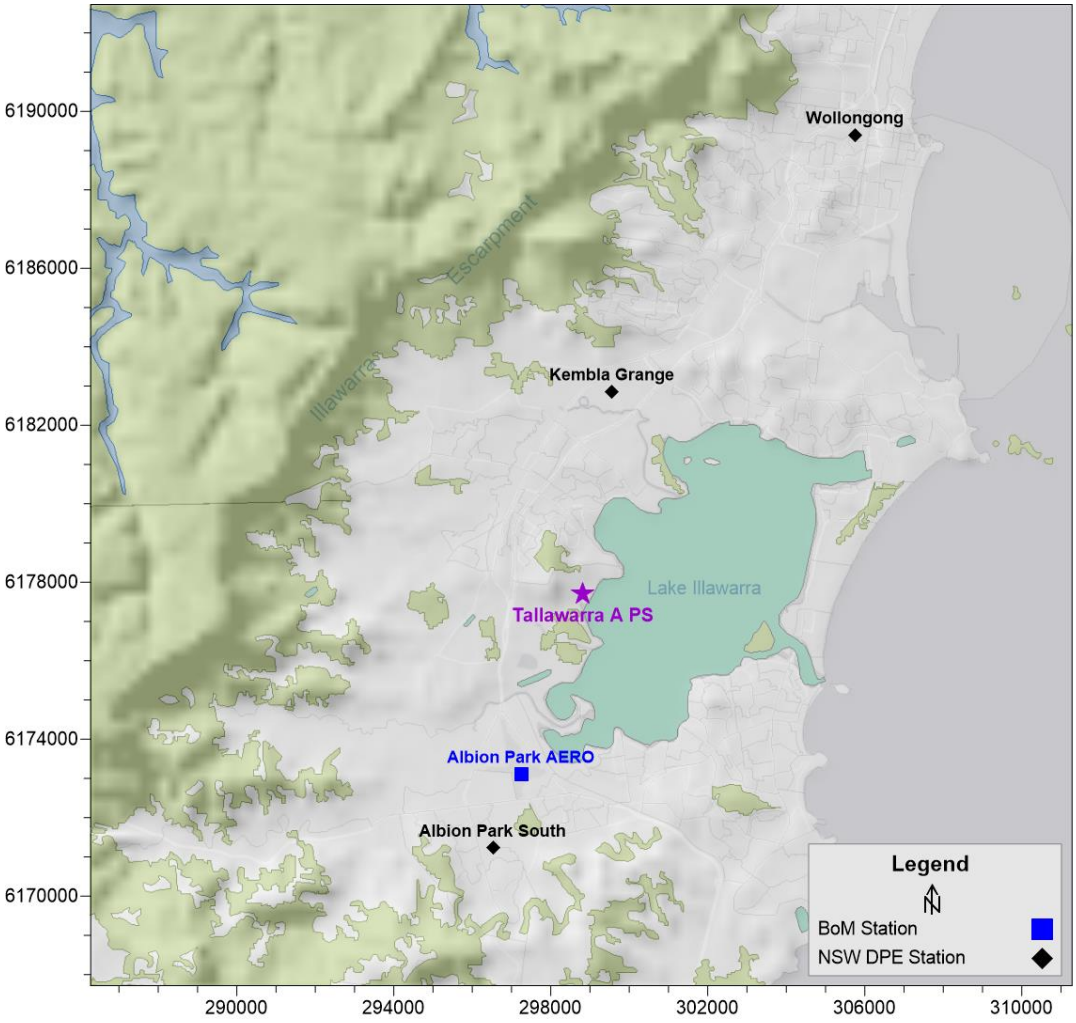

Figure 3 Air quality and meteorological monitoring locations in the study area

Table 8 Ambient concentrations of NO_2 measured at Albion Park South (APS), Kembla Grange (KG) and Wollongong (W) (µg/m³)

Year	Maximum 1-hour average			Annual average			Data capture		
	APS	KG	W	APS	KG	W	APS	KG	W
2018	80.0	75.9	88.2	8.2	9.9	13.3	94%	91%	92%
2019	84.1	86.1	82.0	7.8	10.4	12.3	94%	92%	92%
2020	80.0	77.9	84.1	5.8	8.2	13.3	94%	91%	92%
2021	65.6	57.4	86.1	4.7	5.3	9.7	93%	92%	94%
2022	63.6	55.4	59.5	6.4	3.9	8.4	94%	90%	93%
Criterion	**164**			**31**			**-**		

Table 9 Ambient concentrations of PM_{10} measured at Albion Park South (APS), Kembla Grange (KG) and Wollongong (W) (µg/m³)

Year	Maximum 24-hour average (no. of days above criterion in parentheses)			Annual average			Data capture		
	APS	KG	W	APS	KG	W	APS	KG	W
2018	**94.4 (2)**	**71.8 (10)**	**59.7 (5)**	17.8	22.8	19.9	98%	96%	97%
2019	**104.2 (14)**	**115.8 (21)**	**117.6 (16)**	19.6	**25.5**	22.3	93%	94%	88%
2020	**153.3 (10)**	**187.7 (19)**	**121.6 (11)**	17.1	21.5	18.8	98%	98%	97%
2021	39.4	62.3 (1)	43.2	13.1	17.6	15.1	98%	99%	99%
2022	29.9	43.83	45.4	10.9	14.5	14.3	99%	99%	98%
Criterion	**50**			**25**			**-**		

Table 10 Ambient concentrations of $PM_{2.5}$ measured at Albion Park South (APS), Kembla Grange (KG) and Wollongong (W) (µg/m³)

Year	Maximum 24-hour average (no. of days above criterion in parentheses)			Annual average			Data capture		
	APS	KG	W	APS	KG	W	APS	KG	W
2018	**29.3 (1)**	21.9	**47.6 (3)**	6.9	7.1	7.3	91%	92%	92%
2019	**49.4 (11)**	**70.0 (12)**	**81.4 (14)**	**8.6**	**8.9**	**9.1**	89%	92%	93%
2020	**96.3 (10)**	**100.3 (11)**	**100.9 (10)**	6.8	7.1	7.8	99%	96%	85%
2021	23.3	23.5	23.4	4.8	5.1	5.7	98%	99%	97%
2022	13.6	12.2	13.2	3.9	4.0	4.7	98%	97%	98%
Criterion	**25**			**8**			**-**		

Table 11 Ambient concentrations of SO_2 measured at Albion Park South (APS) and Wollongong (W) (µg/m³)

Year	Maximum 1-hour average		Maximum 24-hour average		Data capture	
	APS	W	APS	W	APS	W
2018	88.7	111.5	21.8	25.9	94%	91%
2019	71.5	97.2	23.6	15.9	93%	91%
2020	62.9	57.2	15.5	10.6	93%	92%
2021	57.2	60.1	17.7	17.7	93%	93%
2022	45.8	48.6	15.3	10.6	94%	94%
Criterion	**286/215**		**57**		**-**	

Table 12 Ambient concentrations of O_3 measured at Albion Park South (APS), Kembla Grange (KG) and Wollongong (W) (µg/m³)

Year	Maximum 8-hour rolling average O_3 (no. of periods above criterion in parentheses)			Data capture		
	APS	KG	W	APS	KG	W
2018	130.5	112.4	114.5	93%	92%	93%
2019	131.1	**162.6 (9)**	**165.8 (10)**	93%	93%	93%
2020	**144.4 (7)**	**149 (7)**	**141.2 (2)**	92%	92%	93%
2021	118.0	124.1	101.7	93%	92%	94%
2022	**139.7 (1)**	125.5	127.9	89%	94%	93%
Criterion	**139**			**-**		

5.5 Meteorology

Local meteorology is of paramount importance for dispersion of air pollutants generated by the power stations; key parameters are wind speed, wind direction, atmospheric stability and boundary layer mixing height. Conditions in the local area for 2018, as derived from the meteorological modelling carried out for the assessment, are summarised in Appendix A1.4.

Meteorological conditions in the region are measured by BoM at Albion Park (Shellharbour Airport) as well as by the DPE at the three nearby air quality monitoring sites. A map of the BoM and DPE monitoring station locations with respect to TAPS is shown in Figure 3.

A summary of winds from three sites (BoM Albion Park, DPE Kembla Grange and DPE Wollongong) for the past five years (2018-2022) has been provided in the form of annual, seasonal and diurnal wind roses in Figure 4 to Figure 12. A summary of winds from DPE Albion Park South has not been provided as the BoM Albion Park (Shellharbour Airport) site is nearby and considered a more robust source of data.

The data show the following:

- Winds at BoM Albion Park (Shellharbour Airport), DPE Kembla Grange and DPE Wollongong show similar distributions
- Stronger winds are recorded at the BoM site due to the exposed nature of the airport site and DPE Kembla Grange has stronger winds than DPE Wollongong due to the more rural location also being more exposed
- Diurnal winds show prevailing westerly winds in the evenings, overnight and into the morning, with a northeasterly sea breeze common in the afternoon

- Seasonal distributions show that the northeasterly sea breeze is most common in spring and summer
- Annual distribution of winds are generally consistent across the years at each site, except for northerly winds being more common at Wollongong in 2022 as compared to other years.

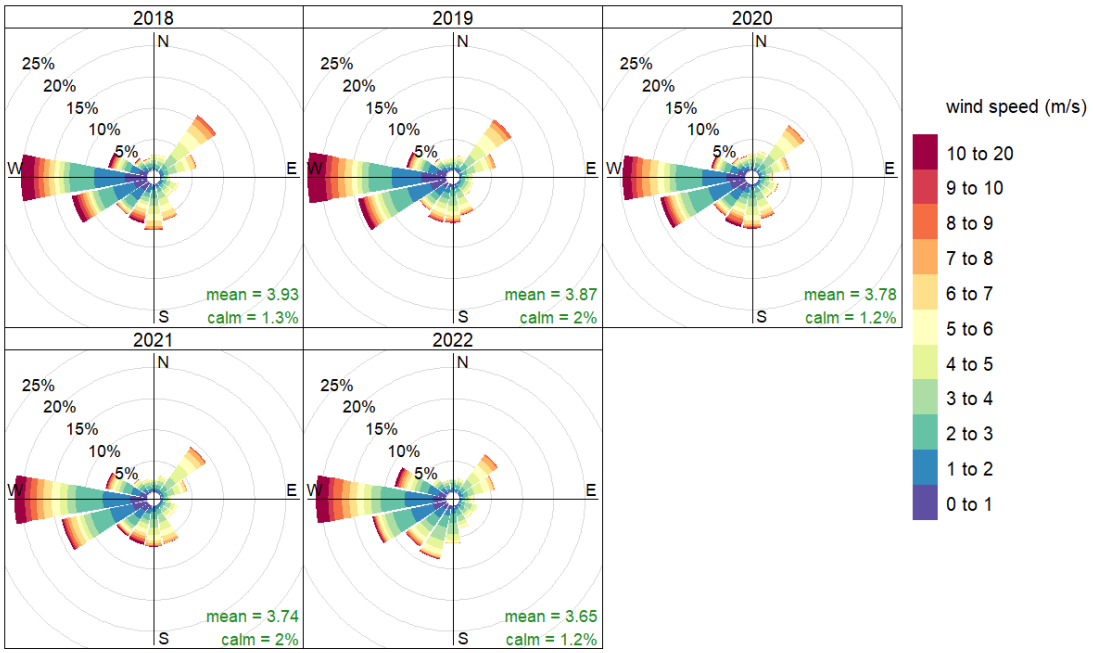

Figure 4 **Annual distribution of winds for 2018 – 2022 at BoM Albion Park (Shellharbour Airport)**

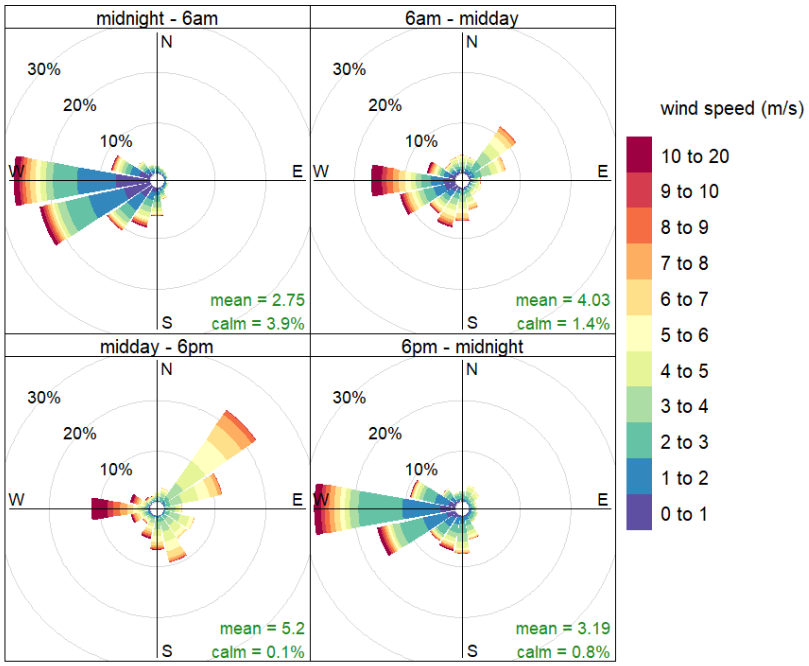

Figure 5 **Diurnal distribution of winds for 2018 – 2022 at BoM Albion Park (Shellharbour Airport)**

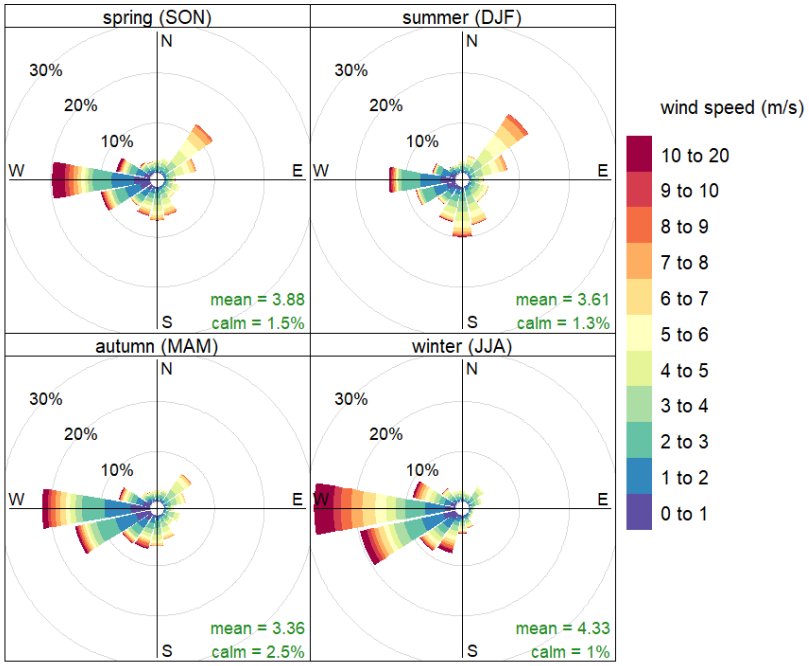

Figure 6 **Seasonal distribution of winds for 2018 – 2022 at BoM Albion Park (Shellharbour Airport)**

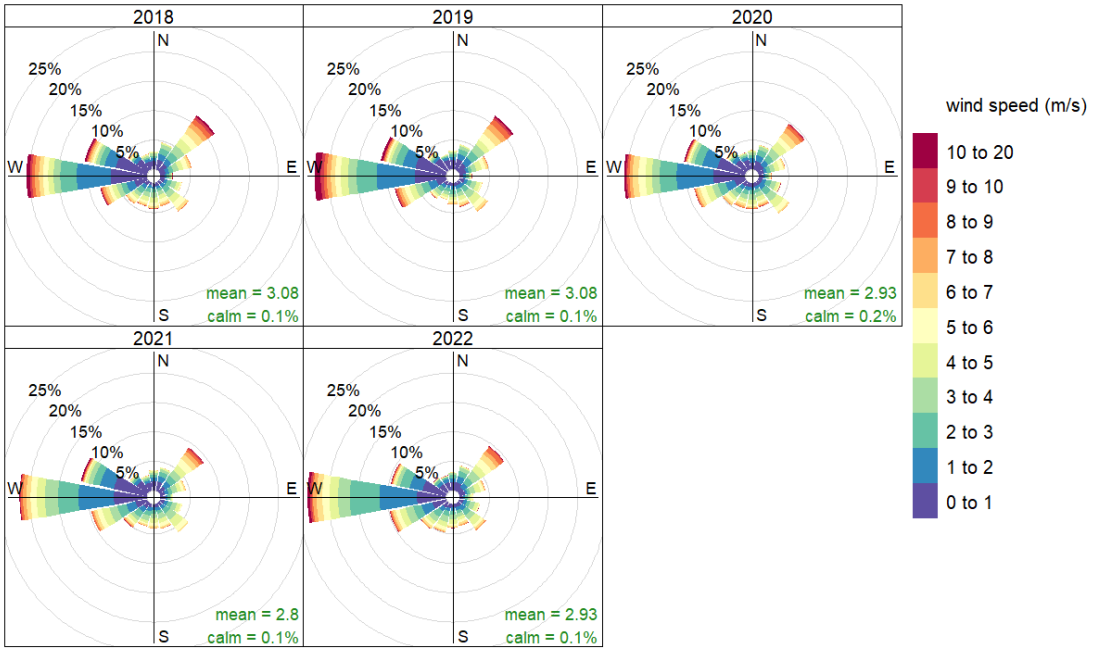

Figure 7 **Annual distribution of winds for 2018 – 2022 at DPE Kembla Grange**

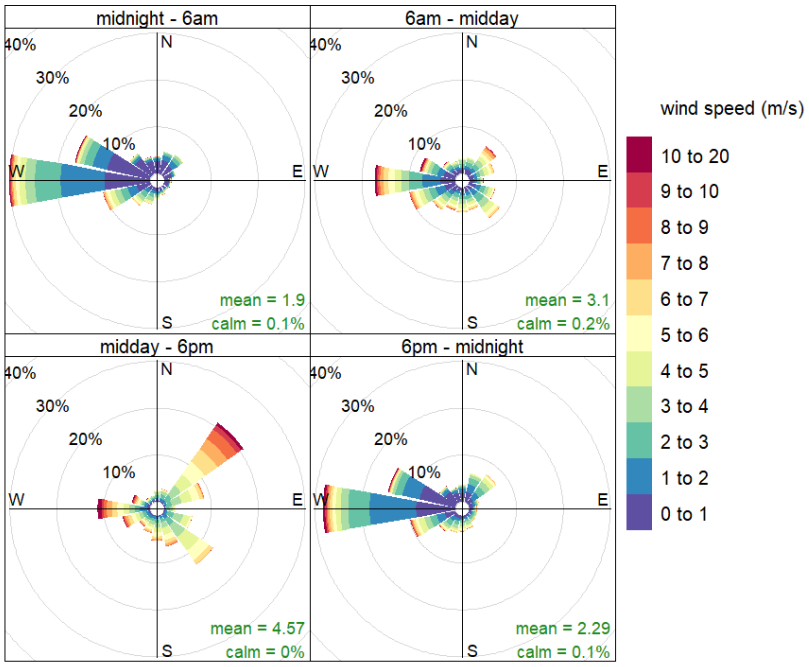

Figure 8 **Diurnal distribution of winds for 2018 – 2022 at DPE Kembla Grange**

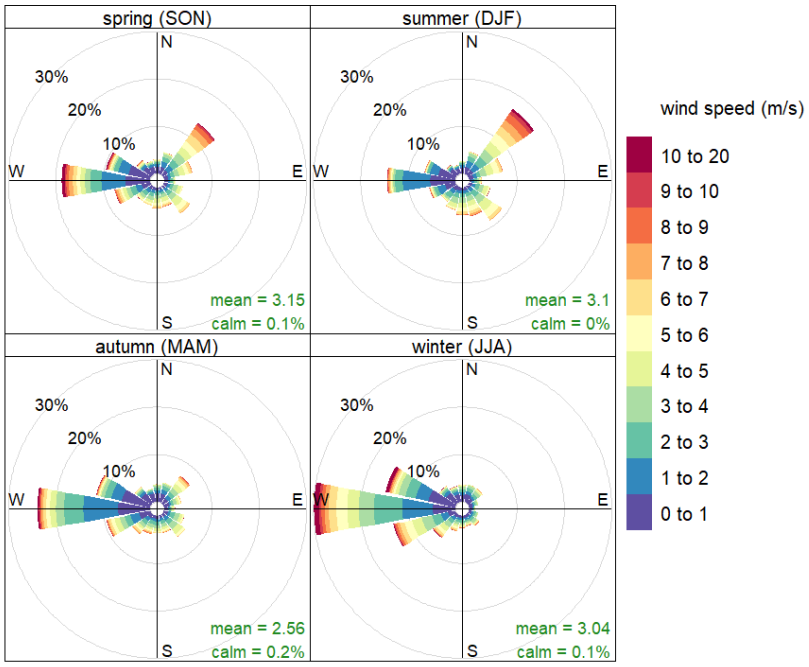

Figure 9 **Seasonal distribution of winds for 2018 – 2022 at DPE Kembla Grange**

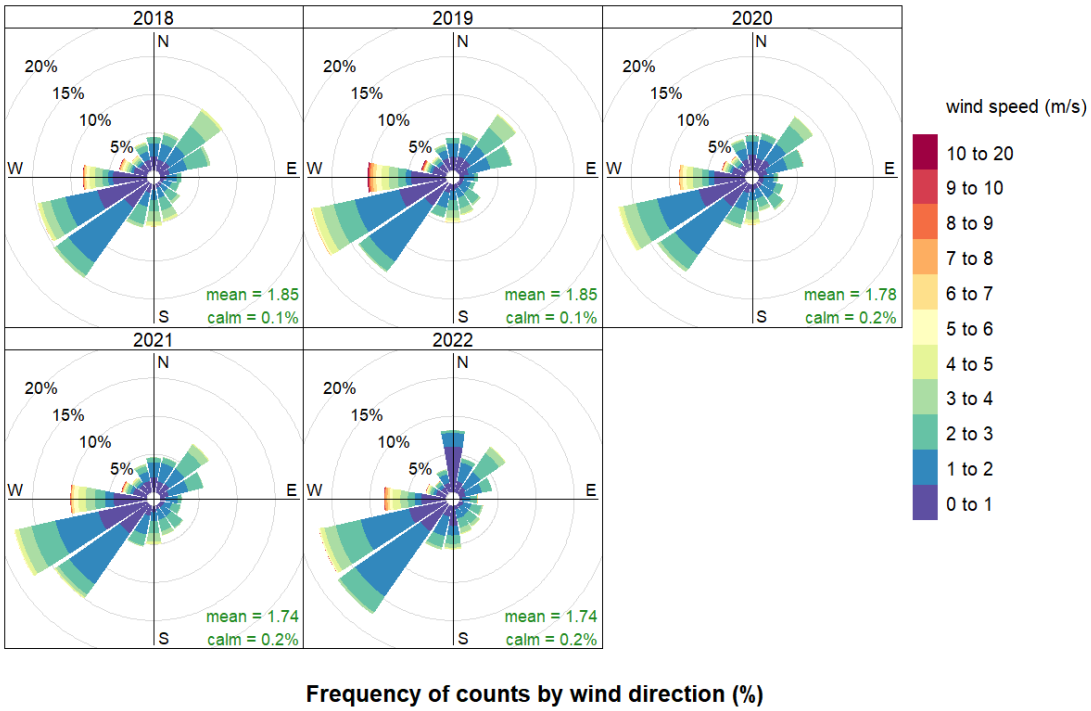

Figure 10 **Annual distribution of winds for 2018 – 2022 at DPE Wollongong**

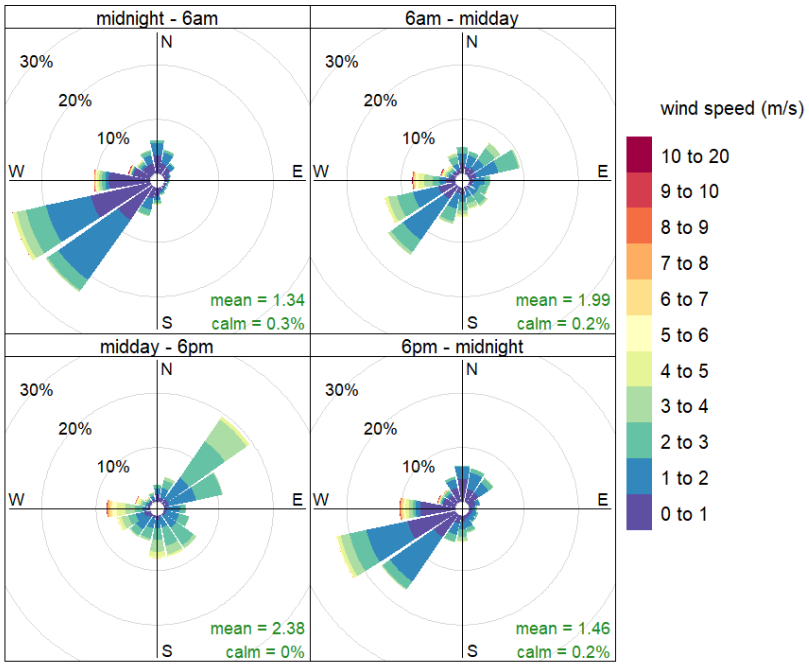

Figure 11 **Diurnal distribution of winds for 2018 – 2022 at DPE Wollongong**

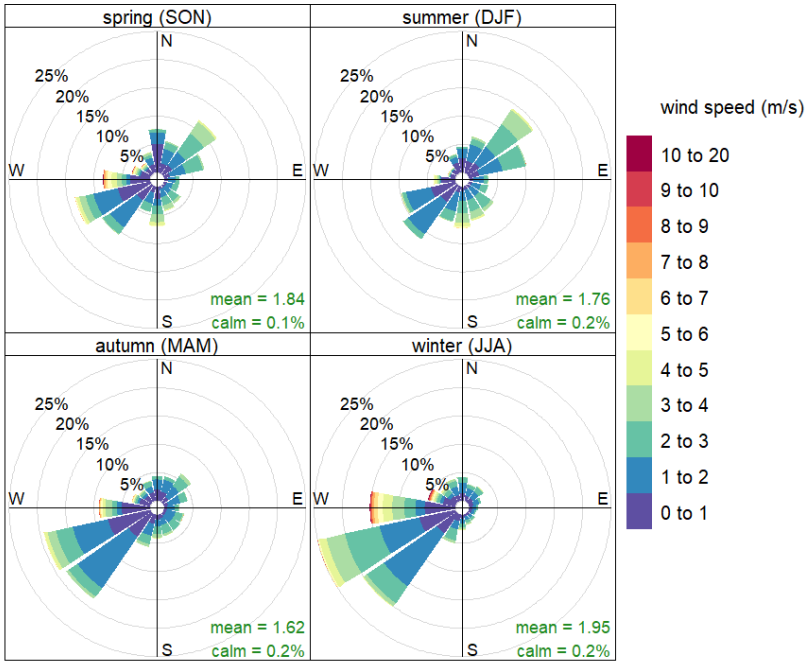

Figure 12 **Seasonal distribution of winds for 2018 – 2022 at DPE Wollongong**

6. EMISSIONS TO THE ATMOSPHERE

Table 13 and Table 14 provide the relevant source characteristics and emission rates utilised in the dispersion modelling for the TAPS and TBPS stacks. Parameters have been informed by operational data provided by EA and Aurecon and the emission limits specified in EPL 555, as discussed in the methodology Section 4.2.

Both TAPS and TBPS have been assumed to operate continuously for every hour of the year for modelling purposes, in order to quantify potential impacts under all possible meteorological conditions over a 12-month period. This will significantly overstate annual emissions and makes the assessment worst-case. This conservatism can be quantified further by considering the modelled annual NOx emissions as compared to the EPL load limit of 900 tonnes/year (see Section 3.4).

Using the modelled NOx emissions rates from Table 13 and Table 14, annual NOx emissions from TAPS (post-upgrade) would be 901 tonnes, while those from TBPS would be 1,125 tonnes. The total, 2,026 tonnes, is 2.3 times the EPL load limit of 900 tonnes/year. Clearly the assumptions applied will result in highly conservative model predictions, especially for annual mean concentrations. TAPS has historically operated with a capacity factor of less than 50%, while TBPS is anticipated to operate with a capacity factor of approximately 9.1%. Applying these percentages to the modelled NOx emission rates results in predicted annual NOx emissions of 451 tonnes from TAPS and 102 tonnes from TBPS, giving a total of 553 tonnes, which is well below the EPL load limit.

Table 13 Emission parameters used in the dispersion modelling of emissions from TAPS

Parameter	Units	Value	
		Pre-upgrade	Post-upgrade
Stack characteristics			
Stack x coordinate	UTM m (GDA2020/MGA zone 56)	298,824	298,824
Stack y coordinate		6,177,708	6,177,708
Stack height	m	60	60
Exhaust stack diameter	m	6.45	6.45
Exhaust temperature	K	365.2	347.5
Exhaust velocity	m/s	18.6	18.0
Moisture content	Volume %	6.5	6.5
Oxygen content	Volume %, dry	13.3	13.3
Flow rate (wet, stack °C, 101.3 kPa)	m^3/s	607.8	589.2
Flow rate (dry, 0 °C, 101.3 kPa)	Nm^3/s	546.6	556.8
Emission concentrations			
NO_x	mg/m^3 (dry, 15% O_2)	51.3	51.3
PM	mg/m^3 (dry, 15% O_2)	10	10
SO_x	mg/m^3 (dry, 15% O_2)	8.6	8.6
Emission rates (total)			
NO_x	g/s	28.1	28.6
PM_{10} (and $PM_{2.5}$)*	g/s	5.5	5.6
SO_x	g/s	4.7	4.8

Table note:
* Emissions of $PM_{2.5}$ have been estimated by conservatively assuming that all PM_{10} is $PM_{2.5}$

Table 14 Emission parameters used in the dispersion modelling of emissions from TBPS

Parameter	Units	Value
Stack characteristics		
Stack x coordinate	UTM m (GDA2020/MGA zone 56)	298,895
Stack y coordinate		6,177,812
Stack height	m	48
Number of PDD outlets	#	12
PDD outlet diameter (per PDD)	M	20
PDD exhaust temperature	K	906.6
PDD exhaust velocity	m/s	0.5
Moisture content	Volume %	9.36
Oxygen content	Volume %, dry	13.3
Flow rate (wet, stack °C, 101.3 kPa) (total)	m^3/s	1,975
Flow rate (dry, 0 °C, 101.3 kPa) (total)	Nm^3/s	694.8
Emission concentration		
NO_x	mg/Nm^3 (dry, 15% O_2)	51.3
Emission rate		
NO_x	g/s	3.0 [1]

Table note:
[1] emission rate is per PDD outlet for a cumulative release of 35.7 g/s (discrepancy due to rounding to a single decimal place)

7. IMPACT ASSESSMENT

7.1 TAPS contribution comparison: Pre- and post-upgrade

Predicted contributions to ground-level concentrations of NOx, SO_2 and particulate matter (as PM_{10}) have been compiled for TAPS in isolation pre- and post-upgrade in order to assess the changes in concentrations that are likely to occur as a result of the upgrade at each sensitive receptor and at the modelled grid point with the highest concentration, referred to as 'max on domain' (Table 15). $PM_{2.5}$ concentrations have been conservatively assumed to be the same as PM_{10}. The results indicate that:

- Predicted ground-level concentrations are generally higher post-upgrade due to the slightly higher pollutant emission rates and lower temperature and exit velocity that are associated with the post-upgrade operation of TAPS (see Table 13).
- Contributions to annual average concentrations of NOx, SO_2 and PM_{10} are extremely small with or without the upgrade, being no more than 2% of their respective criteria (this being the case when comparing the maximum modelled NOx concentration to the NO_2 criterion; this assumes that all NOx is NO_2, when in reality NO_2 concentrations will be lower). With the total contribution being so small, any change as a result of the upgrade is insignificant.
- Contributions to maximum 1-hour average concentrations of SO_2 and maximum 24-hour average concentrations of PM_{10} are also very small with or without the upgrade, at less than 6% of their respective criteria. Consequently, the change as a result of the upgrade is insignificant.
- Contributions to maximum 1-hour average NOx concentrations are larger, but again these are total NOx concentrations and NO_2 concentrations will be lower. Conversion of NOx to NO_2 has not been considered here, but this has been incorporated when calculating total cumulative concentrations (See Section 7.2). While the changes at individual receptors vary greatly, from -8% to 109%, the change to the maximum anywhere on the grid is very small, increasing from 70.6 $\mu g/m^3$ to 71.5 $\mu g/m^3$. This suggests that, while the spatial distribution of air pollutant concentrations due to TAPS shifts with the upgrade, the absolute magnitude of predicted concentrations changes only very slightly.

This analysis presents a useful indication of the changes in concentrations that are likely with the upgrade to TAPS, but the key assessment is that of total cumulative concentrations against the relevant criteria from the Approved Methods for Modelling; this set out in the following sections.

Table 15 Comparison of ground-level NOx, SO_2 and PM_{10} concentrations for TAPS in isolation pre- and post- proposed upgrade

Sensitive Receptor	NOx (µg/m³)						SO_2 (µg/m³)						PM_{10} (µg/m³)					
	1-hr Max			Ann Ave			1-hr Max			24-hr Max			24-hr Max			Ann Ave		
	Pre	Post	% Δ	Pre	Post	% Δ	Pre	Post	% Δ	Pre	Post	% Δ	Pre	Post	% Δ	Pre	Post	% Δ
SE Dapto	15.1	19.2	27%	0.1	0.1	47%	2.5	3.2	27%	0.4	0.6	35%	0.5	0.7	35%	<0.1	<0.1	47%
South Dapto	69.9	71.3	2%	0.3	0.3	26%	11.7	11.9	2%	1.1	1.3	20%	1.3	1.5	20%	0.1	0.1	26%
Avondale	23.4	30.8	32%	0.2	0.2	9%	3.9	5.1	32%	0.7	0.7	1%	0.8	0.8	1%	<0.1	<0.1	9%
Yallah	21.3	35.0	65%	0.3	0.4	25%	3.5	5.8	65%	0.6	0.7	17%	0.7	0.8	17%	0.1	0.1	25%
Oak Flats	14.0	15.6	12%	0.1	0.1	28%	2.3	2.6	12%	0.3	0.4	25%	0.3	0.4	25%	<0.1	<0.1	28%
Mt Warrigal	25.0	30.3	21%	0.1	0.1	24%	4.2	5.1	21%	0.8	1.0	22%	1.0	1.2	22%	<0.1	<0.1	24%
Windang	17.6	21.9	25%	0.2	0.3	15%	2.9	3.7	25%	1.2	1.3	6%	1.4	1.5	6%	<0.1	0.1	15%
Barrack Heights	11.5	14.4	25%	0.1	0.1	18%	1.9	2.4	25%	0.4	0.5	10%	0.5	0.5	10%	<0.1	<0.1	18%
Primbee	16.0	19.2	20%	0.2	0.3	16%	2.7	3.2	20%	1.4	1.5	8%	1.6	1.7	8%	<0.1	<0.1	16%
Pt Kembla	10.6	12.1	14%	0.1	0.1	21%	1.8	2.0	14%	0.4	0.5	27%	0.5	0.6	27%	<0.1	<0.1	21%
Dapto	29	29.7	2%	0.2	0.2	29%	4.8	5.0	2%	0.7	0.7	8%	0.8	0.9	8%	<0.1	<0.1	29%
Horsley	22.5	23.8	6%	0.2	0.2	17%	3.8	4.0	6%	0.7	0.7	7%	0.8	0.9	7%	<0.1	<0.1	17%
Berkeley	12.4	18.8	51%	0.1	0.1	24%	2.1	3.1	51%	0.4	0.5	19%	0.5	0.6	19%	<0.1	<0.1	24%
Lake Heights	11.4	13.1	15%	0.1	0.1	22%	1.9	2.2	15%	0.4	0.4	6%	0.5	0.5	6%	<0.1	<0.1	22%
Unanderra	7.9	8.8	12%	0.1	0.1	19%	1.3	1.5	12%	0.4	0.4	17%	0.4	0.5	17%	<0.1	<0.1	19%
Wollongong	6.5	7.2	11%	0.1	0.1	21%	1.1	1.2	11%	0.3	0.3	8%	0.3	0.3	8%	<0.1	<0.1	21%
Shellharbour	11.1	12.2	10%	0.1	0.1	22%	1.8	2	10%	0.6	0.6	15%	0.6	0.7	15%	<0.1	<0.1	22%
Albion Park	18.0	16.6	-8%	0.1	0.1	15%	3.0	2.8	-8%	0.2	0.3	61%	0.3	0.4	61%	<0.1	<0.1	15%
Haywards Bay	17.5	36.7	109%	0.1	0.2	28%	2.9	6.1	109%	0.3	0.4	31%	0.4	0.5	31%	<0.1	<0.1	28%
Max on Domain	**70.6**	**71.5**	**1%**	**0.5**	**0.6**	**16%**	**11.8**	**11.9**	**1%**	**2.1**	**2.4**	**14%**	**2.4**	**2.8**	**14%**	**0.1**	**0.1**	**16%**

7.2 Cumulative concentrations

Predicted cumulative ground-level concentrations of NO_2 and SO_2 at sensitive receptors, and the maximum on the modelled grid, are presented in Table 16.

Predicted annual average concentrations of NO_2 and 1-hour and 24-hour maximum concentrations of SO_2 are well below the assessment criteria throughout the model domain. Maximum 1-hour average concentrations of NO_2 at sensitive receptors are well below the assessment criterion. The maximum anywhere on the modelled grid is greater, but still below the assessment criterion.

Plate 1 and Plate 2 present contour plots of predicted cumulative maximum 1-hour average and annual average ground-level concentrations of NO_2. Contour plots have not been provided for SO_2 as the contribution of TAPS is extremely small (see Table 15) and predicted concentrations are dominated by the ambient background contribution.

Table 16 Modelled cumulative concentrations of NO_2 and SO_2 (µg/m³)

Receptor	NO_2		SO_2	
	Maximum 1-hour Average	Annual Average	Maximum 1-hour Average	Maximum 24-hour Average
Albion Park	75.9	9.3	88.9	20.9
Avondale	75.9	9.5	88.7	20.9
Barrack Heights	76.7	9.2	88.7	20.9
Berkeley	75.9	9.3	88.7	20.9
Dapto	75.9	9.5	88.7	20.9
Haywards Bay	76.4	9.4	89.4	21.1
Horsley	75.9	9.5	88.7	20.9
Lake Heights	75.9	9.3	88.7	20.9
Mt Warrigal	78.6	9.3	88.7	20.9
Oak Flats	77.8	9.3	88.7	21.0
Primbee	75.9	9.6	88.7	20.9
Pt Kembla	75.9	9.3	88.7	20.9
SE Dapto	75.9	9.4	88.7	20.9
Shellharbour	76.3	9.2	88.7	20.9
South Dapto	77.2	9.7	88.7	20.9
Unanderra	75.9	9.2	88.7	20.9
Windang	76.1	9.6	88.7	20.9
Wollongong	75.9	9.2	88.7	20.9
Yallah	84.8	9.9	90.2	21.0
Max on domain	161.3	10.3	90.6	21.3
Impact Assessment Criterion	**164**	**31**	**286**	**57**

Predicted cumulative ground-level concentrations of PM_{10} and $PM_{2.5}$ at sensitive receptors, and the maximum on the modelled grid, are presented in Table 17.

Predicted annual average concentrations of PM_{10} and $PM_{2.5}$, and 24-hour maximum concentrations of $PM_{2.5}$, are below the assessment criteria throughout the model domain and are mostly made up of the background contribution (the contribution of TAPS is extremely small (see Table 15)).

Maximum 24-hour average concentrations of PM_{10} exceed the assessment criterion due to regional sources such as bushfires, dust storms and hazard reduction burns. Consequently, a contemporaneous assessment is required (per the Approved Methods for Modelling).

Table 18 presents a contemporaneous assessment for 24-hour average PM_{10}, detailing the background concentration, maximum modelled concentration anywhere on the grid as a result of emissions from TAPS and the resulting total concentration on every day that theoretically could have seen a total concentration above 50 µg/m³ (with the maximum contribution from TAPS being 2.8 µg/m³, according to Table 15, this is every day with a background concentration above 47.2 µg/m³). Table 18 demonstrates that the operation of TAPS causes no additional days of exceedance beyond those caused by background concentrations. It is not considered necessary to present concentrations on the days with the greatest incremental concentrations as a result of emissions from TAPS, as total concentrations will be below the criteria and all incremental concentrations are known to be 2.8 µg/m³ or less.

Contour plots have not been provided for PM_{10} and $PM_{2.5}$ as the contribution of TAPS is extremely small (see Table 15) and predicted concentrations are dominated by the ambient background contribution.

Table 17 Modelled cumulative concentrations of PM_{10} and $PM_{2.5}$ (µg/m³)

Receptor	PM_{10}		$PM_{2.5}$	
	Maximum 24-hour Average	**Annual Average**	**Maximum 24-hour Average**	**Annual Average**
Albion Park	71.8	21.9	22.3	7.1
Avondale	71.8	21.9	22.7	7.1
Barrack Heights	71.9	21.9	22.4	7.1
Berkeley	71.9	21.9	22.5	7.1
Dapto	71.8	21.9	22.7	7.1
Haywards Bay	71.8	21.9	22.4	7.1
Horsley	71.8	21.9	22.7	7.1
Lake Heights	71.8	21.9	22.4	7.1
Mt Warrigal	71.9	21.9	23.1	7.1
Oak Flats	71.8	21.9	22.3	7.1
Primbee	71.8	21.9	23.6	7.1
Pt Kembla	71.8	21.9	22.5	7.1
SE Dapto	72.1	21.9	22.5	7.1
Shellharbour	71.8	21.9	22.6	7.1
South Dapto	71.8	21.9	23.4	7.2
Unanderra	71.8	21.9	22.4	7.1
Windang	71.9	21.9	23.3	7.1
Wollongong	71.8	21.9	22.2	7.1
Yallah	71.8	22.0	22.7	7.2
Max on domain	72.4	22.0	24.7	7.2
Impact Assessment Criterion	**50**	**25**	**25**	**8**

Table 18 Summary of contemporaneous assessment for 24-hour PM_{10} (µg/m³)

Date	Background	Maximum Increment	Total
2/12/2018	71.8	0.6	72.4
22/11/2018	71.6	0.8	72.4
18/03/2018	65.6	0.5	66.1
15/02/2018	64.8	0.8	65.6
19/03/2018	64.3	1.0	65.3
14/04/2018	59.9	0.8	60.7
12/04/2018	54.5	0.4	54.9
13/04/2018	53.5	0.1	53.6
19/07/2018	52.0	0.3	52.3
28/12/2018	50.6	0.3	50.9
14/02/2018	49.1	0.2	49.3
22/01/2018	48.2	0.8	49.0
18/07/2018	48.1	0.6	48.7
5/11/2018	47.8	1.1	48.9
9/05/2018	47.5	1.2	48.7
Impact Assessment Criterion	**50**	**-**	**50**

7.3 Ozone

7.3.1 Input data

The input data for the level 1 screening assessment are provided in Table 19, with the increment in daily emissions derived as described in Section 4.7. The incremental increase in emissions of NOx, CO and VOCs as a result of the TAPS upgrade have been calculated assuming 24 hours of operation at full load, which is conservative.

Table 19 Input data used in the level 1 screening assessment

Parameter	Value	Unit
Source region	Wollongong	-
VOC input option	Default VOC Reactivities	-
Ozone attainment area	Non-attainment	-
NOx	0.0454	tonnes/day
CO	0.0038	tonnes/day
VOC	0.0005	tonnes/day

7.3.2 Results

The maximum 1-hour and 4-hour incremental increases to concentrations of ozone calculated as a result of the TAPS upgrade are 0.017 ppb and 0.011 ppb, respectively. The incremental concentrations are well below the maximum allowable increment of 1 ppb and therefore no further assessment is required.

8. CONCLUSIONS

Katestone was commissioned by Aurecon on behalf of Energy Australia to conduct an air quality assessment of the Tallawarra A Power Station Upgrade Proposal. The air quality assessment has found the following:

- The upgrade proposal is likely to result in slightly higher emissions of air pollutants. The temperature and exhaust velocity of gases discharged from the stack of TAPS are likely to reduce.
- Modelling of emissions from TAPS in isolation, pre- and post-upgrade, has demonstrated that, in general, changes in concentrations as a result of the upgrade will be negligible. Contributions to annual average concentrations of NOx, SO_2 and PM_{10}, maximum 1-hour average concentrations of SO_2 and maximum 24-hour average concentrations of particulates are insignificant, with or without the upgrade.
- The contribution to the maximum 1-hour average NOx concentration anywhere in the model domain increases very slightly (from 70.6 µg/m^3 to 71.5 µg/m^3, an increase of just 1.3%, or 0.6% of the 164 µg/m^3 assessment criterion for NO_2), reflecting the finding that while the spatial footprint of the impacts of Tallawarra A Power Station shifts with the upgrade, the absolute magnitude of those impacts changes only very slightly. It should be noted that these are NOx concentrations; the contributions to NO_2 concentrations, and changes in NO_2 concentrations, will be much smaller (likely around 30%). Most sensitive receptors will experience a small increase in NOx concentrations, although some will experience a decrease. The change in NOx concentration at the sensitive receptor with the highest contribution (South Dapto – increase from 69.9 µg/m^3 to 71.3 µg/m^3) is just 0.9% of the 164 µg/m^3 assessment criterion for NO_2, while the largest change at any sensitive receptor (Haywards Bay – increase from 17.5 µg/m^3 to 36.7 µg/m^3) is 11.7% of the 164 µg/m^3 assessment criterion for NO_2, but the total contribution is still small and the proportion that is NO_2 will be much smaller.
- The assessment has demonstrated that cumulative concentrations of NO_2, SO_2 and $PM_{2.5}$, incorporating the contributions of TAPS post upgrade, TBPS (in the case of NO_2) and background, will be below their respective assessment criteria. Maximum 24-hour average PM_{10} concentrations exceed the assessment criterion as a result of the background contribution, however, a contemporaneous assessment demonstrates that the operation of TAPS causes no additional days of exceedance beyond those caused by background concentrations. The cumulative total results indicate that no material change in impacts of any pollutant is expected due to the Tallawarra A Power Station Upgrade Proposal.
- The dispersion modelling outputs will be conservative, as they assume continuous operation at full load throughout the year. Tallawarra A Power Station is limited to emitting no more than 900 tonnes/year of NOx, with or without the upgrade. This limit also applies to the combined emissions of Tallawarra A Power Station and Tallawarra B Power Station. Using the NOx emission rates modelled for every hour of the year, annual NOx emissions from Tallawarra A Power Station (post-upgrade) would be 901 tonnes, while those from Tallawarra B Power Station would be 1,125 tonnes. The total, 2,026 tonnes, is 2.3 times the load limit of 900 tonnes/year. As such, modelled annual average contributions from the power stations are likely at least 2.3 times higher than will actually occur, and it is very likely that short-term maximum concentrations are over-predicted. It is anticipated that TAPS will operate with a capacity factor of less than 50%, while TBPS is anticipated to operate with a capacity factor of approximately 9.1%, which together will result in annual NOx emissions well below the 900 tonnes/year limit (553 tonnes/year).
- A level 1 screening assessment for ground-level ozone impacts has demonstrated that the incremental increases in ozone concentrations as a result of the upgrade will be well below the 1 ppb screening thresholds, thus no further assessment is required.

9. REFERENCES

Environ Australia Pty Ltd, 2011, *A Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources, prepared for NSW EPA* NSW EPA, 2022, *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*

NSW EPA, 2022, *Protection of the Environment Operations (Clean Air) Regulation 2022*

NPI, 2021/22 National Pollutant Inventory Database (website), Australian Government, Department of the Environment and Energy

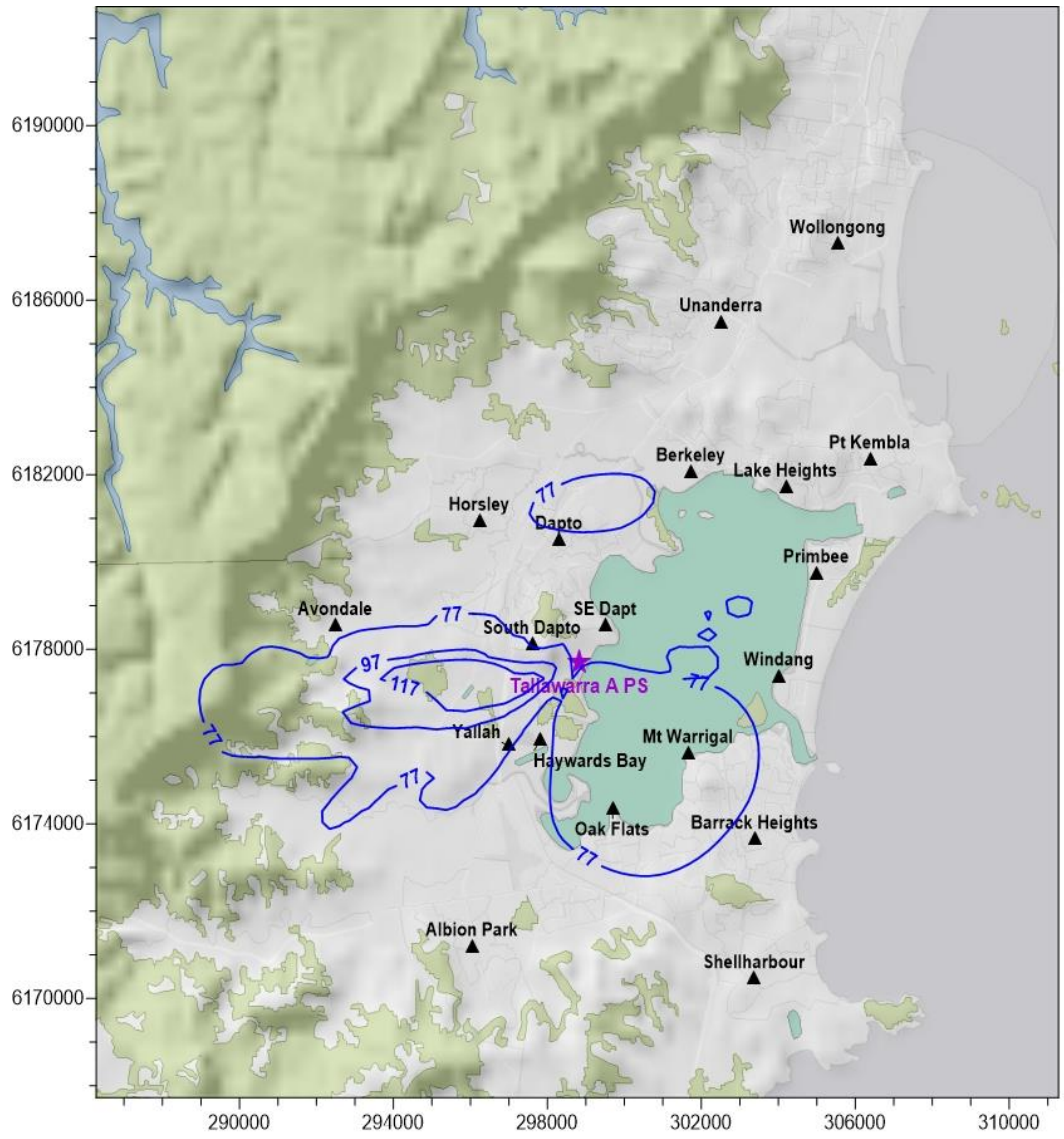

Plate 1 **Maximum cumulative 1-hour average ground-level concentrations of NO_2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollongong	1-hour	TAPM	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum	164 µg/m^3	D. Gallagher	May 2023

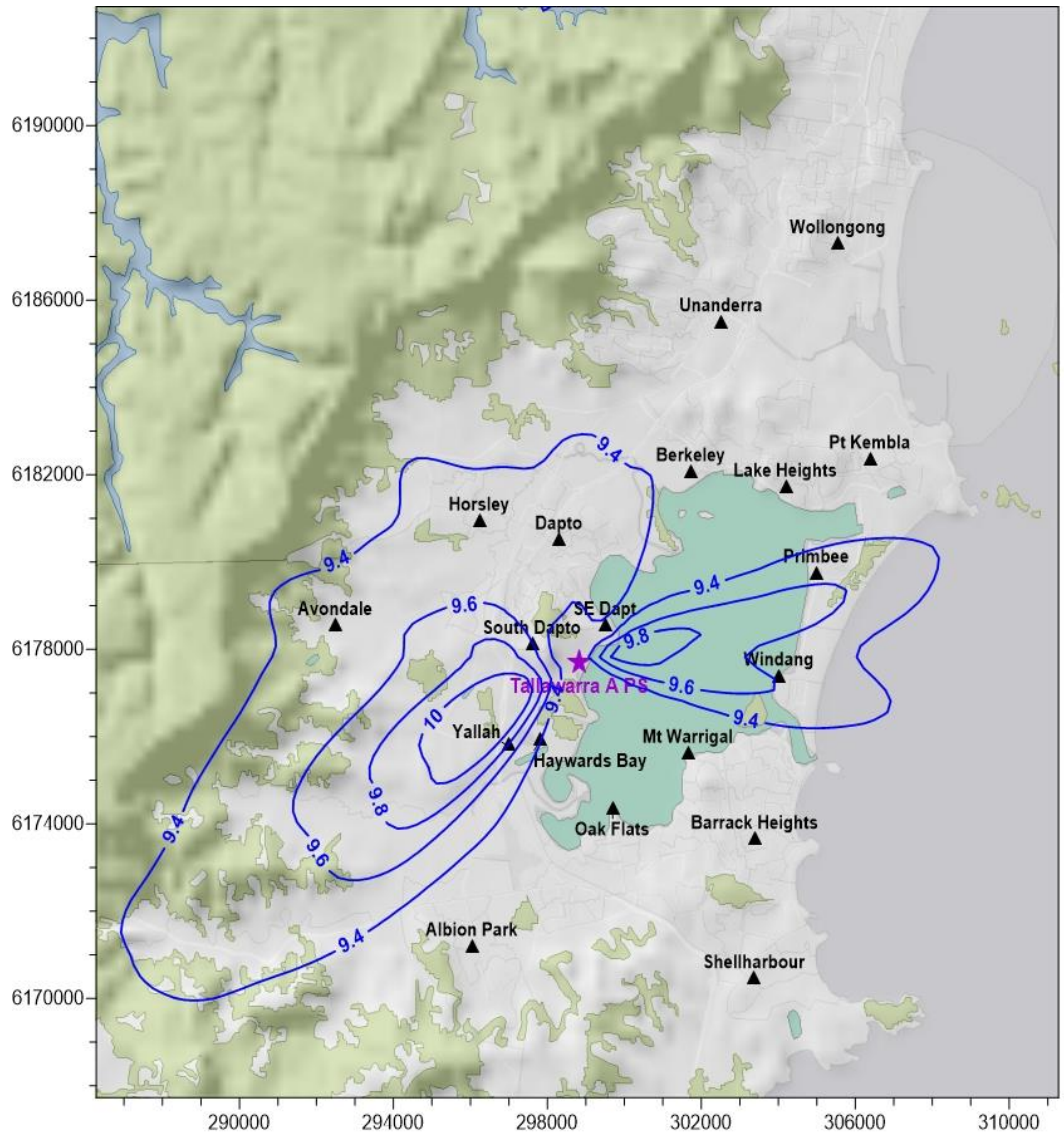

Plate 2 **Maximum cumulative annual average ground-level concentrations of NO_2**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollongong	Annual	TAPM	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Average	31 µg/m^3	D. Gallagher	May 2023

APPENDIX A METEOROLOGICAL AND DISPERSION MODELLING METHODOLOGY

A1 Meteorology

The meteorological modelling methodology for the Project included the following steps:

- Selection of a representative year
- TAPM modelling and validation
- CALMET modelling.

The following sections describe each step of the meteorological modelling conducted for the Project. A summary of the meteorological data generated is provided in Section A1.4.

A1.1 Selection of representative year

Dispersion modelling is required to be conducted using a representative year of meteorological conditions. Using a representative year in the air quality assessment ensures that the typical conditions experienced at the Project site are reflected in the model.

Selection of a representative year has been done through statistical analysis of historical meteorological observations at the Bureau of Meteorology automatic weather station located at Albion Park, adjacent to Shellharbour Airport. Meteorological observations from the past five years (2018 to 2022) at Albion Park were analysed to assess the inter-annual variability.

Figure A1 presents annual wind roses for the five years and shows that inter-annual conditions are typically very similar. Figure A2 presents frequency distribution plots for humidity, wind direction, wind speed and temperature, and demonstrates that there is relatively little variation in the distribution of these variables year-on-year. Notable exceptions are the distribution of wind direction in 2022 and the distribution of temperature in 2019. Figure A3 presents Z-Scores for each variable for each year, these being a measure of the variation of values in each individual year against the mean of values across all years. No one year stands out as being ‘typical’, but discounting 2019 and 2022 on the basis of the frequency distribution plots, any of the years 2018, 2020 and 2021 could be considered to be typical years.

Initial screening level modelling was performed to examine ground-level impacts from TAPS for the years 2018 and 2021. 2018 was found to predict more conservative ground-level concentrations at sensitive receptors compared to 2021, and so was adopted as the representative year for modelling. This is also consistent with Katestone’s past work modelling emissions from TAPS and TBPS.

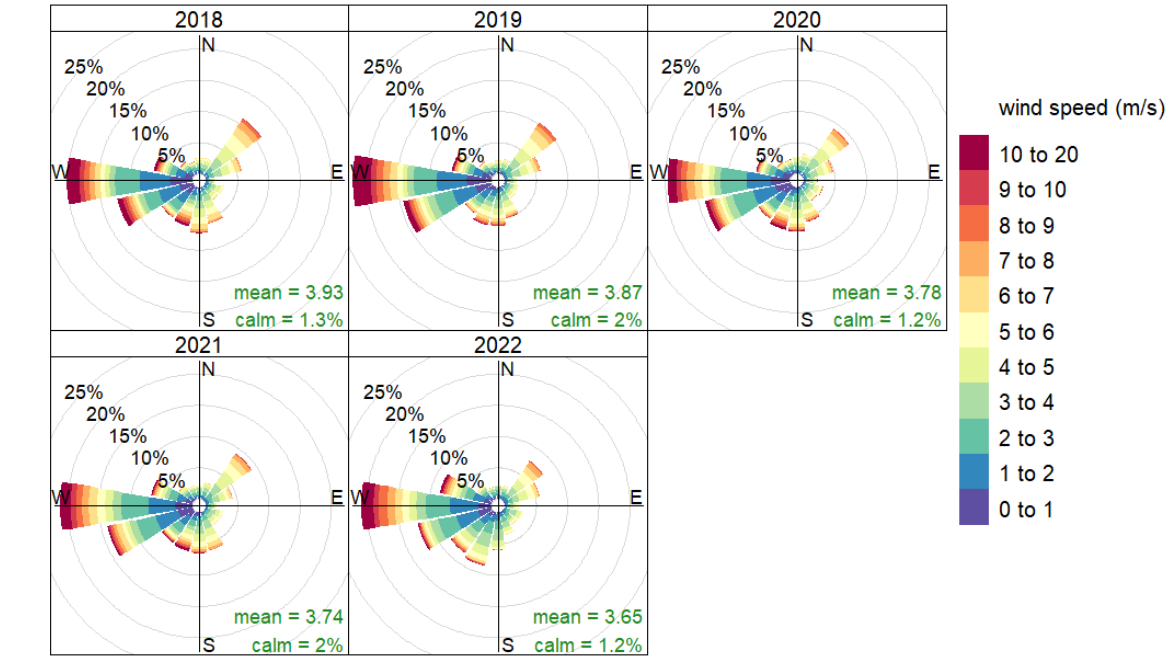

Figure A1 Annual wind roses for BoM Albion Park between 2018 and 2022

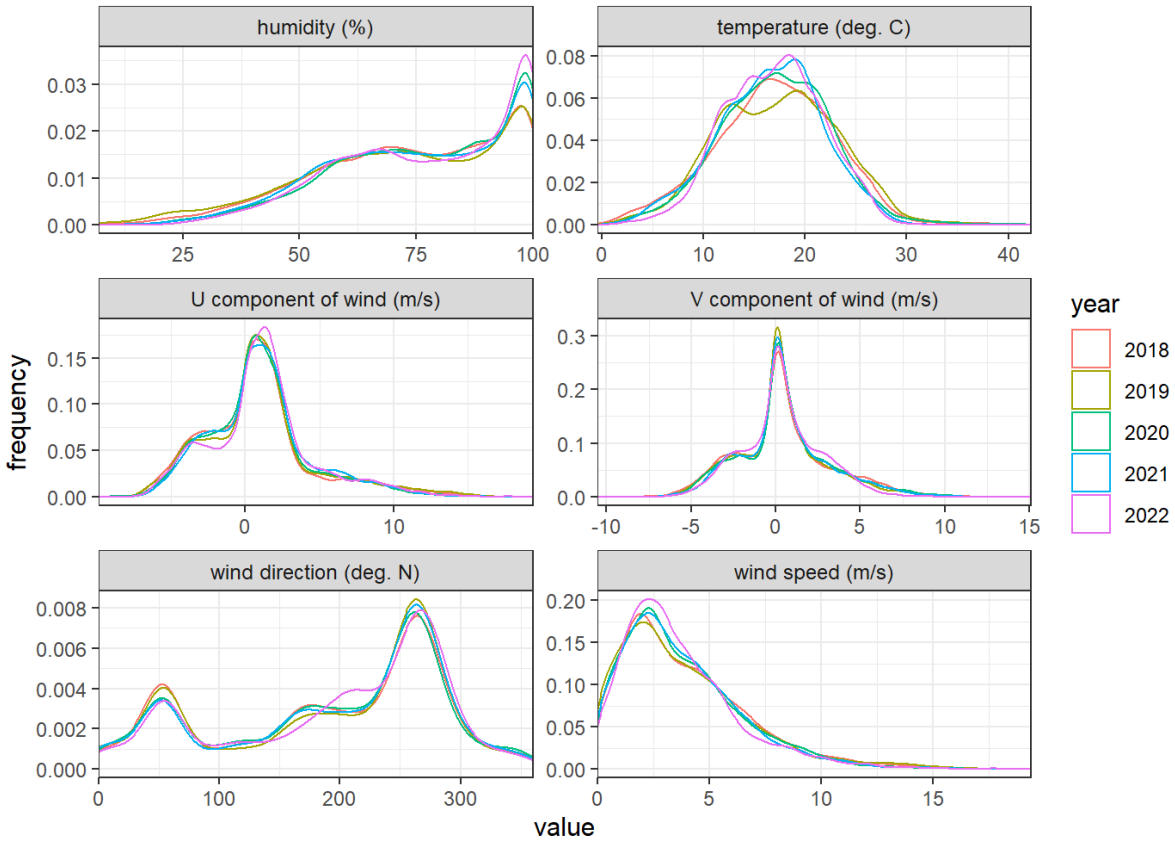

Figure A2 Annual frequency distribution plots for BoM Albion Airport between 2018 and 2022

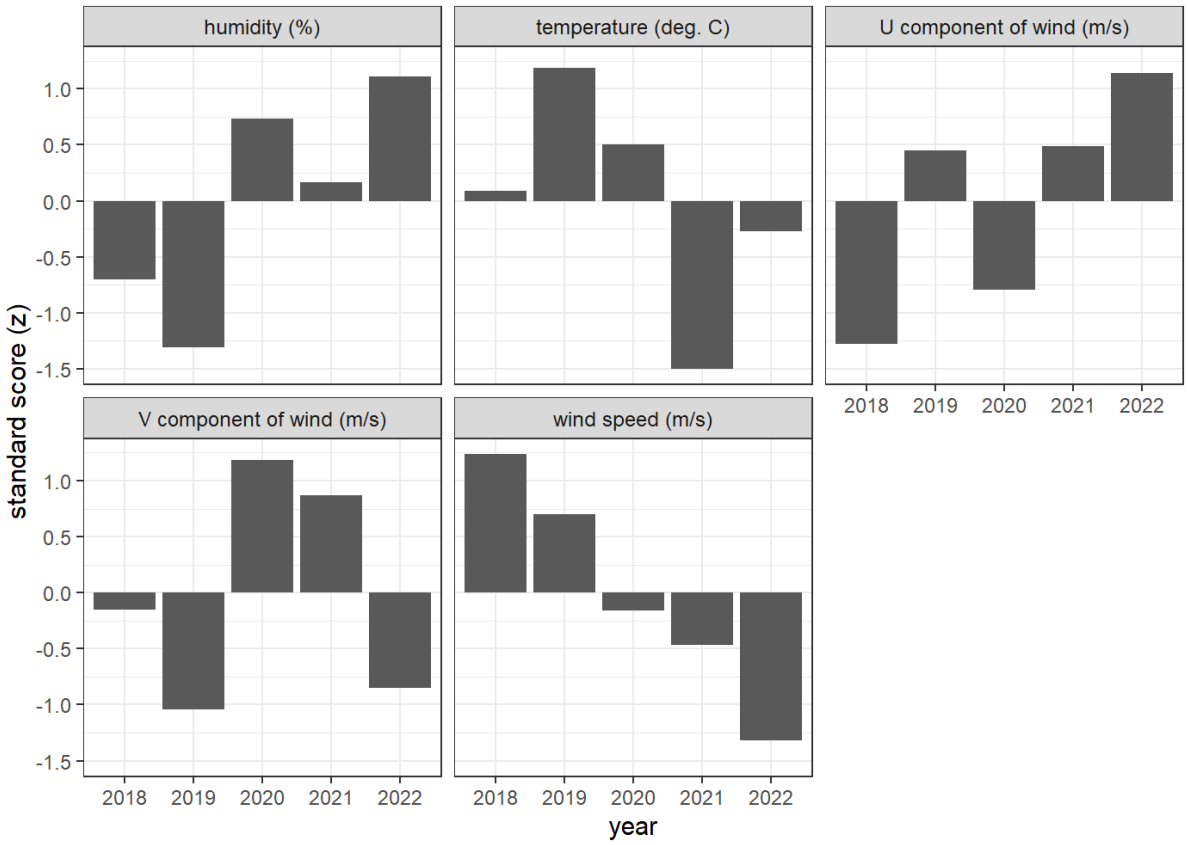

Figure A3 Z-Scores for BoM Albion Airport between 2018 and 2022

A1.2 TAPM meteorological modelling configuration

TAPM (The Air Pollution Model) was developed by the CSIRO and has been validated by the CSIRO, Katestone and others for many locations in Australia, in south-east Asia and in North America (CSIRO, 2008). Katestone has extensive experience with TAPM for sites throughout Australia and in parts of America, Bangladesh, New Caledonia and Vietnam. The model performs well in simulating regional wind patterns and has proven to be a useful tool for simulating meteorology in locations where monitoring data is unavailable.

TAPM is a prognostic meteorological model which predicts the flows important to regional and local scale meteorology, such as sea breezes and terrain-induced flows from the larger-scale meteorology provided by the synoptic analyses. TAPM solves the fundamental fluid dynamics equations to predict meteorology at a mesoscale (20 km to 200 km) and at a local scale (down to a few hundred metres). TAPM includes parameterisations for cloud/rain micro-physical processes, urban/vegetation canopy, soil type and radiative fluxes.

TAPM requires synoptic meteorological information for the region. This information is generated by a global model similar to the large-scale models used to forecast the weather. The data were supplied on a grid resolution of approximately 75km, and at elevations of 100m to 5km above the ground. TAPM uses this synoptic information, along with specific details of the location such as surrounding terrain, land-use, soil moisture content and soil type to simulate the meteorology of a region as well as at a specific location.

TAPM version 4.0.5 was configured with the following parameters:

- Modelling period from 1 January to 31 December 2018
- 36 x 36 grid point domain with nesting resolutions of 30 km, 10 km, 3 km, and 1 km
- 25 vertical levels

- Grid centred on latitude -34° 30.0', longitude 150° 48.5'
- Geoscience Australia 9 second DEM terrain data
- TAPM default land cover data edited to be consistent with aerial imagery
- Default options selected for advanced meteorological inputs
- Data assimilation as follows:
    - Data from the Bureau of Meteorology's monitoring station at Albion Park (Shellharbour Airport) assimilated over two vertical levels with a radius of influence of 10km and a quality factor of 1
    - Data from the NSW Department of Planning and Environment's monitoring station at Kembla Grange assimilated over two vertical levels with a radius of influence of 10km and a quality factor of 1
    - Data from the NSW Department of Planning and Environment's monitoring station at Wollongong assimilated over two vertical levels with a radius of influence of 10km and a quality factor of 1.

A1.3 Comparison of TAPM output with observational data

A1.3.1 Overview

The model validation in this section compares observational data with data derived from running TAPM after assimilating data from the Bureau of Meteorology's monitoring station at Albion Park and the NSW Department of Planning and Environment's monitoring stations at Kembla Grange and Wollongong. Comparison of the observational data with the model predictions at these three sites showed that the model generally performed well at simulating the meteorology across the region.

A1.3.2 Validation of TAPM modelling

The following section presents the results of the validation of the final TAPM run that was used for the dispersion modelling assessment. The model validation compares the BoM Albion Park observational meteorological data with data extracted from TAPM at the location of the BoM Albion Park monitor.

Figure A4 shows probability density functions that graphically compare statistical distributions of meteorological parameters between the TAPM output and BoM Albion Park observational data. Table A1 presents statistical comparisons of TAPM output (wind speed and temperature) to meteorological data recorded at the Bom Albion Park monitoring station. The TAPM output was extracted from the closest inner grid point to the location of the weather station.

The following statistical measures of model accuracy are presented in the tables:

- The mean bias, which is the mean model prediction minus the mean observed value. Values of the mean bias close to zero show good prediction accuracy.
- The root mean square error (RMSE), which is the standard deviation of the differences between predicted values and observed values. The RMSE is non-negative and values of the RMSE close to zero show good prediction accuracy. The RMSE is given by

$$\mathrm{RMSE} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2}$$

where N is the number of observations, P_i are the hourly model predictions and O_i are the hourly observations

- The index of agreement (IOA), which takes a value between 0 and 1, with 1 indicating perfect agreement between predictions and observations. The IOA is calculated following a method described in Willmott (1982), using the equation

$$\mathrm{IOA} = 1 - \frac{\sum_{i=1}^{N}(P_i - O_i)^2}{\sum_{i=1}^{N}(|P_i - O_{mean}| + |O_i - O_{mean}|)^2}$$

where N is the number of observations, P_i are the hourly model predictions, O_i are the hourly observations and O_{mean} is the observed observation mean.

Whilst the bias values are slightly outside the benchmark ranges, the IoA for wind speed and temperature are both greater than the minimum benchmark value, and the probability density functions illustrate that the TAPM run with assimilated data shows good agreement between predicted and observed meteorological data, which is to be expected given the assimilation of data at the BoM Albion Park, DPE Kembla Grange and DPE Wollongong locations.

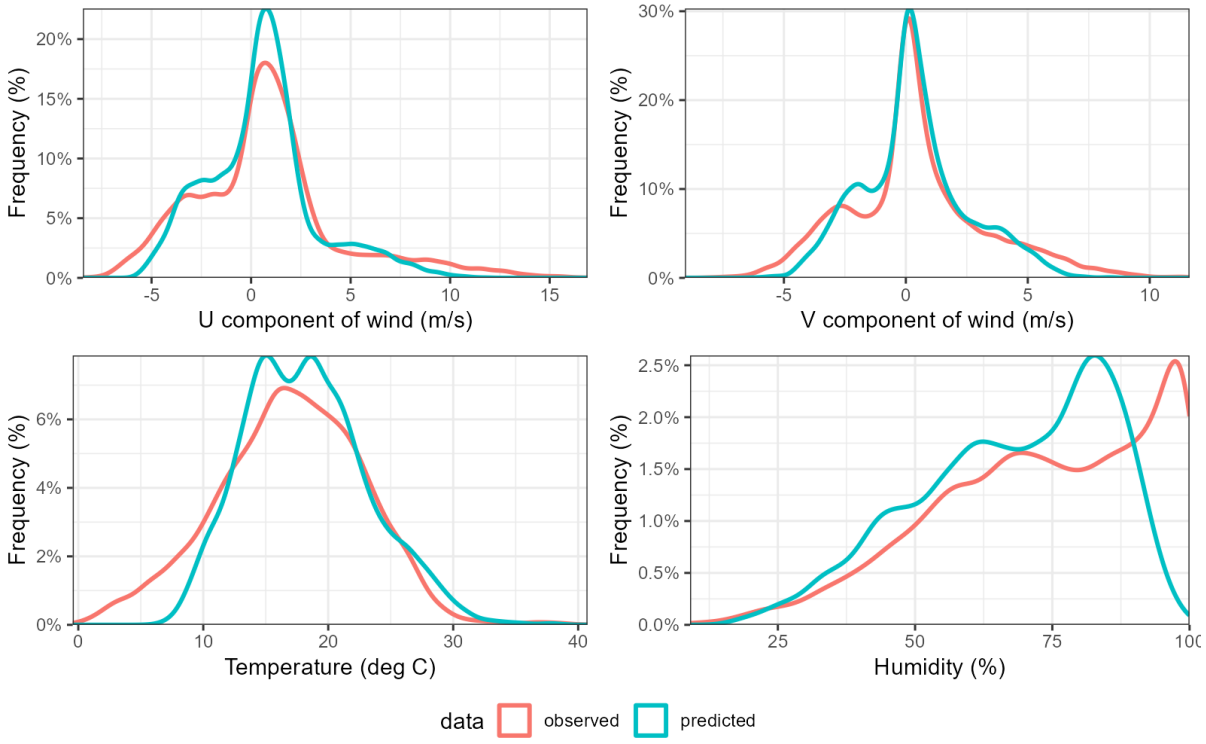

Figure A4 Probability density functions comparing 2018 observational data (blue) with TAPM data (red) at the location of the BoM Albion Park monitoring station

Table A1 A comparison of the observed meteorological data with the TAPM output for 2018 at the location of the BoM Albion Park monitoring station

Statistic	"Good" value	Wind speed			Temperature		
		Benchmark	Observational data	TAPM	Benchmark	Observational data	TAPM
Mean	-	-	3.9	3.0	-	17.0	18.3
SD	-	-	2.8	2.0	-	5.9	4.9
Min	-	-	0.0	0.0	-	-0.5	6.1

Statistic	"Good" value	Wind speed			Temperature		
		Benchmark	Observational data	TAPM	Benchmark	Observational data	TAPM
Max	-	-	17.1	11.9	-	40.8	38.5
Bias	0	< ± 0.5 m/s	-0.81		< ± 0.5 °C	1.37	
RMSE	Close to 0	< 2 m/s	1.27		-	3.40	
IoA	Close to 1	> 0.6	0.93		≥ 0.8	0.90	

A1.4 TAPM meteorological outputs

The following sections provide a description of the meteorological parameters that are important for the dispersion of air pollutants in the atmosphere, namely wind speed, wind direction, atmospheric stability, mixing layer height, and temperature. These parameters have been extracted from the TAPM dataset at the Project site.

A1.4.1 Wind speed and wind direction

The annual distribution of winds predicted by TAPM for 2018 is presented in Figure A5. The seasonal and diurnal distribution of winds is presented in Figure A6 and Figure A7.

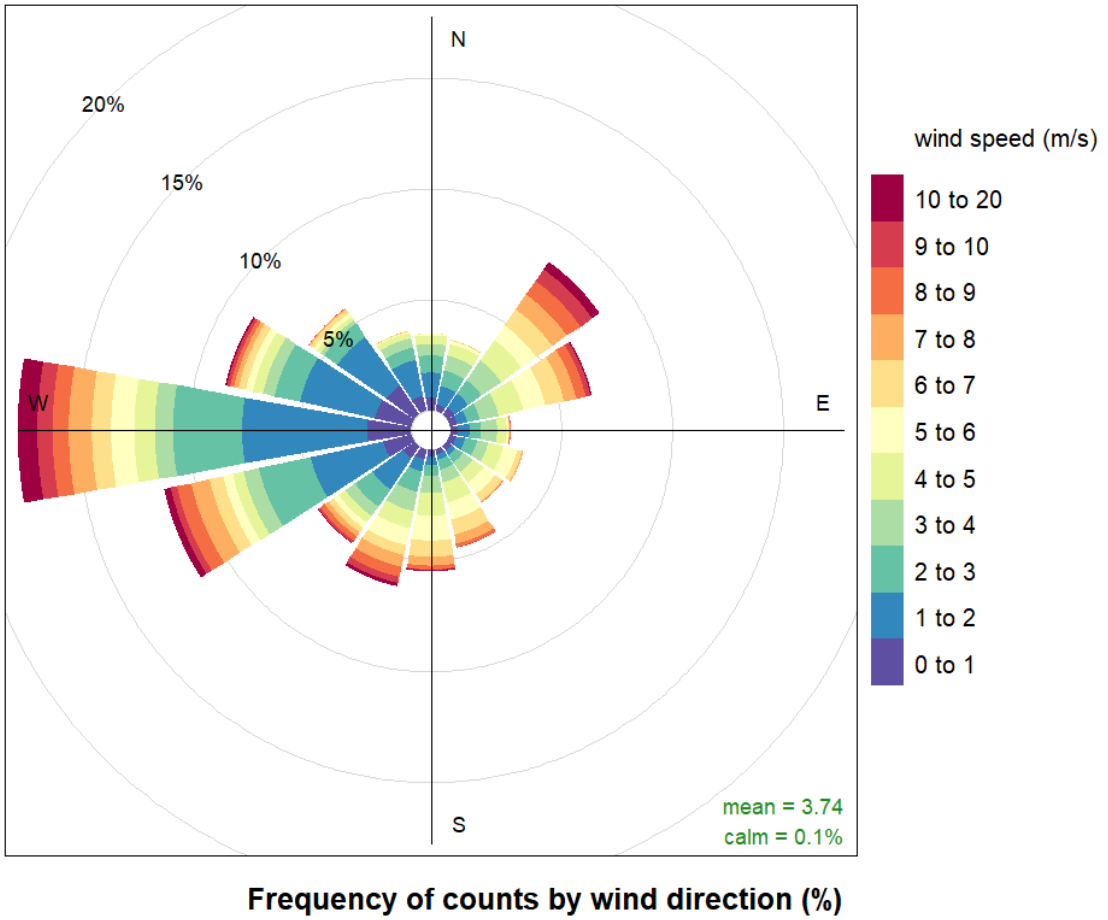

Figure A5 2018 Annual distribution of winds predicted by TAPM

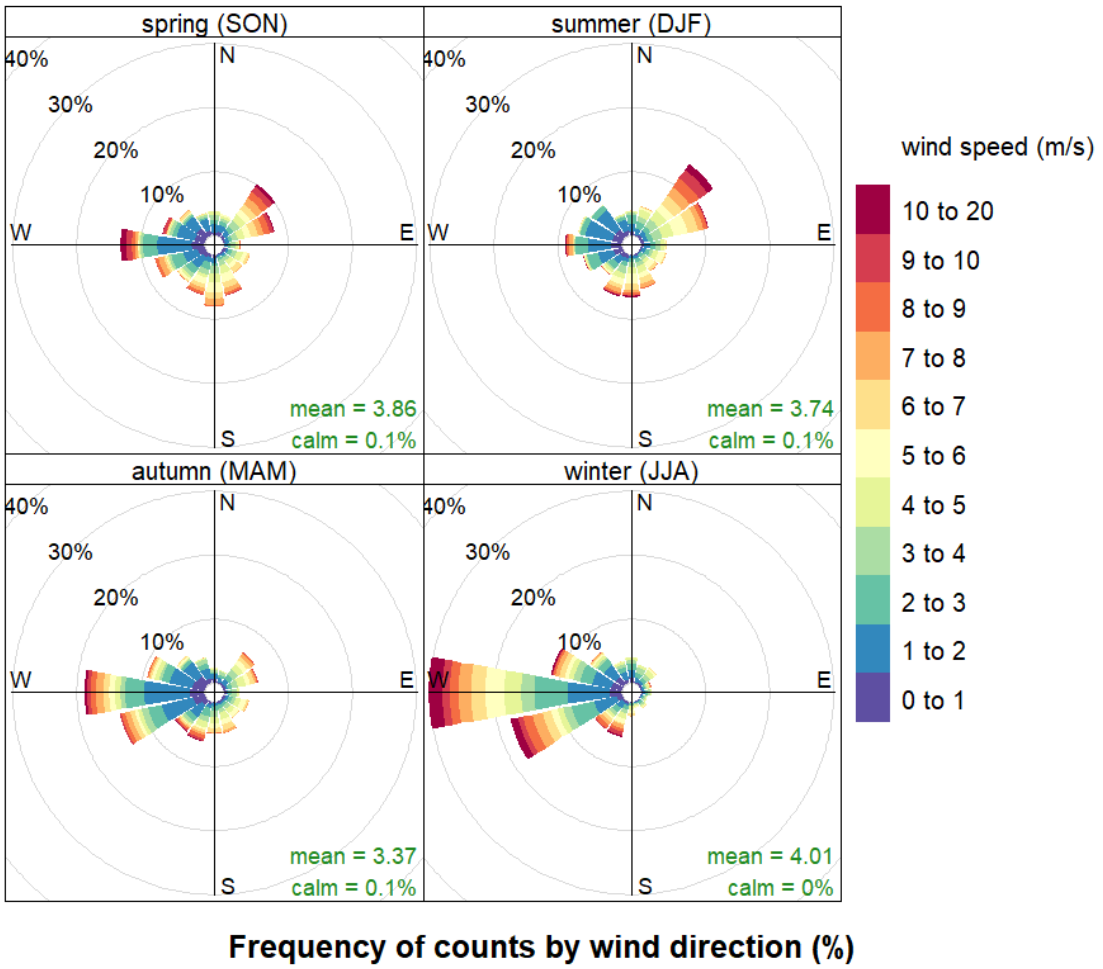

Figure A6 2018 Seasonal distribution of winds predicted by TAPM

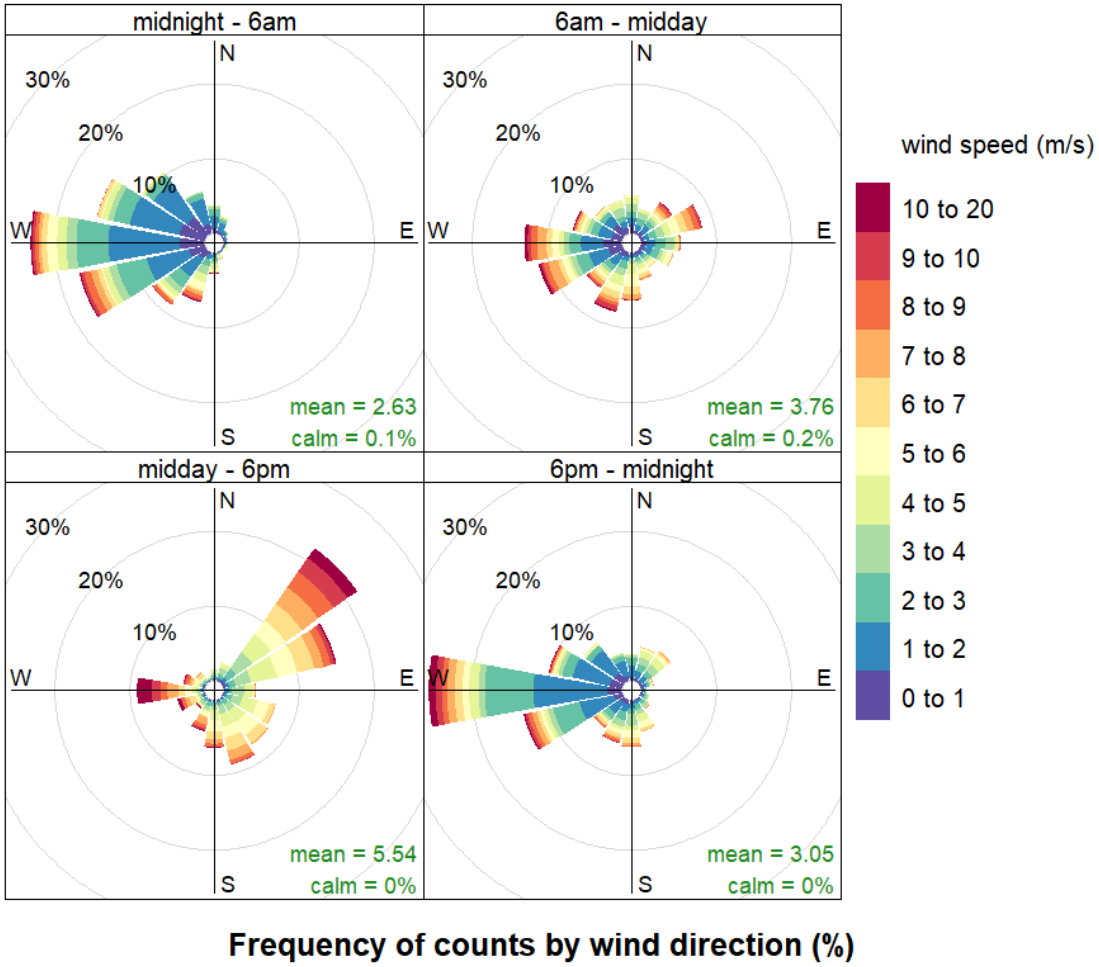

Figure A7 2018 Diurnal distribution of winds predicted by TAPM

A1.4.2 Atmospheric stability

Stability classification is a measure of the stability of the atmosphere and can be determined from wind measurements and other atmospheric observations. The stability classes range from A Class, which represents very unstable atmospheric conditions that may typically occur on a sunny day, to F Class, which represents very stable atmospheric conditions that typically occur during light wind conditions at night. Unstable conditions (Classes A to C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for Class D conditions are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface. During the night, the atmospheric conditions are generally stable (often Classes E and F).

Figure A8 and Table A2 show the distribution of stability classes extracted from the TAPM dataset, where Class A represents the most unstable conditions and Class F represents the most stable. Class D stability occurs approximately 63% of the time due to moderate wind speeds. Class E stability occurs approximately 23% of the time and represents calmer evening conditions. Some unstable (Class B) conditions occur between 6 am and 5 pm.

Table A2 Frequency of occurrence (%) of surface atmospheric stability at the TAPS site under the Pasquil-Gifford stability classification scheme (as predicted by TAPM)

Pasquil-Gifford stability class	Classification	Frequency (%)
A	Extremely unstable	0.1%
B	Unstable	4.6%
C	Slightly unstable	9.9%
D	Neutral	62.7%
E	Slightly stable	22.6%
F	Stable	0.1%

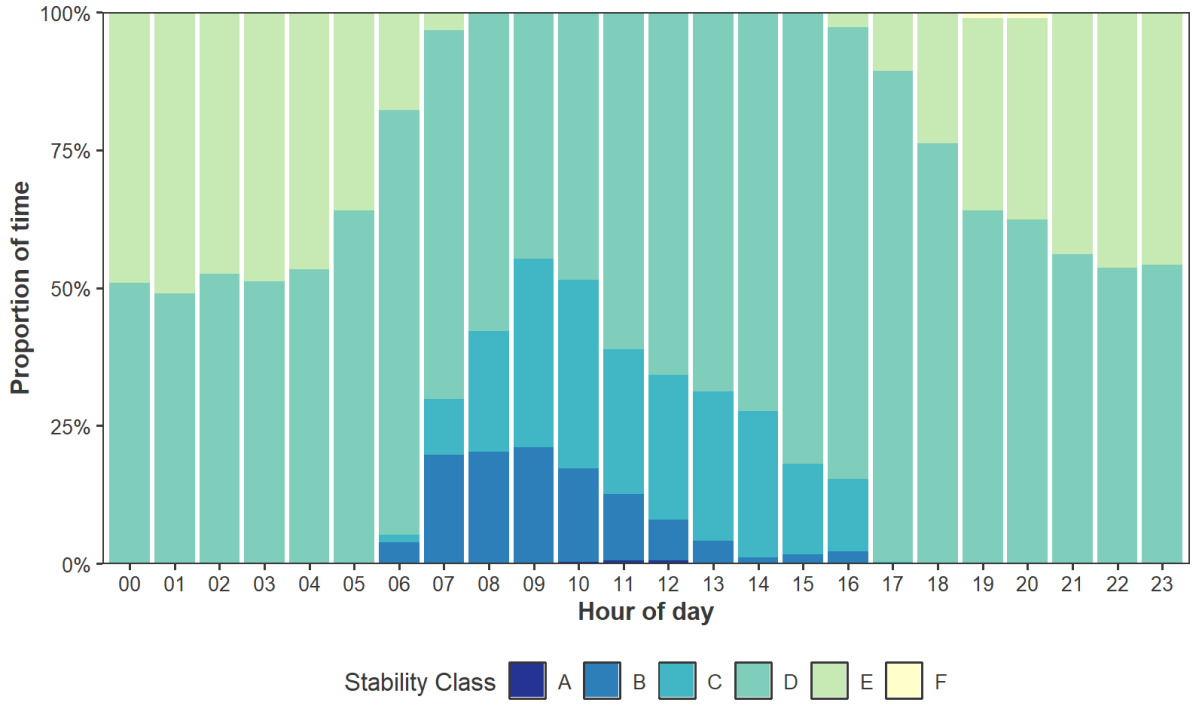

Figure A8 2018 diurnal distribution of stability classes predicted by TAPM

A1.4.3 Mixing height

The mixing height defines the height of the mixed atmosphere above the ground (mixed layer), which varies diurnally. Air pollutants released at or near the ground will become dispersed within the mixed layer. During stable atmospheric conditions, the mixing height is often quite low, and dispersion is limited to within this layer. During the day, solar radiation heats the ground and causes the air above it to warm, resulting in convection and an increase to the mixing height. The growth of the mixing height is dependent on how well the warmer air from the ground can mix with the cooler upper-level air and, therefore, depends on meteorological factors such as the intensity of solar radiation and wind speed. Strong winds cause the air to be well mixed, resulting in a high mixing height.

Mixing height information extracted from the TAPM dataset are presented as a diurnal frequency (box and whisker) plot in Figure A9. The data show that the mixing height remains fairly consistent throughout a typical day, developing marginally after about 7 am and reaching a peak around 3 pm before descending again.

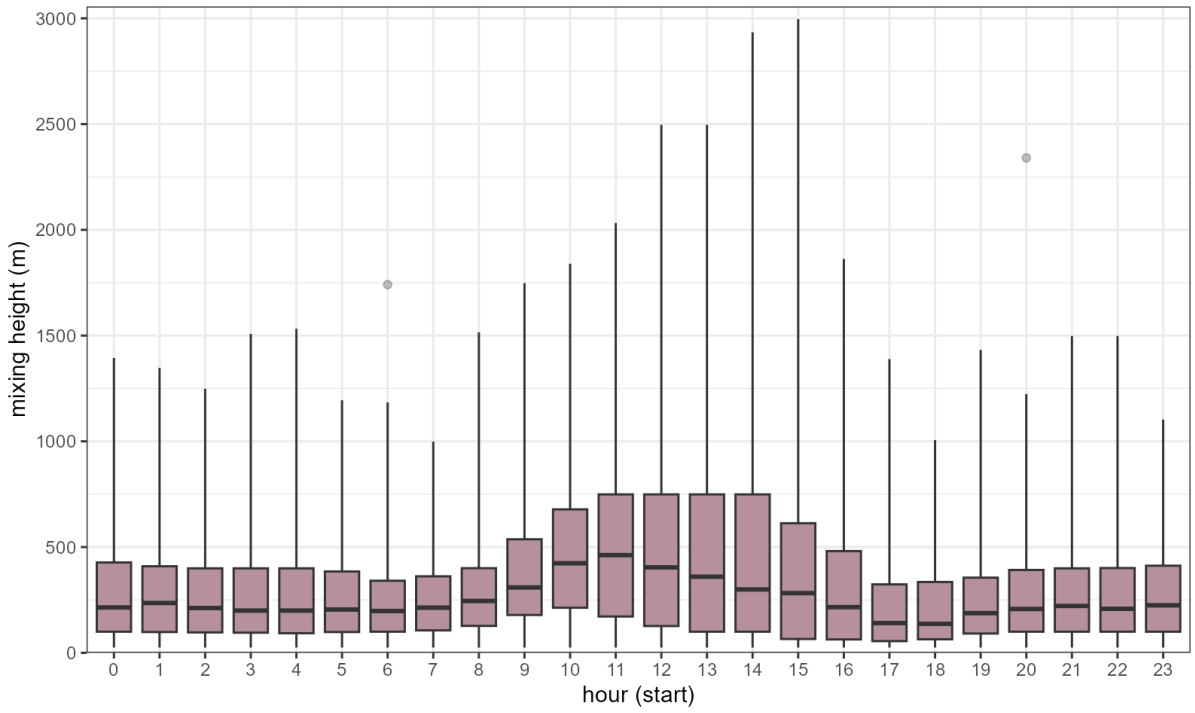

Figure A9 2018 Diurnal profile of mixing height predicted by TAPM

A2 Dispersion modelling

A2.1 General dispersion modelling approach

TAPM pollution modelling was conducted for TAPS (pre- and post-upgrade) and for TBPS including the modified PDD outlet. Settings for TAPS were as follows:

- Pollution modelling grid based off the 36 x 36 grid point 1 km resolution domain, centred at latitude 34°30' and longitude 150°48.5' for all scenarios
- Resolution increased to 101 x 101 grid points with 250 m spacing
- A single source representing the TAPS stack point was included with a single tracer included in a .pse file at a unit rate of 1 g/s
- All background concentrations were set to zero
- All emission sources initialised in LPM
- 900 second particle travel time before converting to EGM
- All other settings were left as default.

Extraction and processing of results from the TAPM modelling in order to attain cumulative results involved the following steps:

- Ground-level concentration files (.glca) were extracted from the TAPM dispersion modelling runs for TAPS and TBPS, providing 1-hour average ground-level concentrations for every grid point within the model domain
- The .glca files were then imported to R Studio and the unit emission rates scaled according to the calculated emission rates for each pollutant for TAPS and TBPS
- Hourly ambient background monitoring concentrations of NO_2, PM_{10}, $PM_{2.5}$, SO_2, and O_3 were then imported to R Studio
- Cumulative results were determined for every hour of the year at every grid point within the modelling domain by summing the predicted TAPS and TBPS contributions and ambient background concentrations, including the application of OLM for NO_2
- Respective 24-hour and annual averages, and 1-hour and 24-hour maxima, were then determined for each grid point within the modelling domain, with concentrations at sensitive receptors being represented by the nearest grid point.

A2.2 Specifics of dispersion modelling of TBPS

Two modelling approaches were examined to determine an appropriate method for characterising emissions from the modified PDD installed on the TBPS exhaust stack. The approaches were informed by CFD modelling carried out by Stacey Agnew. Figure A10 adopted from Stacey Agnew's report, presents contours of the exhaust gas velocity and temperature after emissions from the PDD. Scaling from these figures, the core of the exhaust emissions reaches a maximum horizontal extent of around 124 m before tending to rise approximately vertically thereafter. The downward angled emissions extend to about 6.5 m below the top of the PDD. Figure A11 depicts the two approaches, which included:

- Approach 1: characterising emissions as a 124 m wide point source with a low exit velocity, which reflects the lack of initial vertical momentum in emissions from the PDD.

- Approach 2: concentrating the emissions around the edges of the circle using twelve 20 m diameter point sources to represent the twelve points of emission from the PDD (with a diameter of 20 m having been used as an approximation of the width of the rising plumes in Figure A10 while maintaining a low initial vertical exit velocity).
- In both cases the stack height was ascribed to 38.5 m above ground, which is 6.5 m lower than the top of the actual stack resulting from the downward angled discharges from the PDD.

It was found that Approach 2 provided more conservative predicted ground-level concentrations of NO_2 and so was adopted for use in this assessment.

CALPUFF settings for TBPS were the same as described above for TAPS.

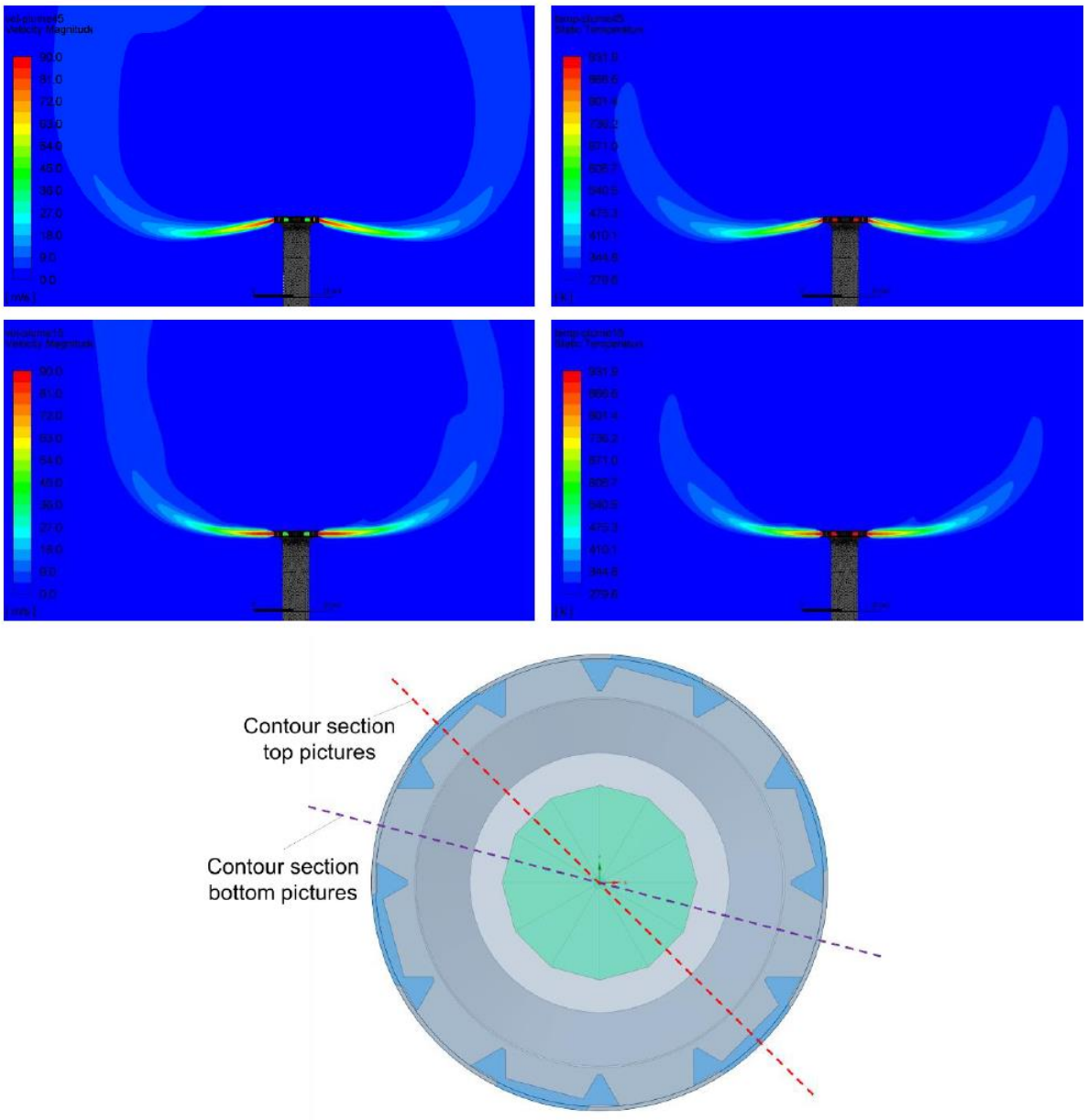

Figure 15. Contours of velocity (left pictures) and temperature (right pictures) close to the stack – 'Initial' wind case. The top pictures show a section through the downward deflected openings and the bottom pictues a section through the horizontal openings.

Figure A10 Exhaust gas velocity and temperature as modelled by CFD

Figure A11 Modelled point source layout for the two modelling approaches of the modified PDD

Appendix C: Aviation risk assessment

katestone
www.katestone.global

19 September 2023

Attn: Peter Fawcett

Aurecon
Level 11, 73 Miller Street
North Sydney NSW 2060

Email: Peter.Fawcett@aurecongroup.com

Re: Tallawarra A upgrade – Aviation Risk Assessment

Dear Peter,

Katestone Environmental Pty Ltd was commissioned by Aurecon Australasia Pty Ltd on behalf of EnergyAustralia to evaluate the risk to aviation associated with the proposed Tallawarra A Power Station Upgrade Proposal.

The Tallawarra A Power Station is a combined cycle gas turbine power station located approximately 13 kilometres southwest of central Wollongong, New South Wales. EnergyAustralia proposes to upgrade internal components of the Power Station's gas turbine in April 2024 during a scheduled routine maintenance outage. The upgrade will increase the nominal output to 440 megawatts and increase maximum capacity to 480 megawatts due to increased efficiency. Following the upgrade, power station operations shall resume consistent with the existing operating strategy of the power station. Associated benefits as part of the upgrade include a reduction in emissions intensity on a per MW basis and projected benefits to carbon emissions with the new technology making the power station 'hydrogen capable'.

On 25 August 2023, the Department of Planning and Environment issued the Planning Secretary's Environmental Assessment Requirements (SEARs) under Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* and Part 8 of the *Environmental Planning and Assessment Regulation 2021*. Of relevance to aviation risk, the SEARs include the following assessment requirements:

Hazards and Risks – including:

- *an assessment of potential changes to the aviation risk from the existing Tallawarra Power Station, including any proposed measures and/ or monitoring to mitigate aviation risk*

The exhaust plumes that are emitted by chimneys, stacks or vents associated with industrial processes have the potential to affect aircraft safety if they are hot enough or large enough to rise quickly due to their buoyancy and/or initial vertical momentum and induce a significant updraft. The Civil Aviation Safety Authority (CASA) has identified the need to assess the potential hazard to aviation where the vertical exit velocity from gas efflux or exhaust plume

exceeds 6.1 metres per second (m/s). CASA's requirements are specified under *Advisory Circular AC 139.E-02v1.0, Plume Rise Assessments, March 2023*.

The Tallawarra A power station was approved in 1999 with no conditions relating to aviation risk. In 2020, Aviation Projects, on behalf of EnergyAustralia, prepared an Aviation Impact Assessment[1] of the proposed Tallawarra B power station (TBPS AIA). In relation to the TBPS AIA, CASA specifically directed EnergyAustralia to use 6.1 m/s as the critical plume velocity, writing:

> *...a plume velocity of 6.1 m/s should be used when determining the potential plume rise turbulence impact on aircraft.*
>
> *CASA recommends that the plumes …be managed through an engineering solution…to ensure the plume reduce below 6.1 m/s by 1031 ft AMSL.*

The TBPS AIA assessed the vertical velocity induced by the Tallawarra A power station (Table 1). The vertical velocity induced by the Tallawarra A plume was found to fall below 6.1 m/s at 356 ft above mean sea level (AMSL), which is well below CASA's recommended height of 1031 ft AMSL, meaning the Tallawarra A plume will have negligible effect on aircraft safety.

Table 1 Tallawarra A power station, critical plume heights

Plume vertical velocity (m/s)	Height (ft, AMSL)
10.6	266
6.1	356
4.3	558

The Tallawarra A Power Station Upgrade Proposal is expected to change the exhaust characteristics of the Tallawarra A plume slightly. Exhaust characteristics for the pre- and post-upgraded power station are shown in Table 2.

Table 2 shows reductions in the temperature, exhaust velocity and volumetric flow rate of emissions from the upgraded Tallawarra A stack. These reductions result in a 25% reduction in the initial buoyancy flux of the Tallawarra A plume and a 6% reduction in the initial momentum flux, which in turn will reduce the vertical velocity of the plume at all heights. Therefore, the upgraded Tallawarra A power station would have a reduced risk for aircraft safety. No mitigation measures or monitoring are required to address aviation risk.

Table 2 Tallawarra A power station, pre- and post-upgrade exhaust characteristics

Parameter	Units	Pre-upgrade	Post-upgrade
Nominal output	MW	400	440
Load	%	100	100
Stack height	m	60	60
Exhaust stack diameter	m	6.45	6.45
Exhaust temperature	°C	92.2	74.5
Exhaust velocity	m/s	18.6	18
Flow rate (wet, stack °C, 101.3 kPa)	m^3/s	607.8	589.2
Initial Buoyancy Flux	m^4/s^3	348.8	261.3
Initial Momentum Flux	m^3/s	3,599	3,382

In conclusion, the proposed upgrade of the Tallawarra A power station will result in reductions in the key parameters that contribute to the vertical velocity induced by the power station's plume. Consequently, the initial buoyancy flux

[1] Tallawarra B OCGT, Aviation Impact Assessment, prepared for EnergyAustralia Development Pty Ltd, 062001-03, 13 February 2020

of the plume will be reduced by 25% and the initial momentum flux will be reduced by 6%, resulting in reduced vertical velocity of the plume at all heights. Therefore, the upgraded Tallawarra A power station has a reduced risk for aircraft safety as compared to its current configuration.

Please contact the undersigned on (07) 3369 3699 if you would like to discuss this further.

Yours sincerely,

Simon Welchman - Director

Appendix D: Social impact assessment

Tallawarra A Power Station

Social Impact Assessment

EnergyAustralia

Reference: P522990

Revision: 2

2023-10-16

aurecon

Bringing ideas to life

Document control record

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Report title		Social Impact Assessment				
Document code			**Project number**		P522990	
File path						
Client		EnergyAustralia				
Client contact			**Client reference**			
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
1	2023 10 16	Draft V1	Milly Truong	Liliana Pena		Allison Heller
2	2023 10 20	Final	Milly Truong	Liliana Pena		Allison Heller
3						
Current revision		**2**				

Approval			
Author signature		Approver signature	
Name	Milly Truong Liliana Pena	Name	Allison Heller
Title	Manager: Senior Consultant, Engagement and Change Advisory, Aurecon	Title	Principal, Social Value – Engagement and Change Advisory, Aurecon

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Qualifications of professionals who prepared this Social Impact Assessment

The authors of this Social Impact Assessment (SIA) meet the qualifications and experience criteria outlined in the SIA Guideline – i.e., have qualifications in relevant social science disciplines and/ or proven experience over multiple years and competence in social science research methods and SIA practices. Table 1 summarises the experience of the report authors.

Table 1 SIA authors qualifications and experience

Author	Experience
Allison Heller *BTP (Hons 1)* *PGDipHistArch* *MPIA* Principal, Social Value – Engagement and Change Advisory, Aurecon	**SIA Approver** Allison has more than 20 years of experience in urban and social planning/ policy across the private and public sectors. With expertise in social impact assessment, social infrastructure planning, place strategy and broad-based social sustainability strategies, she brings a deep understanding of the complexities of infrastructure delivery and the growing need for organisations to demonstrate social value to shareholders, governments, and communities. Allison is a leading SIA practitioner. She has led SIAs for major government and private sector projects, including a range of state significant health, education, transport, and cultural infrastructure projects. She is adept at applying the NSW DPE's new SIA Guideline 2023. Allison brings deep expertise in leading Social Strategy and multidisciplinary teams to work constructively with clients in identifying, analysing, and advising on social impacts, with a view to optimising social value.
Liliana Peña *BSW(Hons)* *MAURP* Senior Consultant, Engagement & Change Advisory	**SIA Lead** Liliana contributes over 14 years of domestic and international experience in social impact assessment, social research, stakeholder and community engagement, and urban planning. She has worked on large-scale infrastructure projects across various sectors in Australia and overseas. Liliana is Aurecon's SME for Social Impact Assessments and Social Factors Research. She has a rich background in social research, communications and delivery of stakeholder and community engagement activities from project inception to construction. Liliana has delivered Social Impact Assessment reports for several government and private projects in NSW and VIC. She works around various authority standards and best practice guidelines for social impact assessment and stakeholder engagement, including the International Association for Impact Assessment Guidelines and Principles for Social Impact Assessment, the NSW DPE Social Impact Assessment Guideline 2021, and the International Association for Public Participation IAP2.
Milly Truong Senior Engagement and Change Manager	**SIA Analyst** Milly brings more than 18 years' experience in community engagement, communications, placemaking, community infrastructure planning and impact analysis. She has extensive experience working within culturally and politically sensitive environments and leads multi-disciplinary teams to establish programs and projects to ensure the success of complex infrastructure projects and programs.

Executive Summary

This Social Impact Assessment (SIA) has been prepared by Aurecon on behalf of EnergyAustralia, to support the State Significant Development Application SSD-60938959[1] to upgrade some of the internal components of the gas turbine of the Tallawarra A power station (the proposal).

The proposal will provide design improvements and allow for the installation of new technology and improved materials within the main gas turbine drive equipment. It will increase the nominal output of the power station from approximately 400 MW to 440 MW and would require that the network maximum output capacity registered with AEMO be increased from 440 MW to 480 MW.

The proposal is classified State Significant Development (SSD) by the Department of Planning and Environment (DPE). All SSD projects require development consent under the *Environmental Planning and Assessment Act 1979* (the EP&A Act) from either the Independent Planning Commission or the Minister for Planning (the Minister) before they may proceed.

An Environmental Impact Statement (EIS) has been prepared to accompany the application as of Part 8, Division 5 of the EP&A Regulation and any other relevant legislative instruments that relate to the EIS.

A SIA is required in accordance with the *Social Impact Assessment Guideline for State Significant Projects. The* SIA will evaluate the social impacts, including cumulative impacts, of the proposal in context with other existing developments within the study area surrounding the Tallawarra A power station and ancillary suburbs and locations surrounding Lake Illawarra.

This SIA responds to the Secretary's Environmental Assessment Requirements (SEARs) issued under **SSD-60938959[1]**

SEARs	Detail
SSD-60938959	Social and Economic – including: *A Social Impact Assessment prepared in accordance with the Social Impact Assessment Guidelines for State Significant Projects*

Assessed impacts and benefits of the proposal

- **The overall social significance of impacts during construction, assessed against the categories specified in the Guideline range from minor to minimal.**
- **The overall social significance of impacts during operation, assessed against the categories specified in the Guideline range from minor to minimal.**

Potential negative impacts of the proposal

The negative impacts of the proposal are minimal. The works proposed to the Tallawarra A power station will be contained in the existing turbine hall of the plant, where possible. One 220 tonne mobile crane will be temporarily established for lifting the once through cooler attemperator for installation at the required height. One 40 tonne mobile franna crane will be required to remove the old exhaust gas housing and install the new one. All materials will be stored within the existing footprint of the power station site.

The power station is located on the western side of Lake Illawarra and accessed by Yallah Bay Road directly off the Princes Highway. Deliveries to the power station will not pass through local neighbourhoods and street networks. Apart from the additional truck movements and more workers on site during the works – which are akin to regular maintenance works, there will be no visible activities conducted outside the power station as part of the proposed upgrade.

During construction: As the works are being contained within the turbine hall, social/ human health impacts related dust, noise and visual impacts are not expected. Traffic impacts associated with truck movements will be minimal, as access to the plant is via the access road directly off the Princes Highway.

1 Department of Planning and Environment 2023, Planning Secretary's Environmental Assessment Requirements, viewed 12 September 2023 <https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-60938959%2120230824T194901.629%20GMT>

During operation: As the works will not change the surrounding environment, there will be no negative social impacts during operation.

Potential positive impacts of the proposal

The works will improve the maximum output capacity of the power station from 440 MW to 480 MW. This will enable it to supply up to 480 MW of electricity at peak demand or under specific conditions. This is an increase of 40 MW in the station's maximum capacity.

The works, new plant materials and equipment, will enable EnergyAustralia to generate more electricity without using more gas. The newer and more reliable components will improve electricity production making the power station more efficient whilst reducing plant maintenance frequency from 5 to 8 years. Ultimately, the decrease in maintenance frequency will reduce disruptions to energy supply.

The assessment of positive social impacts within the local identified study area indicates the following:

During construction: opportunities to enhance local workforce skills and support the local economy through local jobs (albeit minimal).

During operation: improved energy supply efficiency and security in the area, with associated economic benefits, along with reduced carbon emissions.

The broader district and regional operational benefits of the upgrade of the Tallawarra A power station include:

- Improvements to the consistency of network voltage within established parameters across the NSW electricity grid.
- Enhanced power station efficiency by decreasing the consumption of natural gas.
- Minimised greenhouse gas emissions.
- Enhanced energy grid security and stability to mitigate episodes of variable renewable energy production.
- Increased resilience of the NSW electricity grid and the National Electricity Market (NEM) to support the transition from coal power stations to renewable energy.
- By making Tallawarra A hydrogen capable, the upgrade increases the potential customer base for hydrogen in the Illawarra region, supporting the creation of a hydrogen industry.

1 Introduction

1.1 Proposal site and surrounds

The Tallawarra A power station – owned and operated by EnergyAustralia – is a gas turbine facility located on the western side of Lake Illawarra in the suburb of Yallah. The facility is located in the Wollongong Local Government Area (LGA) in proximity with suburbs in the Shellharbour LGA.

The power station is 2 km from the suburb of Koonawarra and is approximately 13 km south of Wollongong, in the NSW south coast region.

The power station was commissioned in 2009 and has the capacity to generate 400 megawatts (MW) of electricity and the ability to power up to 200,000 homes. EnergyAustralia plans to upgrade the gas turbine's internal components as part of a planned maintenance outage in April 2024.

The upgrade includes design improvements, adoption of new technology, and the application of high-quality materials for main gas turbine drive equipment. The technological advancements enable the power station to operate more efficiently using less gas to generate more electricity thereby enhancing its reliability whilst reducing carbon emissions.

1.2 Purpose and scope of this report

The proposed power station upgrade (the proposal) falls under the category of State Significant Development (SSD) as defined by Clause 2.6(1) of the State Environmental Planning Policy (Planning Systems) 2021. As per Section 4.12(8) of the Environmental Planning and Assessment Act 1979, it is required to be accompanied by an Environmental Impact Statement (EIS) that complies with the guidelines outlined in Part 8, Division 5 of the EP&A Regulation and other relevant legislative instruments related to the EIS.

An Environmental Impact Statement (EIS) is being prepared to accompany the application as of Part 8, Division 5 of the EP&A Regulation and any other relevant legislative instruments that relate to the EIS.

This Social Impact Assessment (SIA) has been specified through the Secretary's Environmental Assessment Requirements (SEARs) issued under SSD-60938959.[1] It has been prepared in accordance with the NSW Department of Planning and Environment, Social Impact Assessment Guideline 2023, applicable to State Significant Projects.

The SIA assesses the social impacts of the proposal, within a study area that has been defined with regard to the likely impacts of the proposal during construction and operation – including suburbs surrounding Lake Illawarra.

Due to the potential minor impacts associated with this proposal a 'minor' level of assessment is required to evaluate the proposal potential impacts.

1.3 Methodology

This SIA has been prepared for a '**minor'** level assessment, as outlined in Table 2, and as per the NSW Department of Planning Industry and Environment (DPIE), Social impact Assessment Guidelines for State Significant Project (DPIE Feb 2023) (Technical supplement)[4]. The minor level of assessment reflects the proposal scale and magnitude of potential impacts to the socio-economic environment.

Table 2 Indicative data requirements for different levels of assessment[2]

Level of assessment	Secondary data	Primary data	
		Consultation	*Research*
Minor	Required	Limited if required	Not required
Standard	Required	Targeted consultation	Potentially targeted research
Detailed	Required	Broad consultation	Targeted research

In accordance with the NSW SIA Guideline, this assessment was prepared using the following methodology:

- Establish the socio-economic study area (refer to Section 3).
- Review statutory planning and legislative requirements, including a review of existing State and local government strategies relevant to the social and economic environment of the study area (refer to Section 3.8).
- Review community consultation for the proposal, including key community issues relevant to the socio-economic impact assessment. Limited community consultation requirements are required, as the proposed works will occur entirely within the existing power station footprint.
- Prepare the social baseline: including an analysis of analyse the existing socio-economic environment of the study area (refer to Section 3). The existing socio-economic environment is described in terms of:
  - Analysis of key population and demographic indicators, including data from the 2021 ABS Census of Population and Housing.
  - Analysis of existing data and information on local business and industry, employment and income, and dwelling characteristics.
  - Desktop audit of community facilities, public services and places of special interest drawing on Council's database to identify likely locations of community activity, and the distribution of services and facilities that are likely to be accessed by communities within the study area.
  - A desktop audit of industrial zones and retail centres drawing on government and council databases to identify likely locations of businesses and traders.
- Identification and assessment of the potential socio-economic impacts of the proposal's construction and operation on local communities – including sensitive receivers and community assets, values, and infrastructure. The impact assessment considers sensitivity and magnitude to determine potential significance of impacts prescribed in the NSW Social impact Assessment Guidelines for State Significant Project (DPIE Feb 2023) (Technical supplement) (refer to Section 4.3).
- Identification and assessment of management and mitigation measures to avoid, minimise, manage, or mitigate the proposal's impacts and enhance or maximise the proposal's benefits identified through the socio-economic impact assessment (refer to Section 4.3).

2 Department of Planning and Environment 2023, Technical Supplement Social Impact Assessment Guideline for State Significant Projects, SIA Methods, viewed 12 September 2023, https://www.planningportal.nsw.gov.au/sites/default/files/documents/2023/GD1944%20SIAG%20-%20Technical%20Supplement_NEW%20VI_14_02_23.pdf, p.9

2 Proposal overview

2.1 Proposal objectives

EnergyAustralia is working to create a portfolio that allows it to use its assets more flexibly. This helps support the use of cleaner energy sources and ensures that EnergyAustralia can provide power when its customers need it most. This transition benefits New South Wales (NSW) and its consumers by creating new capacity and economic opportunities in the areas where EnergyAustralia operates.

The proposed upgrade to the power station will ensure generators of lower emission intensity are available to support the NSW energy transition to more renewable sources as coal fired plants are phased out. Improvements to the power station will ensure that Tallawarra continues as a reliable energy source for customers across NSW, benefitting many beyond the study area. The proposal would contribute to further improving the reliability and security of electricity supply to NSW at a time when large coal power stations generators are being decommissioned. The Liddell Power Station closed in April 2023 and the Eraring power station was scheduled for closure in 2025, but a temporary extension of its operating life is likely.

The objectives of the proposal are to:

- Increase the efficiency and reliability of the power station.
- Minimise natural gas consumption.
- Improve the reliability of the Tallawarra A power station.
- Increase the maximum amount of electricity the power plant can generate, which supports the stability of the electricity network while NSW transitions to renewable energy sources.

2.2 Proposal key features

Proposed improvements to the power station include:

- Upgrade of the existing compressor and turbine by replacing the old blades and vanes with a new design that reduces emissions intensity and increases operational reliability
- Upgrade of the existing combustion by replacing existing hardware components with newer technology to reduce the overall consumption of natural gas required for the same output
- Upgrade the steam cycle and steam turbine internal components to increase the power stations overall combined cycle reliability
- Modification and tuning of the generator performance characteristics to increase the power output consistent with energy system regulations and performance requirements.

The improvements will make the power station “hydrogen capable,” enabling future possibilities for substantial reductions in carbon emissions (pending further approval).

3 Social baseline

This section sets out the current social context for the proposal– the 'social baseline,' against which impacts will be assessed. This is in relation to a defined study 'area of social impact' designated in relation to the proposal.

3.1 Study area

The SIA study area is bounded by the Princes Motorway from Berkeley to the north and Albion Park to the south. Warilla Beach and Windang Beach make up the eastern boundary. Table 3 and Figure 1 show the 29 suburbs encompassed within the SIA study area, spanning the Shellharbour and Wollongong LGAs. The study area has been defined with regard to the potential for visual and other impacts associated with works to the power station to impact communities around Lake Illawarra and local surrounds.

The closest homes to the proposal site are situated approximately 1 km to the north. There are upcoming redevelopment plans for the areas around the proposal site, which could involve residential, commercial/ industrial, and potential school developments. If these plans move forward, the nearest future residential area would be situated approximately 700 m to the north of the proposal.

Table 3 Suburbs and the LGAs comprising the designated study area

Wollongong LGA	Shellharbour LGA
Windang	Albion Park Rail
Warrawong	Oak Flats
Lake Heights	Mount Warrigal
Port Kembla	Blackbutt
Cringila	Shellharbour City Centre
Berkeley	Flinders
Unanderra	Shell Cove
Kembla Range	Shellharbour
Kanahooka	Barrack Heights
Koonawarra	Warilla
Dapto Brownsville	Lake Illawarra Barrack Point
Mount Marshall Spring Hill Primbee Yallah Haywards Bay	

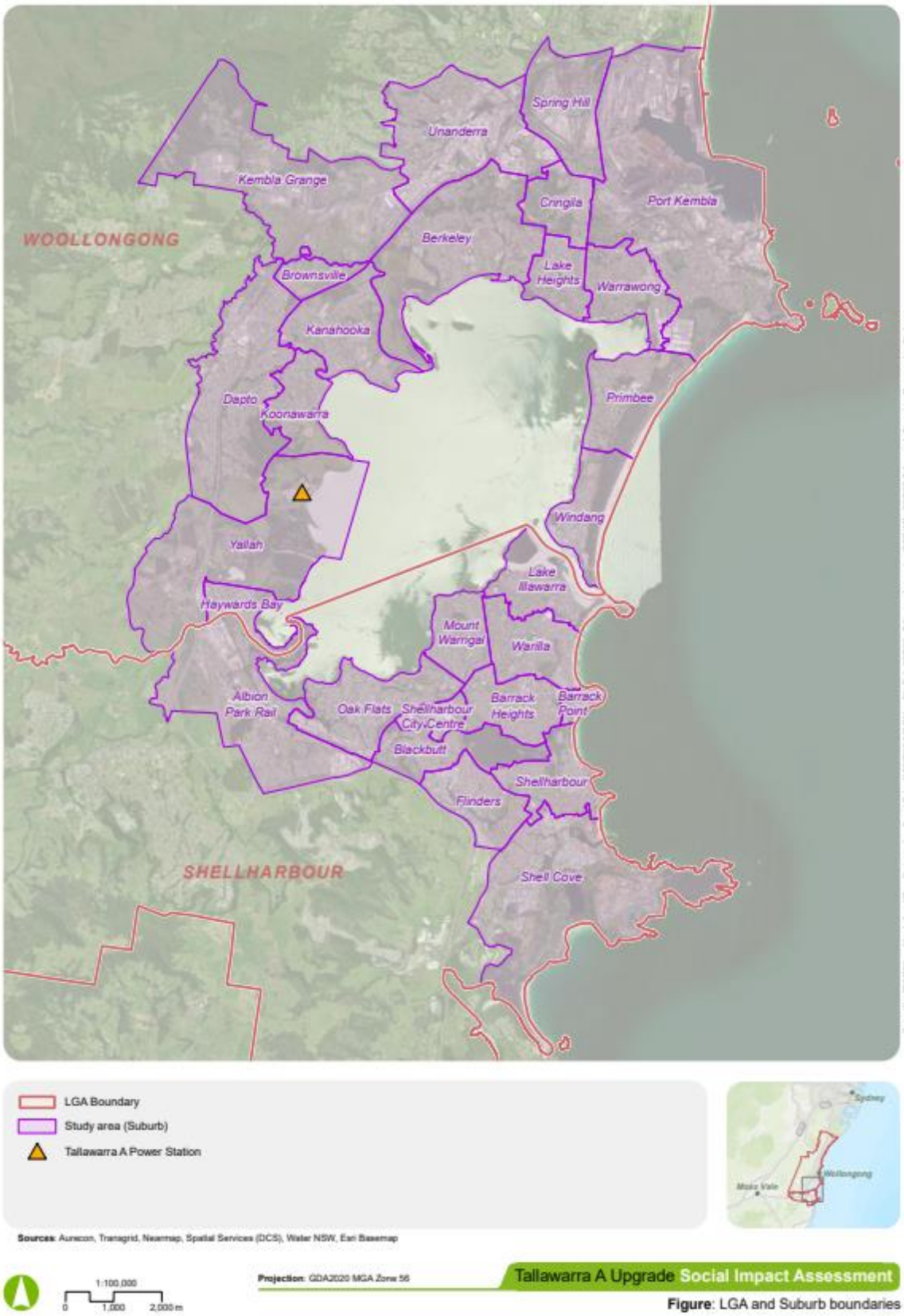


Figure 1 Study area designation

3.2 Existing socio-economic conditions

The Tallawarra A power station is positioned on the fringes of Lake Illawarra between Wollongong City Council and Shellharbour City Council. The area's appealing features, such as Lake Illawarra, the Illawarra Escarpment, picturesque coastlines, coves, estuaries, and national parks, have contributed to the expansion of the local tourism industry.

Due to its closeness to Sydney, the Illawarra Shoalhaven region has experienced swift population growth in recent years. The study area is connected to strategic regional economic centres such as Wollongong, Shellharbour and Kiama. An addition of 100 000 people is expected to migrate from Sydney to the Illawarra Shoalhaven region by 2041. The swift growth of population poses challenges for infrastructure, jobs housing and transportation.[5]

The Illawarra Shoalhaven Regional Plan 2041[3] has identified the West Lake Illawarra as strategic growth area and as a result released a significant land parcel to cater to the increase of new residents seeking a sea change. Infrastructure Australia has highlighted the significance of expanding the region's economic base into value-added sectors like renewable energy to ensure future prosperity[4].

The designated Growth Area is shown at Figure 2.

3.3 Population profile

This SIA has examined the current characteristics of the community based on ABS 2021 Census data and projected resident population changes across the relevant LGAs. This analysis aims to build a baseline profile of the people, communities and livelihoods that could be impacted by the proposed power station upgrade. Key findings are identified below:

The study area residents are mostly working aged adults

Analysis of the service age groups of the study area shows that the young adult age group (15 to 24 years) were the smallest cohort. The largest cohort of residents were those in the middle adulthood (25 to 44 years) and older adulthood (45 to 64 years) groups.

Overall, 18.2% was aged between 0 and 14 years, 12% was aged between 15 to 24 years, 24% was aged between 25 to 44 years, 25% was aged between 45 to 64 years and 21% were aged 65 years and over. This is a similar pattern seen in service age groups in the Wollongong and Shellharbour LGA, with the predominant service age group of working adults (25 to 64 years) comprising of 49% of the study area population.

3 NSW Government 2021, *Illawarra Shoalhaven Regional Plan 2041*, viewed 12 September 2023, <https://www.planning.nsw.gov.au/sites/default/files/2023-03/illawarra-shoalhaven-regional-plan-2041.pdf >

4 Infrastructure Australia 2022, RSIG: Regional Analysis NSW, viewed 12 September 2023, <https://www.infrastructureaustralia.gov.au/2022-regional-strengths-and-infrastructure-gaps-NSW>

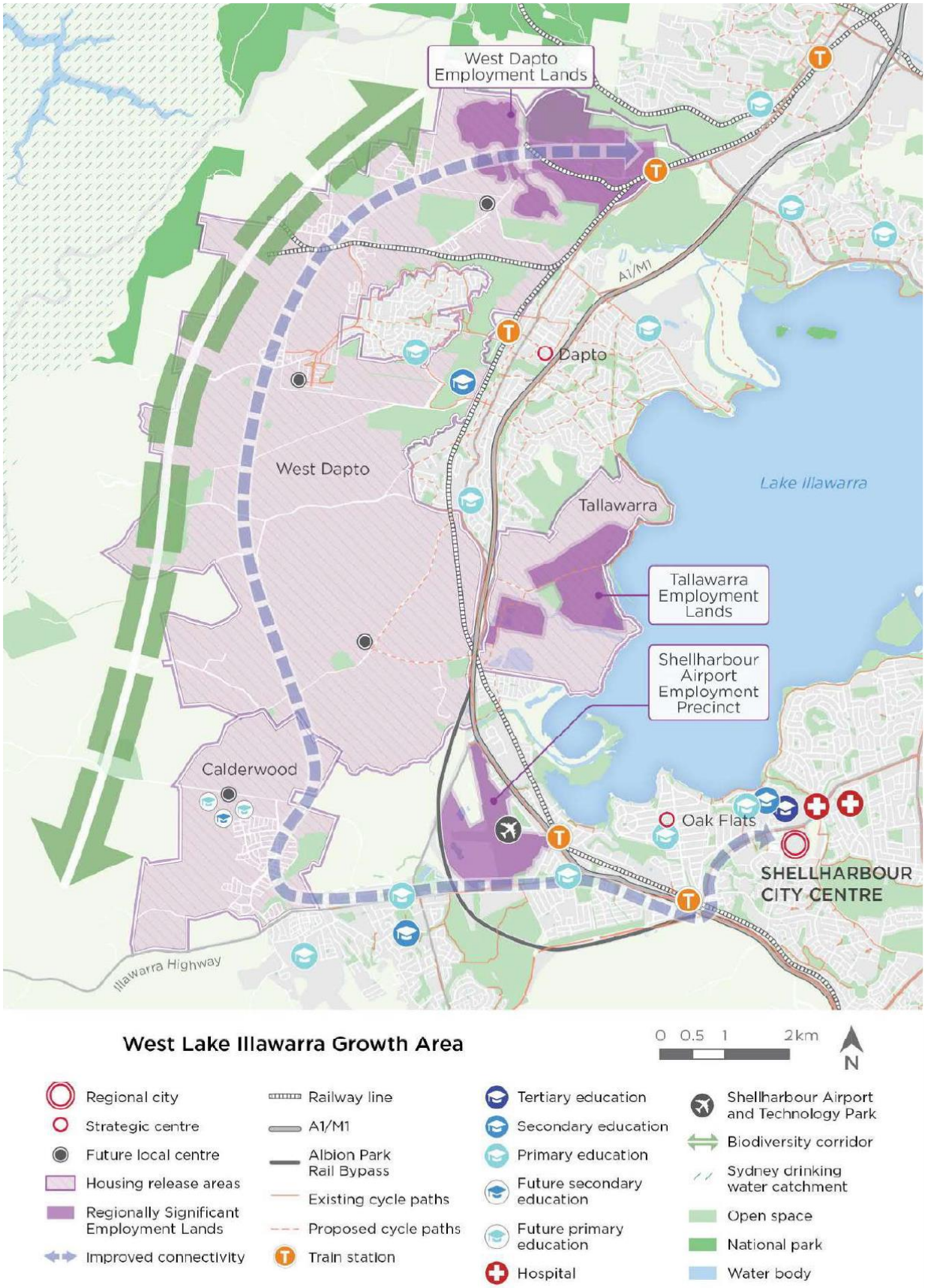


Figure 2 West Lake Illawarra Growth Area[5]

5 NSW Government 2021, *Illawarra Shoalhaven Regional Plan 2041*, viewed 12 September 2023, <https://www.planning.nsw.gov.au/sites/default/files/2023-03/illawarra-shoalhaven-regional-plan-2041.pdf >

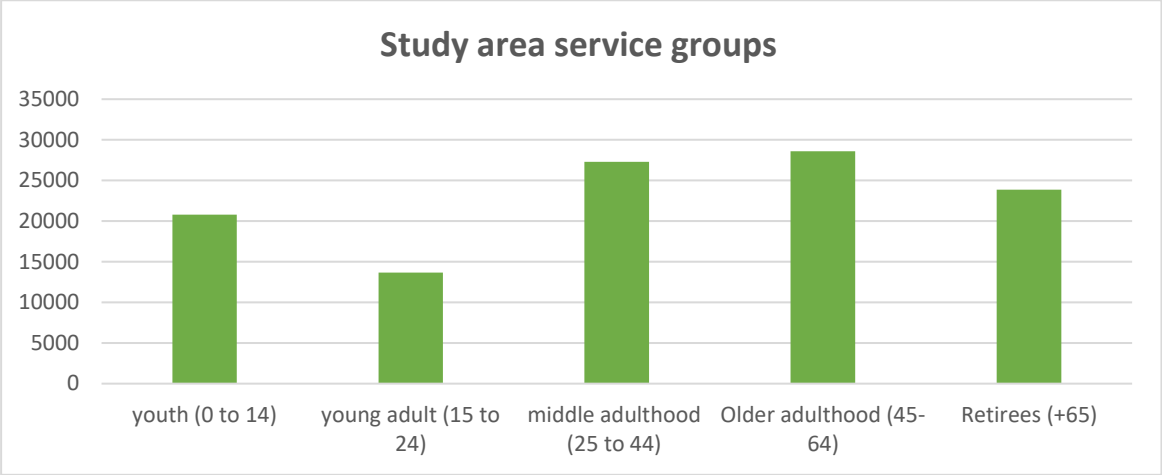


Figure 3 Study area by age groups

Higher proportion of middle-income earners

Middle income earners were most represented in the study area with 48% earning an income between $500 to $2,000 per week. Low-income earners earning less than $500 per week and high-income earners earning more than $2000 per week comprised of 38% and 7.5% respectively. The study area has a moderate unemployment rate, with 6% identified as unemployed.

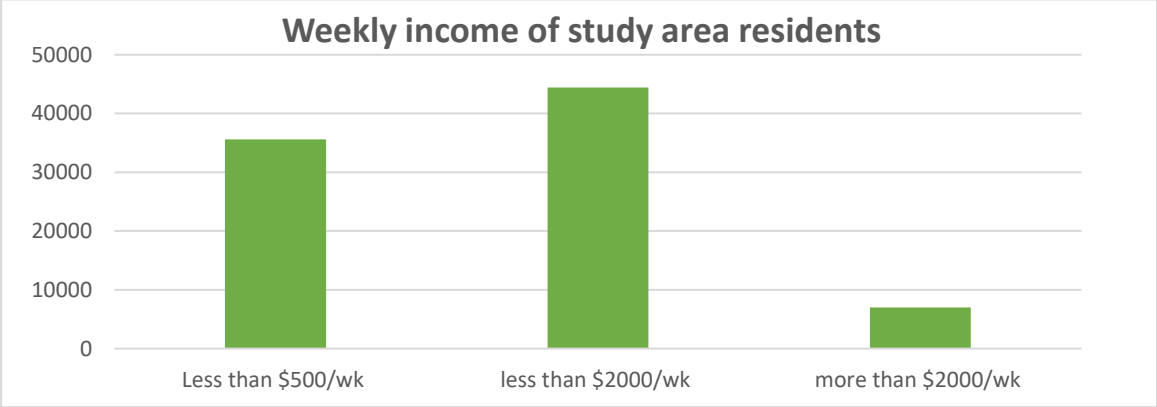


Figure 4 Weekly income of study area residents

Predominant housing type is mainly low-density separate houses; tenure is mixed

The study area is mainly comprised of single separated homes in low density residential suburbs. 82.5% of all dwellings in the study area are comprised of separate houses.

Of total occupied dwellings, 36% are owned outright, 31% are owned with a mortgage and 30% are rented, which is significantly lower than Greater Sydney at 34.5%.

English is the main language spoken at home

The study area has low cultural diversity, with 81% of residents identifying English as their primary language spoken at home. The top three languages spoken at home besides English are Macedonian (2.5%), Arabic (1.1%) and Italian (1.2%). This trend is similarly reflected across the Wollongong and Shellharbour LGA with 79.8% and 85.5% of residents speaking English only at home, respectively.

Socio-Economic Indexes for Areas (SEIFA) score

The Socio-Economic Indexes for Areas (SEIFA) are used to measure aspects of socio-economic advantage and disadvantage across the study area, in terms of people's access to material and social resources, and their ability to participate in society.

SEIFA indexes use a range of variables to develop a score for each area in the index. A lower score may infer more households with low incomes and less skilled occupations. Higher scores indicate greater advantage and a relative lack of disadvantage. A higher score may infer households with higher income and skilled occupations.

As shown in Table 4, the SEIFA scores for the study area are like those for Greater Sydney, with Shellharbour City being slightly higher, and Wollongong City slightly lower.

Table 4 SEIFA scores for the two LGAs

LGA	SEIFA
Wollongong City	1000
Shellharbour City	1079.2
Greater Sydney	1010.0

3.4 Population projections

The population of the study area is currently 143,750 and predicted to increase to 175, 512 (22%) by 2041. This is a similar pattern of population growth with Wollongong LGA and Shellharbour LGA predicted to increase their population by 23%[6] and 27%[7].

Table 5 Population projections of Wollongong and Shellharbour

Population	2021	2041	% growth
Study area	143,750	175,512	22%
Wollongong	219, 624	270,518	23%
Shell Harbour	80,052	101,777	27%

3.5 Economic profile

The Illawarra Shoalhaven economy is heavily driven by Port Kembla, which provides a strategic economic hub providing significant import and export capabilities for the region and New South Wales more broadly. The port of Port Kembla directly and indirectly generates approximately 3,500 jobs and generates an annual contribution of $543 million to the regional economy.[8]

As the population ages the Illawarra region shifts towards a service and health care-based economy, from manufacturing as the largest employers. The Australian Bureau of Statistics, Labour Force Survey (May 2023) reveals that the top three employment industries in the Illawarra region are now health care and social assistance (17%), construction (11.9%) and retail trade (10.9%).

With an increasing proportion of the population aged over 65, and more people preferring local regional holidays, retirement services and local tourism operations will provide significant growth in employment opportunities.

The study area surrounding the Tallawarra A power station accommodates a range of local businesses including, recreational businesses such as Port Kembla Sailing Club, along with cafes, restaurants, retail, and professional services, such as accounting businesses.

6 Profile ID 2022, *Wollongong City Council population forecasts*, viewed 12 September 2023, <https://forecast.id.com.au/wollongong>

7 Profile ID 2022, Shellharbour City Council population forecasts, viewed 12 September 2023, <https://forecast.id.com.au/shellharbour>

8 Infrastructure Australia 2022, RSIG: Regional Analysis NSW, viewed 12 September 2023, <https://www.infrastructureaustralia.gov.au/2022-regional-strengths-and-infrastructure-gaps-NSW>

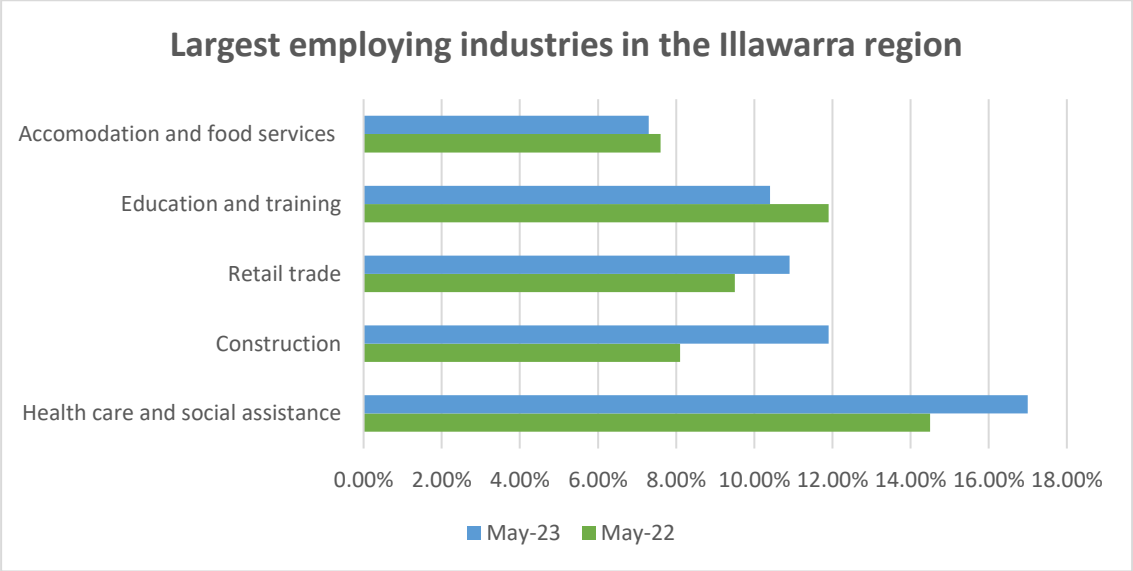


Figure 5 Employing industries in the Illawarra region

3.6 Land uses and natural assets

Lake Illawarra is a significant natural asset for the Illawarra region and is highly valued by the community. The lake is a barrier estuary, and its catchment covers an area of around 240km^2.

The Lake and its catchment spans across both Wollongong and Shellharbour City Council LGA's and the two Councils currently manage the Lake, as well as State agencies (e.g., Department of Planning, Industry and Environment (DPIE). Land use within the study area ranges from natural bushland, grazing land, urban residential areas, and industrial land uses.

Lake Illawarra is valued by local communities for its social, economic and recreational characteristics. The estuary supports significant tourism and commercial fishing industries and provides for a wide range of recreational activities.

First Nations areas of cultural significance

Lake Illawarra contains areas of Aboriginal cultural significance from a long history of use of the lake and its surrounds. Cultural identities are extremely important for Aboriginal and Torres Strait Islander people. They represent different heritages, languages, cultural practices, spiritual beliefs, and geographic areas. It is also a key input used to understand estuary health.

A range of sites of Aboriginal significance and cultural heritage are located around the lake. Traditional Dharawal clan groups and their people resided at several sites around Lake Illawarra including Berkeley and Hooka Creek. Other nation groups residing within the Illawarra region include, but are not limited to, the Yuin, Wiradjuri, Kamilaroi, Bundjalung, Dunghutti and Gumbayggir Nations.[9]

The Aboriginal people of the Lake Illawarra region are intrinsically connected to the lake and its water due to their belief in the interrelated systems and functions of the natural world.

3.7 Social infrastructure and areas of community interest

Lake Illawarra spans approximately 9.5 km in length and 5.5 km in width, covering an area of 33 km^2, with a maximum depth of 3.7 m. There are 13 boat ramps surrounding the lake, making it a popular destination for recreational activities such as fishing, prawning, and water sports such as boating, kayaking and paddle boarding. Popular land-based recreation uses include bike riding, bush regeneration activities, bushwalking and birdwatching.

9 Wollongong City Council 2023, Aboriginal Culture and Communities; A Brief History, viewed 12 September 2023, < https://www.wollongong.nsw.gov.au/about/aboriginal-culture-and-communities/a-brief-history#:~:text=Traditional%20Dharawal%20clan%20groups%20and,neighbours%20without%20fear%20of%20trespassing.>

The lake provides a large variety of passive recreational facilities with many reserves, parks, picnic spots, cafes and restaurants. It is also surrounded by local heritage assets such as the; Shellharbour City Museum, Illawarra Light Railway Museum and HARS Aviation Museum.

Walking and biking are strongly promoted, especially with the recent completion of the Lake Illawarra Boardwalk and Art Trail. The boardwalk extends from the Koonawarra Bay footpath to the adjacent Tallawarra footpath, which continues to the jetty. Meanwhile, the art trail is situated at Reddall Reserve on Lake Illawarra. Local artists, in collaboration with the community, have crafted indigenous public artworks inspired by the lake, its rich history, and its people.

Fire and Rescue Warrawong, NSW ambulance and Fire Rescue Dapto are to the north of the study area and within 15 minutes' drive.

To the south of the study area are Shellharbour Hospital, Marine Rescue Port Kembla, NSW Rural Fire Service, Emergency Control Centre and Albion Park Police Station within 15 minutes' drive.

Wollongong City Council looks after several open spaces, pathways and stormwater outlets to the north of the lake. Shellharbour City Council looks after similar items on the southern side of the lake. Structures like jetties, wharves, and the bridge are managed by the NSW Government.

3.8 Strategic policy drivers

Table 6 below outlines the key drivers relating to the proposal, from a review of key relevant Federal, State and Local government strategies and plans.

Table 6 Strategic drivers of Government strategies and plans

Key strategic drivers	Details	Policy documents
Reliable energy	■ The Illawarra-Shoalhaven region is focused on supplying via an intelligent grid that is optimised for reliability, sustainability and resilience to extreme climate events. Specifically, the region is focused on using localised clean energy generation.	■ Shoalhaven and Illawarra Enabling Regional Adaptation[10]
Promote economic growth	■ Growing a prosperous Illawarra-Shoalhaven region centred on an innovative and sustainable economy. It is a state and local priority to increase productivity and liveability to make the region a more attractive place to live, work and play. It is a regional priority to grow an entrepreneurial culture that attracts investment and stimulates employment in diverse industries, including health and knowledge services. ■ The region is focused on developing the local workforce capacity and capability while growing the Electricity and Gas industries.	■ Wollongong City Council, Economic Development Strategy 2019 – 2029[11] ■ Department of Regional NSW, Shellharbour Regional Economic Development Strategy – 2023 Update[12] ■ Greater Cities Commission, Six Cities Region Discussion Paper[13]

10 State of NSW and Office of Environment & Heritage 2019, Adapt NSW Shoalhaven and Illawarra Enabling Regional Adaptation https://www.climatechange.environment.nsw.gov.au/sites/default/files/2021-06/Shoalhaven%20Illawarra%20Enabling%20Regional%20Adaptation%20report.PDF

11 Wollongong City Council, Economic Development Strategy 2019 – 2029 https://www.wollongong.nsw.gov.au/__data/assets/pdf_file/0018/43218/Economic-Development-strategy-2019-2029.pdf

12 Department of Regional NSW 2023, Regional Economic Development Strategies – 2023 Update https://www.nsw.gov.au/sites/default/files/2023-02/2023-REDS-Update-Framework-and-Readers-Guide.pdf

13 Greater Cities Commission September 2022, Discussion Paper The Six Cities Region, Delivering global competitiveness and local liveability, https://greatercities.au/strategic-planning/region-plans/six-cities-region

Key strategic drivers	Details	Policy documents
Address climate change	▪ Reducing pollution and carbon dioxide production to achieve net-zero targets is a key priority across Australia. Both the Shellharbour City Council and Wollongong City Council have announced net-zero targets. This includes prioritising electrification by using renewable energy and restricting the use of gas in new developments from 2025. ▪ Shellharbour City Council and Wollongong City Council are committed to addressing and adapting to climate change. Both councils are committed to supporting the community and households to reduce their emissions through education and engagement, behaviour change programs and planning and development processes.	▪ Wollongong City Council, Climate Change Planning Summary 2022[14] ▪ Wollongong City Council, Climate Change Mitigation Plan 2020[15] ▪ Wollongong City Council, Sustainable Wollongong 2030[16] ▪ Shellharbour City Council, Net Zero Strategy 2022-2025[17] ▪ Greater Cities Commission, Six Cities Region Discussion Paper ▪ State of NSW and Office of Environment and Heritage, Shoalhaven and Illawarra Enabling Regional Adaptation ▪ Department of Planning, Industry and Environment, Net Zero Plan Stage 1: 2020–2030[18]
Maintain, protect and improve Lake Illawarra's value	▪ Tallawarra power station is positioned on the fringes of Lake Illawarra. Both Wollongong and Shellharbour City Council are committed to maintaining and improving Lake Illawarra's ecological, social and economic value with the view to achieve ecological sustainability for Lake Illawarra over the long term. ▪ Importantly, the councils are dedicated to improving and maintaining access to aquatic facilities and activities for residence.	▪ Wollongong City Council and Shellharbour City Council, Lake Illawarra Coastal Management Program (2020-2030)[19] ▪ Shellharbour City Council. Open Space and Recreation Strategy[20] ▪ Shellharbour City Council, Local Strategic Planning Statement[21]
Efficient energy and water use	▪ The Illawarra- Shellharbour region is committed to providing and encouraging the use of infrastructure and housing which is energy and water efficient.	▪ Illawarra Shoalhaven Regional Plan

14 Wollongong City Council 2022, Climate Change Planning Summary, https://wollongong.nsw.gov.au/__data/assets/pdf_file/0024/158415/Climate-Change-Planning-Summary-2022.PDF

15 Wollongong City Council, Climate Change Mitigation Plan 2020, https://www.wollongong.nsw.gov.au/__data/assets/pdf_file/0014/121343/Climate-Change-Mitigation-Plan-2020.PDF

16 City of Wollongong, Sustainable Wollongong 2030, A Climate Healthy City Strategy, https://wollongong.nsw.gov.au/__data/assets/pdf_file/0011/121214/Sustainable-Wollongong-2030.pdf

17 Shellharbour City Council, Tackling Climate Change Together Zero Emissions Shellharbour Strategy 2022 – 2050, https://cdn.shellharbour.nsw.gov.au/sites/default/files/zeroemissionsshellharbourstrategy0.pdf

18 NSW Government Department of Planning, Industry and Environment, Net Zero Plan Stage 1: 2020-2030, https://www.energy.nsw.gov.au/sites/default/files/2022-08/net-zero-plan-2020-2030-200057.pdf

19 Wollongong City Council and Shellharbour City Council 2020, Lake Illawarra Coastal Management Program (2020-2030), viewed 4 September 2023 <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Coasts/lake-illawarra-coastal-management-program.pdf?la=en&hash=EB7402923ECE17EF6A7EC56F1A1FF83EF33AAB36>

20 Shellharbour City Council 2020, Open Space and Recreation Strategy, viewed 4 September 2023, <https://cdn.shellharbour.nsw.gov.au/sites/default/files/Council_documents/sccosrstrategyadopted7april20200.pdf>

21 Shellharbour City Council n.d., Local Strategic Planning Statement, viewed 4 September 2023, <https://cdn.shellharbour.nsw.gov.au/sites/default/files/Plan_and_build_documents/Adopted_Local_Strategic_Planning_Statement_June_2022.pdf>

Table 7 below sets out the key themes and drivers for the area from the perspectives of the respective councils and communities that intersect the study area.

Table 7 Drivers for local communities and Councils

Theme	Wollongong City Council[22]	Shell Harbour City Council[23]
Lake Illawarra, and surrounding recreational/social infrastructure	▪ Manage and effectively improve the cleanliness, health, biodiversity of land and water including creeks, lakes, waterways and oceans.	▪ The preservation and enhancement of our natural environment is important, as is the efficient use of our natural resources and a sustainable and healthy built environment.
Local economy	▪ Support educational and employment opportunities that retain young people and local talent, attract new workers and provide opportunities for the unemployed. ▪ Increase and attract new business investment and enterprise to Wollongong while supporting and growing existing local businesses	▪ The continuation of development and activation of Shell Cove is important to the ongoing development of Shellharbour City. ▪ Training opportunities, strong local businesses and local jobs for local people are also key to the success of Shellharbour's economic future. ▪ Increased importance of support for businesses and local employment opportunities.
Industrial development	▪ Work with partners to facilitate sustainable and green industries. ▪ Support growth sectors to assist in the ongoing transition of Wollongong's economy.	▪ Tourism is a significant industry and needs to be supported. ▪ Increased importance of promoting and developing the area as a tourist destination. ▪ An increase in visitors to the City and tourism output. ▪ Increased satisfaction with tourism promotion. ▪ Increased activation and utilisation of Shell Cove. ▪ Increased activation opportunities at Lake Illawarra.
Environment	▪ The community is actively involved in the expansion, improvement and preservation of our waterways, green corridors and other natural areas connecting the escarpment to the sea. ▪ Manage and effectively improve the cleanliness, health, biodiversity of land and water including creeks, lakes, waterways and oceans. ▪ Work together to achieve net zero carbon emissions and reduce waste going to landfill.	▪ Increased importance of supporting initiatives that will reduce people's impact on the environment.
Local character	▪ Maintain the unique character of the Wollongong Local Government Area, whilst balancing development, population growth and housing needs. ▪ Provide an appropriate range of active and passive open spaces and facilities to cater for traditional and emerging recreational pursuits. ▪ Provide a variety of quality and accessible public places and opportunities for sport, play, leisure, recreation, learning and cultural activities in the community.	▪ Increased importance of maintaining the character of our residential areas

22 Wollongong City Council 2022, Our Wollongong Our Future Community Strategic Plan 2032, viewed 12 September 2023, < https://our.wollongong.nsw.gov.au/ourfuture>

23 Shellharbour Council 2019, Shell Harbour City Council Community Strategic Plan, viewed 12 September 2023, https://www.shellharbour.nsw.gov.au/council/news-and-publications/community-strategic-plan

3.9 Community sentiment and perspectives

Community consultation

The overriding objectives of the proposal's consultation and engagement approach are to:

- Provide timely information regarding the proposal, channels for providing feedback and the approvals pathway to interested and impacted parties
- Build on existing relationships with stakeholders in the area
- Encourage active stakeholder participation and facilitate feedback / inputs on the proposal
- Demonstrate how community and stakeholder issues and feedback are being captured and used to inform proposal development and assessment.

The consultation carried out throughout the development of this EIS is outlined in the following sections. Consultation has been undertaken in accordance with the *Undertaking Engagement Guidelines for State Significant Projects* (DPIE, 2022).

Stakeholder consultation approach

EnergyAustralia provides regular briefings with the Department of Planning and Environment, Wollongong City Council and Shellharbour City Council to notify the proposal, its scope of works and potential impacts.

Additionally, the NSW EPA has been briefed on the proposal via a consultation meeting (online) and during an EPA visit to the Tallawarra A power station site. NSW Health was also briefed on the proposal.

Community consultation approach

EnergyAustralia established a Community Liaison Group (CLG) in 2004 as the principal community liaison group for the Tallawarra A power station and Tallawarra B Project. The CLG has been designed to inform interested members of the local community about the existing Tallawarra A power station operations and environmental performance matters.

Regular updates are provided at the CLG meetings regarding all aspects of both the site operations and the Tallawarra B Project. CLG meetings are held quarterly at the Tallawarra power station offices. The CLG includes members from the community and stakeholders such as: the amateur radio club, local bird watching societies, the NSW EPA, local high school, the local aboriginal land council, Illawarra National Parks Association and representatives from both Shellharbour and Wollongong City Councils. The CLG will continue to operate in accordance with the CLG Terms of Reference.

EnergyAustralia provides project updates through the community newsletter and published to EnergyAustralia's website.

Two community newsletters are currently published to the project website providing information on the proposal, including its objectives and impacts.

- Tallawarra A High Efficiency Upgrade Factsheet (Appendix 1)
- Tallawarra A SSD Planning Pathway Factsheet (Appendix 2)

Outcomes of consultation

Wollongong City Council, NSW's Office of Energy and Climate Change (OECC), Department of Planning and Environment (DPE), Environment Protection Authority (EPA) and NSW Health were supportive of the proposal. The regular briefings provided an opportunity for all parties involved to review the proposal impacts and its impacts at the community and regional level. The briefings also enable the different stakeholders to consider impacts more holistically. Community engagement is primarily via the CLG.

Further planned consultation

Additional community consultation and strategic stakeholder consultation is planned to gather feedback to inform the development of the EIS. Local communities and stakeholders will also have an opportunity to provide feedback when the concept plan and EIS is publicly exhibited.

Media scan for broader community sentiment

The below table outlines key media articles related to natural gas power stations in NSW and Australia. Overall, media sentiments relating to the proposed Tallawarra power station upgrade and low-cost renewable energy are positive.

Table 8 Media scan

Publications and Link	Headline	Key Points
Financial Review *Aug 2023*	Coal power stations could have new lives with gas	▪ Converting Australia's huge coal-fired electricity plants to gas would make more sense than trying to keep them going and could help Australia's faltering energy transition.
Illawarra Mercury *May 2023*	A thousand homes planned near Tallawarra power station	▪ More than 1000 homes are planned in the vicinity of the Tallawarra power station, according to documents from Monday night's Wollongong City Council meeting.
ABC News *May 2023*	Tallawarra B power station to transition from natural gas to 5% hydrogen mix by 2025	▪ From 2025, Tallawarra B will be fuelled by a 5% hydrogen mix ▪ EnergyAustralia says the plan is to increase the mix to 20%, with the potential for 60%.
The Conversation *Mar 2023*	Australia's 116 new coal, oil and gas projects equate to 215 new coal power stations	▪ Australia has 116 new coal, oil and gas projects in the pipeline. If they all proceed as planned, an extra 1.4 billion tonnes of greenhouse gases would be released into the atmosphere annually by 2030.
Financial Review *Feb 2023*	AEMO fails to dispel angst over lack of gas power	▪ Warnings from the Australian Energy Market Operator of shortfalls in electricity supplies later this decade have revived calls for measures to spur investment in gas power plants, amid worries that battery storage will prove insufficient to avoid intermittent power cuts.
The Guardian *Nov 2022*	AGL to close South Australia's main gas power station, citing new grid link and cheaper renewables	▪ The closure of the Torrens B 600 MW gas-fired plant will happen by mid-2026, instead of 2035 as previously planned. ▪ The new grid to NSW will give the state low-cost renewable energy.
The Guardian *Feb 2022*	Can you really carbon offset a power station? Sure – but it's unimpressive	▪ EnergyAustralia is building a regular fossil fuel power station and buying carbon offsets based on its emissions. ▪ "But in reality, what EnergyAustralia is doing in building a "carbon offset power station" is constructing a regular fossil fuel power station, then working out what the emissions are, and then buying some carbon offsets."
Climate Council *May 2021* *Media Release*	NSW government fails citizens by funding gas	▪ The government's decision to spend taxpayers' money backing a fossil fuel project is completely at odds with its commitment to net zero emissions and keeping the people of NSW safe from the impacts of climate change. ▪ Recently released data revealed that gas generation has declined for the past eight summers in NSW. Over the past summer, renewables provided 31 times more power than gas.

4 Social Impact Assessment

4.1 Introduction and approach

This section sets out the assessment of the social impacts according to the NSW SIA Guideline 2023. The assessment considers the potential impacts of the proposal on the community and social context, with regard to the social baseline set out in Section 3.

Ultimately, two main types of social impacts may arise because of the proposed development. These are:

- Direct impacts that can be caused by the proposal, which may cause changes to the existing community, as measured using social indicators, such as population, health, and employment.
- Indirect impacts that are less tangible and more commonly related to community values, identity, and sense of place. Both physically observable as well as psychological impacts need to be considered.

Impacts have been assessed to prepare an overall social significance rating, with impacts and mitigation/ enhancement measures targeted at two distinct phases of proposal delivery, being 1) construction and 2) operation. The table below sets out the categories of impact through which the proposal is assessed.

Table 9 Assessment categories

Assessment category
Way of life: how people live, get around, work, play and interact each day.
Community: its composition, cohesion, character, how it functions, resilience, and people's sense of place.
Accessibility: how people access and use infrastructure, services, and facilities (private, public, or not-for-profit).
Culture: both Aboriginal and non-Aboriginal - people's shared beliefs, customs, practices, obligations, values and stories, and connections to Country, land, waterways, places, and buildings.
Health and wellbeing: people's physical, mental, social, and spiritual well-being – especially for people vulnerable to social exclusion or substantial change, psychological stress (from financial or other pressures), access to open space and effects on public health.
Surroundings: access to and use of the natural and built environment, including ecosystem services (shade, pollution control, erosion control), public safety and security, as well as aesthetic value and amenity.
Livelihoods: including people's capacity to sustain themselves through employment or business.
Decision-making systems*:* the extent to which people are able to participate in decisions that affect their lives, procedural fairness, and the resources provided for this purpose.

4.2 Technical assessment framework

The NSW DPE SIA Guideline 2023 sets out a structured technical assessment framework as follows. This considers information gathered through the social baseline analysis, along with community perspectives gained through consultation and other evidence, to assess the relative impacts of the proposal according to each specified assessment social category.

Key affected communities

The SIA evaluates impacts for those individuals, families, and communities who are likely to experience social impacts associated with the proposal with particular focus on temporary construction activities, and potential public benefit in delivering the proposal. Key communities to experience negative or positive social impacts can be grouped as follows:

- Residents
- Visitors to other institutions and businesses within walking distance of the area
- Neighbouring businesses and institutions
- Temporary construction workers in the area
- Local, district, regional and national/ international community members (residents, workers, students, visitors) who may access this renewed cultural infrastructure once operational.

Social Significance Rating

The SIA Guidelines include specific impact magnitude levels to describe the impacts of a project to communities, infrastructure, services and health. The magnitude levels outlined in the SIA Guidelines have been used in this section to describe the socio-economic impacts of the proposal.

Table 10 SIA Guidelines defining magnitude levels for social impacts

Magnitude level	Meaning
Transformational	Substantial change experienced in community wellbeing, livelihood, infrastructure, services, health, and/or heritage values; permanent displacement or addition of at least 20% of a community.
Major	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area.
Moderate	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people.
Minor	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
Minimal	Little noticeable change experienced by people in the locality

The Social Impact Assessment ultimately results in a Social Significance Rating for each social category, as per the matrix set out within the NSW Social Impact Assessment Guideline for State Significant Projects 2023. This is based on the consideration of the likelihood of the impact occurring, and the consequences (magnitude of impact), should the impact occur.

Table 11 Social Impact significance matrix

Magnitude Level						
		1	2	3	4	5
Likelihood level		Minimal	Minor	Moderate	Major	Transformational
A	Almost certain	Low	Medium	High	Very High	Very High
B	Likely	Low	Medium	High	High	Very High
C	Possible	Low	Medium	Medium	High	High
D	Unlikely	Low	Low	Medium	Medium	High
E	Very unlikely	Low	Low	Low	Medium	Medium

Table 12 Defining likelihood levels of social impacts

Likelihood Level	Meaning
Almost certain	Definite or almost definitely expected (e.g., has happened on similar projects)
Likely	High probability
Possible	Medium probability
Unlikely	Low probability
Very unlikely	Improbable or remote probability

Table 13 Dimensions of social impact magnitude

Dimensions		Details Needed to enable assessment
Magnitude	**Extent**	Who specifically is expected to be affected (directly, indirectly, and/or cumulatively), including any vulnerable people? Which location(s) and people are affected? (e.g., near neighbours, local, regional, future generations).
	Duration	Who specifically is expected to be affected (directly, indirectly, and/or cumulatively), including any vulnerable people? Which location(s) and people are affected? (e.g., near neighbours, local, regional, future generations).
	Severity or scale	What is the likely scale or degree of change? (e.g., mild, moderate, severe).
	Intensity or importance	How sensitive/vulnerable (or how adaptable/resilient) are affected people to the impact, or (for positive impacts) how important is it to them? This might depend on the value they attach to the matter; whether it is rare/unique or replaceable; the extent to which it is tied to their identity; and their capacity to cope with or adapt to change.
	Level of concern/interest	How concerned/interested are people? Sometimes, concerns may be disproportionate to findings from technical assessments of likelihood, duration and/or intensity.

4.3 Impact Assessment

Social impacts during construction

Table 14 Social Impacts during construction

Social category	Impact	Sensitivity	Magnitude level	Likelihood level	Overall Social Significance rating	Recommended responses (negative impact mitigation/ benefits optimisation)
Way of life: how people live, get around, work, play and interact each day.	▪ Construction disruption to the local community may be caused because of the proposal. ▪ Impacts and disruption to recreational, hospitality and local tourism activities on Lake Illawarra could occur because of the proposal.	Low	Minor	Unlikely	**Low**	▪ Traffic and construction impacts during the works are unlikely to cause disruption to the surrounding community as works are contained within the footprint of the power station. Vehicle movement numbers will be similar to a typical maintenance outage. ▪ A Community Liaison Management Plan (CLMP) has been prepared to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal. The CLMP includes complaints and enquiries management information for identifying and responding to community issues. ▪ Continue with strategic engagement activities to communicate with surrounding residents, nearby businesses, workers, and visitors to the area to ensure that stakeholders know the timing and likely impact of the construction period. Opportunities for feedback and to ask questions should also be provided.
Community: its composition, cohesion, character, how it functions, resilience, and people's sense of place.	▪ Visual impacts and disruption to recreational activities on Lake Illawarra could occur as a result of the proposal.	Low	Minor	Unlikely	**Low**	▪ Impacts are anticipated to be negligible given works would largely occur within the turbine hall. The use of a 220-tonne crane outside the turbine hall would be mostly shielded by the existing power station infrastructure. The crane would only be established for a few days. ▪ Maintain vegetated buffer zone to provide visual screening to improve visual amenity. ▪ A CLMP has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal. The CLMP includes complaints and enquiries management information for identifying and responding to community issues.

Social category	Impact	Sensitivity	Magnitude level	Likelihood level	Overall Social Significance rating	Recommended responses (negative impact mitigation/ benefits optimisation)
						▪ Continue with strategic engagement activities to communicate with surrounding residents, nearby businesses, workers, and visitors to the area to ensure that all stakeholders know the timing and likely impact of the construction period. Opportunities for feedback and to ask questions should also be provided.
Accessibility: how people access and use infrastructure, services, and facilities (private, public, or not-for-profit).	▪ Increased traffic from construction vehicles may be caused as a result of the proposal.	Low	Minor	Unlikely	**Low**	▪ Yallah Bay Road provides direct vehicle access to the Tallawarra power station and does not connect to any other neighbourhoods or commercial operations. ▪ A CLMP has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal. The CLMP includes complaints and enquiries management information for identifying and responding to community issues.
Culture: both Aboriginal and non-Aboriginal - people's shared beliefs, customs, practices, obligations, values and stories, and connections to Country, land, waterways, places, and buildings.	▪ Impact to the Lake Illawarra and water quality as a result of the proposal.	Low	Minor	Unlikely	**Low**	▪ Identify opportunities to implement stakeholder engagement initiatives tailored to the scale of likely construction impacts and level of community interest. ▪ Foster collaboration opportunities to define measures to monitor, mitigate, and manage construction impacts. ▪ A CLMP has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal.
Health and wellbeing: people's physical, mental, social, and spiritual well-being – especially for people vulnerable to social exclusion or substantial change, psychological stress (from financial or other pressures), access to open space and effects on public health.	▪ Increased noise and visual impacts from upgrade activities caused because of the proposal. ▪ Visual impacts and disruption to recreational activities on Lake Illawarra could occur because of the proposal.	Low	Minor	Possible	**Medium**	▪ An assessment of the impacts of the proposal on amenity was completed as part of the EIS stage. No visual or construction traffic impacts are anticipated as a result of the proposal. Noise during construction would be consistent with the noise levels of normal maintenance performed under the existing approval. ▪ A CLMP has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal. The CLMP includes complaints and enquiries management information for identifying and responding to community issues. ▪ Identify and implement additional mitigation strategies as part of the project Construction Noise and Vibration Management Plan and the Construction Noise and Vibration Guidelines (Roads and Maritime 2016) prior to construction work commencing.

Social category	Impact	Sensitivity	Magnitude level	Likelihood level	Overall Social Significance rating	Recommended responses (negative impact mitigation/ benefits optimisation)
Health and wellbeing: people's physical, mental, social, and spiritual well-being – especially for people vulnerable to social exclusion or substantial change, psychological stress (from financial or other pressures), access to open space and effects on public health.	▪ Impacts to health conditions would result from the plant upgrade.	Low	Minor	Unlikely	**Low**	▪ Continue to engage with current community members during the operation phase to ensure communities are informed and to reduce community concerns, which can have health impacts.
Surroundings: access to and use of the natural and built environment, including ecosystem services (shade, pollution control, erosion control), public safety and security, as well as aesthetic value and amenity.	▪ Visual impacts and disruption to recreational activities on Lake Illawarra could occur because of the proposal.	Low	Minor	Unlikely	**Low**	▪ Continue to engage with current community members during the operation phase to optimise community benefits. ▪ A CLMP has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal. The CLMP includes complaints and enquiries management information for identifying and responding to community issues.
Livelihoods: including people's capacity to sustain themselves through employment or business.	▪ Impacts and disruption to recreational, hospitality and local tourism activities located near Lake Illawarra. ▪ Reduced patronage for local businesses, cultural and tourism attraction venues, tourism accommodation providers and other businesses in the area due to loss of amenity. ▪ A maximum of approximately 150 additional staff and approximately 360 vehicle movements will	Low	Minor	Unlikely	**Low**	▪ Identify opportunities to implement stakeholder engagement initiatives tailored to the scale of likely construction impacts and level of community interest. ▪ Continue with strategic engagement activities to communicate with surrounding residents, nearby businesses, workers, and visitors to the area to ensure that all stakeholders know the timing and likely impact of the construction period. Opportunities for feedback and to ask questions should also be provided.

Social category	Impact	Sensitivity	Magnitude level	Likelihood level	Overall Social Significance rating	Recommended responses (negative impact mitigation/ benefits optimisation)
	occur on-site daily, similar to a typical maintenance outage.					
Livelihoods: including people's capacity to sustain themselves through employment or business	▪ The proposal may contribute to local employment and potentially benefit local accommodation or service/community businesses. ▪ The project may require unique skillsets. upskilling of local community members may be required for construction and operation.	Low	Minor	Likely	**Medium**	▪ Work with local businesses, trade providers, TAFE and Wollongong University to identify future resource requirements to provide employment to locals. Benefits to local employment would be limited given the specialised nature of the work. ▪ Consider developing and implementing social procurement and employment practices to involve marginalised groups. Develop workplace management plans that encourage and support diversity.
Decision-making systems*:* the extent to which people are able to participate in decisions that affect their lives, procedural fairness, and the resources provided for this purpose.	▪ Local communities and stakeholders have limited opportunities to provide feedback.	Low	Minor	Likely	**Medium**	▪ Invite surrounding neighbourhoods, CLG and Wollongong/ Shellharbour City Council to provide feedback on the project during the EIS and throughout the project. ▪ Design and implement a monitoring and management plan to include overarching commitments and principles that guide project decision-making with community involvement for unforeseen matters and responsive grievance and remedy mechanisms in the event of complaints.

Significance of cumulative construction impacts

The Tallawarra B power Station – located near Tallawarra A power station – is currently under construction and anticipated to complete late 2023. Tallawarra B will provide an additional 300 MW of electricity to power to 150,000 homes. Both power stations are accessed via Yallah Bay Road, which does not connect to local road networks or businesses.

Construction timeframes of the two power stations do not overlap. The Tallawarra A power station upgrade would commence construction when Tallawarra B has been completed or is nearing completion. Shellharbour has experienced significant infrastructure investment and construction of major projects near and around Lake Illawarra (The Oaks Flat Depot redevelopment, Shellharbour airport upgrade, Albion Park Rail Bypass and Reddal Reserve Promenade Renewal) that may amplify construction and traffic impacts to the surrounding community.

Table 15 Cumulative impacts resulting from construction

Negative impacts	Positive impacts
Traffic delays from heavy vehicle movements on the Princes Highway from construction activities near Lake Illawarra.	Opportunities to transfer resources and skills from workers from Tallawarra B to Tallawarra A projects.
Community engagement fatigue from continual consultation campaigns and notification.	Creation of 250+ local jobs associated with the power station (directly and indirectly).
Construction disruption created by amplified noise, dust from multiple projects.	
Extended visual amenity impacts from works at the Tallawarra site may impact recreational activities near and surrounding the lake.	
Extended disruption to patronage for local businesses, cultural and tourism attraction venues, tourism accommodation providers and other businesses in the area due to perception of the area under perpetual construction.	

Social impacts during operation

Table 16 Social impacts during operation

Social category	Impact	Sensitivity	Magnitude level	Likelihood level	Overall Social Significance rating	Recommended responses (negative impact mitigation/ benefits optimisation)
Way of life: how people live, get around, work, play and interact each day.	▪ Disruption to the local community may be caused as a result of the operational activities. ▪ Impacts and disruption to recreational, hospitality and local tourism activities on Lake Illawarra could occur as a result of the operations.	Low	Minor	Unlikely	**Low**	▪ Identify opportunities to implement stakeholder engagement initiatives tailored to the scale of likely construction impacts and level of community interest. ▪ Continue to engage with current community members during the operation phase to optimise community benefits. Maintain records of stakeholder consultation outcomes to demonstrate project efforts to engage the community in the decision-making process. ▪ Provide ongoing communication channels for stakeholders to share complaints or feedback.
Community: its composition, cohesion, character, how it functions, resilience, and people's sense of place.	▪ Visual impacts and disruption to recreational activities on Lake Illawarra could occur as a result of the operations.	Low	Minor	Unlikely	**Low**	▪ Seek opportunities to consult community members on available resources to manage change and seek to realise project opportunities. ▪ Install and maintain vegetated buffer zone to provide visual screening to improve visual amenity. ▪ A Community Liaison Management Plan (CLMP) has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal.
Accessibility: how people access and use infrastructure, services, and facilities (private, public, or not-for-profit)	▪ Increased traffic from operation vehicles may be caused as a result of the operational activities.	Low	Minor	Unlikely	**Low**	▪ Yallah Bay Road provides direct vehicle access to the Tallawarra power station and does not connect to any other neighbourhoods or commercial operations. ▪ Continue to engage with current community members during the operation phase to optimise community benefits. ▪ A Community Liaison Management Plan (CLMP) has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal.

Social category	Impact	Sensitivity	Magnitude level	Likelihood level	Overall Social Significance rating	Recommended responses (negative impact mitigation/ benefits optimisation)
Culture: both Aboriginal and non-Aboriginal - people's shared beliefs, customs, practices, obligations, values and stories, and connections to Country, land, waterways, places, and buildings.	▪ Impact to the Lake Illawarra and water quality as a result of the operational activities.	Low	Minor	Unlikely	**Low**	▪ Engage with local Aboriginal Land Councils and communities to identify opportunities to embed Aboriginal values into operation activities where possible. ▪ A Community Liaison Management Plan (CLMP) has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal.
Health and wellbeing: people's physical, mental, social, and spiritual well-being – especially for people vulnerable to social exclusion or substantial change, psychological stress (from financial or other pressures), access to open space and effects on public health.	▪ Increased noise and visual impacts from upgrade activities caused as a result of the operations.	Low	Minor	Unlikely	**Low**	▪ Impacts to recreation activities unlikely to occur as operational activities entirely contained within the footprint of the power station. ▪ A Community Liaison Management Plan (CLMP) has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal. ▪ Identify and implement additional mitigation strategies as part of the project Construction Noise and Vibration Management Plan and the Construction Noise and Vibration Guidelines (Roads and Maritime 2016) prior to construction work commencing.
Surroundings: access to and use of the natural and built environment, including ecosystem services (shade, pollution control, erosion control), public safety and security, as well as aesthetic value and amenity.	▪ Visual impacts and disruption to recreational activities on Lake Illawarra could occur as a result of the operational activities.	Low	Minor	Unlikely	**Low**	▪ Install and maintain vegetated buffer zone to provide visual screening to improve visual amenity. ▪ Works will take place entirely in power station footprint with limited impact to Lake Illawarra or the surrounding open space. ▪ A Community Liaison Management Plan (CLMP) has been developed to inform stakeholders and community members about the timing and likely impacts of the construction and operation of the proposal.
Livelihoods: including people's capacity to sustain themselves through employment or business.	▪ Operations may contribute to local employment and potentially benefit local accommodation or service/community businesses.	N/A	Minor	Likely	**Low**	▪ Consider engaging with local businesses, local trades, TAFE and Wollongong University to identify future resource requirements to provide local employment. Benefits to local employment would be limited given the specialised nature of the work.

Social category	Impact	Sensitivity	Magnitude level	Likelihood level	Overall Social Significance rating	Recommended responses (negative impact mitigation/ benefits optimisation)
	▪ Operations may require unique skillsets. Upskilling of local community members may be required for construction and operation.					▪ Consider developing and implementing social procurement and employment practices to involve marginalised groups. ▪ Develop workplace management plans that encourage and support diversity.
Decision-making systems*:* the extent to which people are able to participate in decisions that affect their lives, procedural fairness, and the resources provided for this purpose.	▪ Negative effects due to a perceived lack of consultation and/ or unmet community/ stakeholder expectations regarding the power station activities.	Low	Minor	Likely	**Medium**	▪ Continue with strategic engagement activities to communicate with surrounding residents, nearby businesses, workers, and visitors to the area to ensure that all stakeholders are consistently informed and have visibility of power station activities. ▪ Consider the design and implement a monitoring and management plan to include overarching commitments and principles that guide community involvement for unforeseen matters and responsive grievance and remedy mechanisms in the event of complaints.

Significance of cumulative operational impacts

Some of the cumulative impacts from the operation of Tallawarra would be similar to those observed during construction. Housing development in the west Lake Illawarra growth area will see more vehicle movements on the Princes Highway and around the lake. The ongoing construction impacts associated with multiple infrastructure projects may create the following negative and positive cumulative impacts. Table 16 describes the cumulative impacts from operational activities.

Table 17 Cumulative impacts during operation

Negative impacts	Positive impacts
Traffic delays from heavy vehicle movements on the Princes Highway from construction and operation activities near Lake Illawarra.	Opportunities to transfer and share resources and skills from workers from Tallawarra B to Tallawarra A projects.
Community engagement fatigue from continual consultation campaigns and notification.	Provision of 250+ local jobs.
Extended visual amenity impacts from works at the Tallawarra site may impact recreational activities near and surrounding the lake.	Combined energy supply of 740 MW from Tallawarra A and B providing further energy security for the region.
	Potential to switch hydrogen capability to reduce carbon emissions.
	More efficient operation with improved reliability producing a lower intensity of carbon emissions without using additional fuel.

Management and monitoring

Given there are minor to minimal construction socio-economic impacts and positive long-term operational socio-economic impacts, no additional mitigation measures are proposed. The CLMP would be used to guide engagement with the local community about the proposal, including through the complaints and enquiries management information.

Community grants

EnergyAustralia has demonstrated a commitment to its social licence by providing community grants specifically catering to the Tallawarra community. The grants will be determined through community consultation to ensure that the initiatives funded are local and benefit the Illawarra region.

The two priority areas for grant funding identified by the project webpage[24] include:

- Education: Funding aimed at promoting education and knowledge acquisition. This can include programs with a social or environmental focus and organisations which support career or skill development.
- Social inclusion: Funding aimed at facilitating social inclusion. This is aimed at initiatives that support community cohesion and inclusion for all. It can include such things as men's sheds, upgrading communal facilities, improving local amenities and supporting vulnerable community members.

EnergyAustralia could consider including an additional grant specifically catering to developing a skilled local workforce and support for the local economy.

24 EnergyAustralia Tallawarra Community Grants viewed 25 September 2023 https://www.energyaustralia.com.au/about-us/what-we-do/generating-energy/tallawarra-power-station/tallawarra-community#:~:text=Community%20Grants%20Program,promoting%20education%20and%20knowledge%20acquisition

5 Concluding comments

The SIA found various social impacts, both positive and negative, that may occur through the construction and operation of the proposed upgrade works.

The works will take place within the power station building, with minimal impact on Lake Illawarra and the surrounding open spaces. The minimal negative impacts identified in the SIA can be mitigated during planning and through engagement with local communities and stakeholders.

- **The overall social significance of impacts during construction, assessed against the categories specified in the Guideline range from minor to minimal.**
- **The overall social significance of impacts during operation, assessed against the categories specified in the Guideline range from minor to minimal.**

Access to the site is via Yallah Bay Road from the Princes Highway. Yallah Bay Road does not connect to the local road network or commercial properties, resulting in minimal local traffic impacts. However, significant infrastructure investment and construction, including the construction of Tallawarra B may amplify construction impacts near Lake Illawarra and traffic impacts on the Princes Highway.

Negative cumulative impacts consist of increased vehicle traffic on the Princes Highway, community engagement fatigue due to multiple construction projects, and extended visual impacts on Lake Illawarra and its surroundings, albeit minimal.

Positive cumulative impacts include improved energy supply efficiency and security, the creation of local long-term jobs, reduced carbon emissions, and opportunities to enhance local workforce skills and community investment, albeit minimal given the specialised nature of the work.

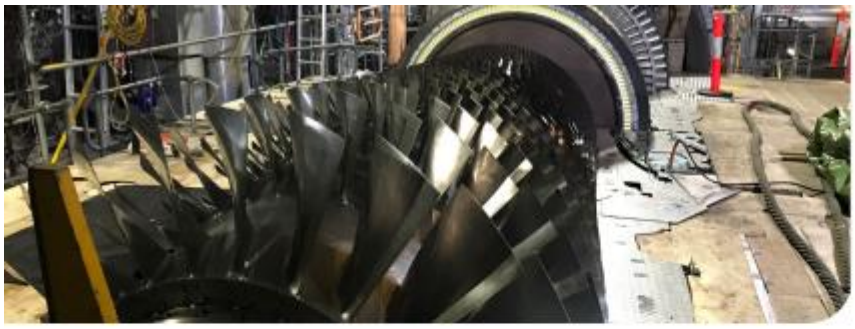
During construction, site access via Yallah Bay Road from the Princes Highway will limit traffic impacts on local roads. It is expected that a maximum of approximately 150 additional staff and approximately 360 vehicle movements will occur on-site daily, similar to a typical maintenance outage.

Overall, the proposal is expected to provide long-term positive social and economic impacts – in the form of reliable and more efficient energy supply – for residents and businesses in the study area and the broader Illawarra Shoalhaven region.

Continued consultation would reduce the overall impact magnitude and ensure the proposal can deliver the predicted benefits for the region and New South Wales.

6 Appendices

Appendix 1: Tallawarra A High Efficiency Upgrade Factsheet



EnergyAustralia

FACTSHEET | Tallawarra A

Tallawarra A High Efficiency Upgrade

EnergyAustralia acknowledges that the Tallawarra A Power Station operates on the traditional lands of the Dharawal Peoples. We recognise their continued connection to Country and culture, and we pay our respects to Elders past, present, and emerging.

About the Tallawarra A High Efficiency Upgrade

The Tallawarra A Power Station is scheduled for servicing during a routine maintenance outage in April 2024. During this planned maintenance event, EnergyAustralia propose to replace several internal components of the power station. Utilising new technology and improved materials, the upgrade will increase the efficiency of the power station. The upgrade will increase the nominal output of the power station from 400 MW to 440 MW and would increase the maximum output capacity from 440 MW to 480 MW.

What do we mean by 'high efficiency' upgrade?

The Tallawarra A High Efficiency Upgrade (HE Upgrade) will allow EnergyAustralia to output more electricity into the National Electricity Market (NEM), also known as the grid, without increasing the amount of gas used in the process. With newer, more reliable components, the operation of Tallawarra A will become more efficient. And, as a result, major outages for maintenance would only be needed every eight years, instead of every five years.

Increase in nominal power output

400 MW ⟶ 440 MW

Increase in maximum power output capacity

440 MW ⟶ 480 MW

Key features of the upgrade

Tallawarra A is a Combined Cycle Gas Turbine (CCGT) Power Station. This means that the exhaust heat from the gas turbine is recovered and used to generate steam, thereby generating more electricity from the same fuel.

The Tallawarra A High Efficiency Upgrade will include:

1. **Upgrade of the existing compressor and turbine**
   Replacing the old blades and vanes with a new design that reduces emissions intensity and increases operational reliability.
2. **Upgrade of the existing combustion process**
   Replacing hardware components with newer technology so the same output can be produced, using less gas.
3. **Upgrade of the steam cycle and steam turbine**
   Replacing internal components to increase the power station's overall combined cycle efficiency.

The HE Upgrade will also make Tallawarra A hydrogen capable in the future. The decision to use hydrogen in Tallawarra A would be subject to a future planning approval process.

Project impacts

The HE Upgrade will be contained entirely in the existing turbine hall with materials and other items stored in laydown areas on site. There are no activities outside the existing footprint of the power station. From a community perspective, there will be no changes to the outside of the power station. Local residents may notice more people on site during the two-month outage, as they will be working more shifts to deliver the work as quickly as possible.

The main turbine at Tallawarra A during maintenance

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Appendix 2: Tallawarra A SSD Planning Pathway Factsheet

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State Significant Development Planning Pathway

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About the Tallawarra A High Efficiency Upgrade

The Tallawarra A Power Station is scheduled for servicing during a routine maintenance outage in April 2024. During this planned maintenance event, EnergyAustralia propose to replace several internal components of the power station. Utilising new technology and improved materials, the upgrade will increase the efficiency of the power station. The upgrade will increase the nominal output of the power station from 400 MW to 440 MW and would increase the maximum output capacity from 440 MW to 480 MW.

Increased output
480 MW

Energy for homes
200,000

State Significant Developments

The Tallawarra A High Efficiency Upgrade is considered to be a State Significant Development (SSD) reflecting its complexity, economic value and potential impacts.

As an SSD, the project will be subject to assessment by the NSW Department of Planning and Environment. Local, state and national-level issues will be considered as part of the project's assessment and approvals process.

The project's plans will be informed through consultation with stakeholders, including neighbours, Traditional Owners, referral agencies, special interest groups and the local community. Evidence will also be gathered by technical and environmental specialists. There will be regular opportunities for feedback at different stages of the project.

Overview of the planning timeline

SSD Planning Approval Process – Key Steps

The New South Wales Minister for Planning and Public Spaces must approve State Significant Development projects under the Environment Planning and Assessment Act before they can proceed.

1. Scoping Report and SEARs

EnergyAustralia will produce a scoping report for the New South Wales Government that introduces the project and requests the issue of the Secretary's Environmental Assessment Requirements (SEARs). SEARs outline the matters that EnergyAustralia will need to address in an Environmental Impact Statement (EIS), including any community consultation requirements.

2. Environmental Impact Statement

Following receipt of the SEARs, EnergyAustralia will prepare an Environmental Impact Statement in accordance with the SEARs. EnergyAustralia will ensure consultation opportunities are provided to gather community and stakeholder feedback on key topics and issues to be addressed by the EIS and other relevant technical studies. This feedback will be considered and, where practical, it will be used to shape planning for the project.

3. Public Exhibition

A concept development plan for the project and the EIS will then be publicly exhibited for a minimum of 28 days to give the community and people with an interest in the project the opportunity to read the EIS and make a submission.

EnergyAustralia will actively promote the EIS process to ensure public visibility of this process and opportunities to provide formal feedback to the assessment.

4. Assessment and Approvals

The NSW Minister for Planning and Public Spaces will evaluate the merits of the project, paying attention to the economic, environmental, and social impacts, the issues raised during consultation and in submissions, and the principles of ecologically sustainable development.

A project may also be referred to an independent committee for a decision in certain circumstances.

After considering the project, the Minister will publish a notice setting out the decision and how community views were considered in making the decision.

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Appendix E: Construction noise assessment

Tallawarra A Power Station Upgrade

Construction Noise Impact Assessment

Aurecon Australia Pty Ltd

Level 11, 73 Miller Street
North Sydney 2060 Australia

Prepared by:

SLR Consulting Australia

Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street, North Sydney NSW 2060, Australia

SLR Project No.: 610.11078.00001

20 October 2023

Revision: 1.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
0.1	22 September 2023	Jordan McMahon	Aaron McKenzie	DRAFT
1.0	10 October 2023	Jordan McMahon	Aaron McKenzie	DRAFT
0.3	18 October 2023	Nicholas Vandenberg	Aaron McKenzie	DRAFT
1.0	20 October 2023	Nicholas Vandenberg	Aaron McKenzie	Aaron McKenzie

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Aurecon Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

EnergyAustralia proposes to upgrade some of the internal components of the existing Tallawarra A combined cycle gas turbine (CCGT) power station during a scheduled routine maintenance outage in April 2024. The upgrade would involve ancillary sites, deliveries and installation of equipment within the existing turbine hall. The work is proposed during the daytime and out of hours to minimise the outage period, however, all deliveries and noisy work would be completed during standard construction hours.

The proposed maintenance is consistent with four previous major outages completed since Tallawarra A was commissioned in 2009. EnergyAustralia has advised that there were no complaints from the community with regard to noise during these outages.

This construction noise impact assessment has been prepared to meet the requirements of the Secretary's Environmental Assessment Requirements and has been conducted in accordance with the NSW Interim Construction Noise Guideline.

The realistic peak construction activities have been modelled and compared to the appropriate noise management levels. The predicted construction noise levels at the nearest receivers are predicted to comply with the management levels in all cases.

Construction traffic noise on public roads has been considered in accordance with the NSW Road Noise Policy. No construction traffic noise impacts are expected due to the location of the proposed traffic routes and relatively high existing traffic volumes on the Princes Highway that would be used to access the project.

Based on this assessment and the outcome of similar previous work undertaken by EnergyAustralia, the proposed upgrade is not expected to result in any construction noise impacts at surrounding residential receivers.

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Appendices

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Aurecon Australia Pty Ltd (Aurecon) to prepare a construction noise impact statement (CNIS) for the proposed construction works associated with the Tallawarra A Power Station Upgrade (the project).

Advice from the turbine manufacturer is there are no changes in the operational noise emissions from the improvements works to the Tallawarra A turbine and as such operational noise emissions are not considered in this assessment.

An explanation of the specialist acoustic terminology used in this report is provided in **Appendix A**.

1.1 Project Description

EnergyAustralia owns and operates the Tallawarra A combined cycle gas turbine (CCGT) power station, which was commissioned in 2009. The power station is located approximately 13 kilometres south of Wollongong on Lot 1092 DP1140369 at Yallah Bay Road, Yallah, New South Wales. The power station is approved to generate 400 megawatts (MW) of energy, which is enough to supply electricity for up to 200,000 homes.

EnergyAustralia proposes to upgrade some of the internal components of the gas turbine (the proposal) during a scheduled routine maintenance outage in April 2024. The proposal would provide design improvements and allow for the installation of new technology and improved materials within the main gas turbine drive equipment.

The maintenance work to be undertaken in April-May 2024 is consistent with four major outages completed since Tallawarra A was commissioned in 2009 (previous outages occurred in 2011, 2014, 2017, and 2019 respectively). EnergyAustralia has advised that there were no complaints from the community with regard to noise during these outages.

The next major outage has been scheduled to commence on 1 April 2024 to minimise the risk to energy security and high prices for NSW energy consumers. There are two main drivers for performing the maintenance outage during this period that are Gas Turbine maintenance intervals and the impact on energy market security and price.

The gas turbine routine major maintenance is required at defined operating hour intervals that are largely inflexible. EnergyAustralia has been monitoring the operating hours of the Tallawarra A Gas Turbine and modifying its operations to ensure that the timing of the major maintenance will be due on 1 April 2024. It has been EnergyAustralia's experience that operating the Gas Turbine past its due date for maintenance results in unplanned outages, longer outage periods due to unforeseen failures and increased costs.

The outage start date was also selected as it falls within a period of lower energy market demand and therefore reduces the risk of disruption to energy security and high prices for NSW energy consumers. Lower energy market demand periods occur in Autumn and Spring ("Shoulder" periods) and with a 65-day outage required to complete the work this results in a largely inflexible outage window for it to occur in the period of lower energy market demand. The outage schedules are planned well in advance so that other EnergyAustralia power stations, other energy market participants and the Australian Energy Market Operator (AEMO) can ensure that there aren't too many generators offline for maintenance at once, which ensures energy market security and reduced risk of high prices for consumers. Any changes to the outage schedule may have an impact on energy security and prices as other outages have been planned around the current schedule.

Consistent with the above points, the outage period needs to be minimised in order to reduce the risk to energy systems security and high energy prices for consumers. On this basis, working a 24 hr schedule of work significantly minimises the length of the outage and would keep it out of the critical Summer and Winter energy market periods. Upgrade activities are proposed six days a week, with two shifts a day of 12 hours each, including public holidays. No work would be undertaken on Sunday after 6am. Working Normal construction hours only would increase the length of the schedule to approximately 120 days and over winter.

The proposal would increase the nominal output of the power station from approximately 400MW to 440MW and would require that the network maximum output capacity registered with AEMO be increased from 440MW to 480MW.

1.2 Secretary's Environmental Assessment Requirements

The Secretary's environmental assessment requirements (SEARs) were issued on 25 August 2023. The requirements specific to construction noise and vibration, and where these requirements are addressed in this report, are outlined in **Table 1**.

Table 1 SEARs – Construction Noise and Vibration

SEARs	Where Addressed
Assessment of the likely construction noise impacts of the project under the Interim Construction Noise Guideline (DECCW, 2009).	**Section 5.0**
An assessment of the likely construction road noise impacts of the project under the NSW Road Noise Policy (EPA, 2011).	**Section 3.2.2**

2.0 Existing Environment

The project is located in the suburb of Yallah NSW, which is within the City of Wollongong local government area, on the western shore of Lake Illawarra. The nearest residential area to the site is approximately 1 km to the north.

The assessment of impacts from the project uses Noise Catchment Areas (NCAs) to describe different receiver areas surrounding the project. NCAs are also used to apply appropriate criteria for groups of residential receivers, based on the existing background noise levels. The NCAs are listed in **Table 2** shown in **Figure 1.**

Table 2 Nearest Residential Receivers

NCA	Location	Distance from the Project	Direction
NCA01	Haywards Bay Drive, Haywards Bay	2 km	Southwest
NCA02	Carlyle Close and Coronet Place, Dapto	1 km	West
NCA03	Malonga Place, Koonawarra	1 km	Northwest
NCA04	Southeast of Lake Illawarra	3.5 km	Southeast

Figure 1 Site Location and Surrounding Receivers

2.1 Historical Noise Compliance

The maintenance work to be undertaken in April and May 2024 is consistent with the previous four major outages completed since Tallawarra A was commissioned. EnergyAustralia has advised that there were no complaints from the community with regard to noise during these outages.

Similarly, no noise complaints have been recorded during the construction of the adjacent Tallawarra B Power Station.

Historical operational noise monitoring undertaken at Tallawarra A Power Station for compliance with NSW Environmental Protection Licence (EPL) 555 has also been within the approved limits. This shows that EnergyAustralia has undertaken work on a 24/7 basis at Tallawarra A Power Station very similar to the proposed upgrade and completed it without any adverse impacts on the community.

3.0 Assessment Criteria

3.1 Construction Noise and Vibration Guidelines

The standards and guidelines relevant to the Project are listed in **Table 3**. These guidelines aim to protect the community and environment from excessive noise and vibration impacts during construction of projects.

Table 3 Construction Noise and Vibration Standards and Guidelines

Guideline/Policy Name	When Guideline is Used
Interim Construction Noise Guideline (ICNG) (DECC, 2009)	Assessment of airborne noise impacts on sensitive receivers
Road Noise Policy (RNP) (DECCW, 2011)	Assessment of construction traffic impacts

3.2 Interim Construction Noise Guideline

The NSW Interim Construction Noise Guideline (ICNG) is used to assess and manage impacts from construction noise on residences and other sensitive land uses in NSW.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers based on the existing background noise in the area. The 'worst-case' noise levels from construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact of the project.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 4**.

Work is recommended to be completed during Standard Construction Hours where possible. More stringent requirements are placed on work that is required to be completed outside Standard Construction Hours (ie during the evening or night-time), which reflects the greater sensitivity of communities to noise impacts during these periods.

Table 4 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours: Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	Noise affected RBL1 + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise • Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dBA	The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Standard Construction Hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours • The proponent should apply all feasible and reasonable work practices to meet the noise affected level • Where all feasible and reasonable practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the NSW *Industrial Noise Policy* (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI).

Sleep Disturbance

Infrastructure projects often require certain work to be completed during the night-time. Where night work is located close to residential receivers, there is potential for sleep disturbance impacts.

The ICNG lists five categories of work that might need to be undertaken outside of Standard Construction Hours:

- The delivery of oversized equipment or structures that require special arrangements to transport on public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services or considerations of worker safety do not allow work within standard hours
- Public infrastructure work that shortens the length of the project and is supported by the affected community
- Work where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

Where construction work is planned to extend over more than two consecutive nights, the ICNG recommends that an assessment of sleep disturbance impacts should be completed.

The most current method for assessing sleep disturbance in NSW policy and guidelines is contained in the NSW EPA *Noise Policy for Industry* (NPfI). Although the NPfI sleep disturbance screening approach relates to industrial noise, it is also considered relevant for reviewing potential impacts from construction noise. The NPfI defined sleep disturbance criteria is 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is the greater.

The ICNG also refers to the NSW Environmental Criteria for Road Traffic Noise (ECRTN) for assessing the potential impacts, which notes that to limit the level of sleep disturbance, the L1 level (or L_{Amax}) should not exceed the existing L90 background noise level by more than 15 dB. The ECRTN has since been superseded by the NSW EPA Road Noise Policy (RNP), which concludes the following regarding research on sleep disturbance:

- Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep. This equates to an upper acceptable range external noise level of 65 dBA when assuming a conservative 10 dB loss for open windows.
- One or two events per night with maximum internal noise levels of 65-70 dBA are not likely to affect health and wellbeing significantly.

The above guidance results in the following assessment requirements:

- The ‘sleep disturbance screening level’ of 52 dBA or RBL + 15 dB (external), which is used to identify receivers where there is potential for sleep disturbance.
- Where the sleep disturbance screening level is predicted to be exceeded, further assessment may be required to determine if the ‘awakening reaction' level of L_{Amax} 55 dB (internal) is likely to be exceeded. The awakening reaction level is the level above which sleep disturbance is considered likely.

3.2.1 Residential NMLs

3.2.1.1 Summary of Residential NMLs

The NMLs applicable at the nearest residential receivers have been adopted from the most recent EIS assessment for the Tallawarra B Power Station Modification (Benbow report 191115_NIA1_Rev4). The residential NMLs for NCAs within the project area are summarised in **Table 5.**

Table 5 Residential NMLs

NCA	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance (L_{Amax} – dBA)		Highly Noise Affected ($L_{Aeq(15min)}$ – dBA)
	Standard Construction (RBL + 10 dB)	Out of Hours (RBL + 5 dB)			Screening Level (52 dBA or RBL + 15 dB, whichever is higher)	Awakening Reaction[2]	
		Daytime[1]	Evening	Night-time			
NCA01	45	40	40	39	52	65	75
NCA02	46	41	41	39			
NCA03	46	41	39	35			
NCA04	45	40	40	39			

Note 1: Daytime out of hours is 7am to 8am and 1pm to 6pm on Saturday, and 8am to 6pm on Sunday and public holidays.

Note 1: Awakening reaction level is based on 55 dBA internal. A conservative 10 dB facade loss has been assumed to represent open windows.

3.2.2 Construction Traffic Noise Guidelines

The potential impacts from construction traffic associated with the proposal when travelling on public roads are assessed under the NSW EPA *Road Noise Policy* (RNP).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB as a result of construction traffic. Where this is considered likely, further assessment is required using the RNP base criteria shown in **Table 6**.

Table 6 RNP Criteria for Assessing Construction Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am – 10 pm)	Night-time (10 pm – 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

The project is expected to require a total of 12 heavy vehicle movements for deliveries, which would access the site from the Princes Highway via Yallah Bay Road. All deliveries would be in standard daytime construction hours.

Since there are no sensitive receivers adjacent to Yallah Bay Road and the construction traffic volumes are low compared to existing daytime traffic volumes on the Princes Highway, no construction traffic noise impacts are expected due to the project.

3.3 Environment Protection Licence

The Tallawarra A Power Station currently operates under NSW Environment Protection Licence (EPL) 555. Although the EPL does not apply to the proposed construction activity, previous maintenance outages have been required to comply with the specified operational noise limits.

The EPL operational noise limits are reproduced in **Table 7** for information purposes only.

Table 7 EPL Operational Noise Limits

Receiver Location	Equivalent NCA in this Assessment	$L_{Aeq(15minute)}$ Night-time (dBA)
Monitoring location “A” (near 32 Coronet Place, Koonawarra)	NCA02	28
Monitoring location “B” (near the entrance gate to Dapto Substation, Yallah)	NCA01	35
Monitoring location “C (Central Park, Mogurah Point overlooking south-western part of Lake Illawarra)	NCA04	33
Monitoring location “D” (near the scout hall at Boonerah Point)	NCA04	35
Monitoring location “E” (Residential boundary of Haywards Bay Estate, Yallah)	NCA03	37

The equivalent night-time construction NMLs applied in this assessment, determined in accordance with the ICNG, are between 35-39 dBA. It is noted that previous maintenance outages have completed work similar to that proposed in April 2024 and complied with the more stringent EPL noise limits.

4.0 Methodology

A noise model of the study area has been used to predict noise levels from the construction of the project to the surrounding receivers. The model uses CONCAWE algorithms in SoundPLAN software to predict external noise levels over the surrounding area and at the nearest residential receivers.

Local terrain and Tallawarra Power Station structures were digitised in the noise model to develop a three-dimensional representation of the construction sites and surrounding areas. Details of the noise modelling parameters used in the assessed are summarised in **Table 8**.

Table 8 Noise Model Inputs

Input Parameter	Source of Data
Ground topography	The noise model includes a 'digital ground model' which is a 3D representation of the terrain in the study area. The ground model was generated from 1 m LIDAR contours.
Receiver locations	The nearest sensitive receivers have been identified based on aerial photography and previous assessments for the project, with consideration of the receiver locations listed in the EPL. All noise predictions are presented for a receiver height 1.5 m above ground level.
Construction Noise Sources	Construction noise sources have been modelled at an average height of 1 m above ground level.
Ground absorption	Ground absorption is modelled as 20% for the project site, 50% for residential areas, 0% (reflective) for water ways and 75% for intervening grassland.
Meteorological conditions	Stability category D with 3 m/s source to receiver wind (noise enhancing weather).

The results of this assessment consider the highest predicted noise level for all receivers in each NCA.

4.1 Construction Activities

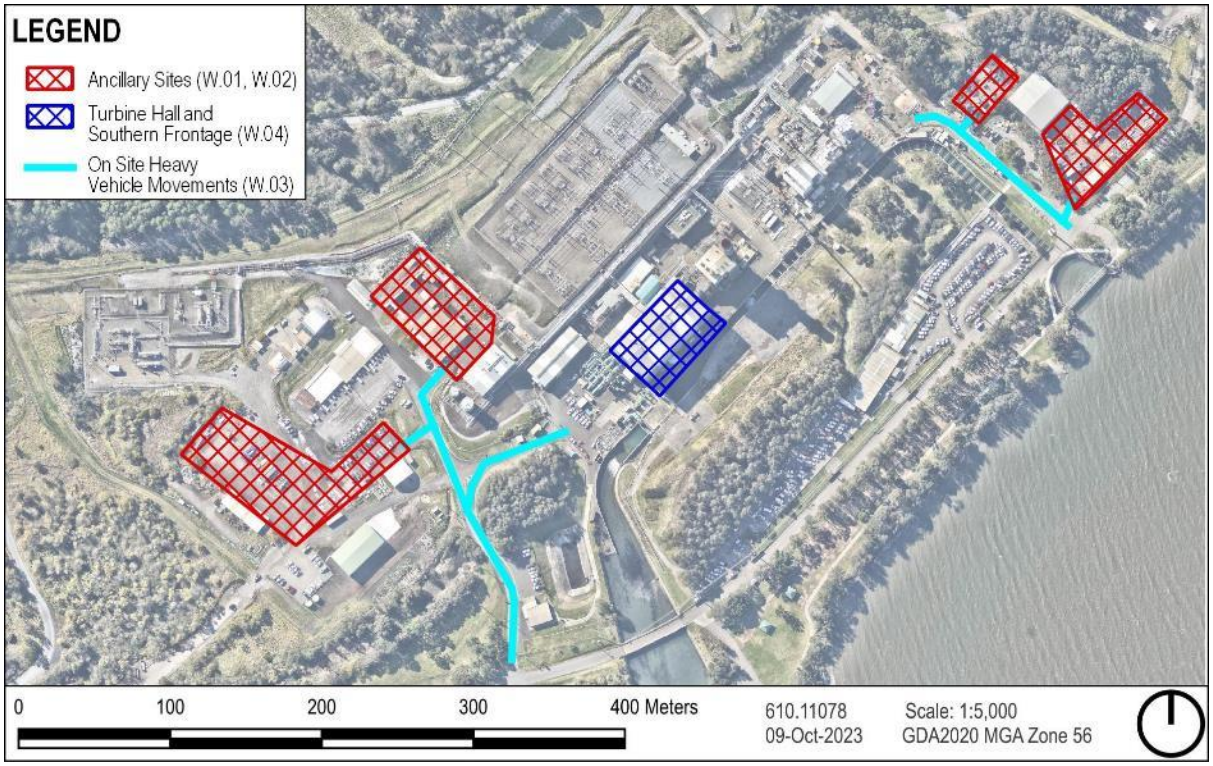
The upgrade would generally involve the following activities:

- Establishment of ancillary sites
- Equipment would be delivered to site during standard working hours by light and heavy vehicles. No over size or over mass vehicles would be required for the proposal
- Equipment would be installed within the existing turbine hall. Existing lifting equipment within the turbine hall would be used during the upgrade, where possible.
- One 220t crane will be required for the once through cooler (OTC) attemperator install due to the height required and a mobile franna crane (40t) to remove the old exhaust gas housing (EGH) and install the new one.
- Removed equipment would be taken off site for reuse, recycling or to be taken to an appropriate waste management facility
- New equipment would be tested and commissioned
- Following construction, ancillary sites and maintenance personnel would be demobilised to facilitate the resumption of operations.

Construction of the proposal is anticipated to require the use of delivery vehicles, hand tools, power tools and a forklift. Existing lifting equipment inside the turbine hall would be utilised, where possible. A 220t mobile crane will be required during the OTC install due to the height required and 40t franna crane for the EGH removal and install. Internal installation activities are not expected to be highly noise producing and impacts are not expected at the nearest receivers.

This assessment considers the potential peak noise producing external activities, including the ancillary sites and truck deliveries. The modelled noise source locations are shown in **Figure 2**.

Figure 2 Construction Source Locations



The assessed construction scenarios are described in **Table 9**.

Table 9 Construction Scenario Descriptions

ID	Scenario	Description
W.01	Ancillary Site Establishment and Demobilisation	Establishment of ancillary sites at cleared and hardstand areas within the footprint of the existing power station.
W.02	Ancillary Site Operation	Laydown and storage of construction materials at the ancillary sites.
W.03	Heavy Vehicle Delivery	Delivery of equipment via Yallah Bay Road during standard daytime hours only. This work would use heavy vehicles but no oversize or mass vehicles would be required.

ID	Scenario	Description
W.04	Equipment Installation	Main work area for equipment installation within the existing turbine hall, where possible. This work would include use of hand tools, existing internal lifting equipment (where possible), and a 220t mobile crane/40t franna crane as required. The 220t crane is expected to be used for 2 days, and the 40t is expected to be used for 12 days. As a conservative approach, the louder 220t crane has been adopted in the equipment list although only proposed to occur for two days. Although, noise producing equipment would generally be inside the hall, it has been modelled as an external source to conservatively represent the need for open doors along the southern frontage of the turbine hall.

The modelled sound power levels of individual equipment and work scenarios are shown in **Table 10**. The modelled equipment represents the realistic peak work scenarios that are expected to occur.

Table 10 Modelled Equipment and Sound Power Levels

ID	Scenario	Equipment	Estimated on-time in any 15 minutes	Sound Power Level[1] (dBA)		
				Maximum $L_{Aeq(15minute)}$		Maximum L_{Amax}
				Individual Item	Activity	
W.01	Ancillary Site Establishment and Demobilisation	Forklift	10	106	107	114
		Hand Tools	15	104		
		Light Vehicles	15	88		
W.02	Ancillary Site Operation	Forklift	10	106	109	116
		Hand Tools	15	108		
		Truck	5	108		
W.03	Heavy Vehicle Deliveries[2]	Truck	15	108	108	111
W.04	Equipment Installation	Existing internal lifting equipment	15	98	114	121
		Hand Tools	15	104		
		Mobile Crane (approx. 220t)	15	113		

Note 1: Sound power level data is taken from the TfNSW Construction Noise and Vibration Guideline, TfNSW Construction Noise and Vibration Strategy, AS 2436-2010, and DEFRA Noise Database.

Note 2: Heavy vehicle deliveries assumes one truck travelling over all internal heavy vehicle routes shown in **Figure 2** in the 15 minute assessment period at an average speed of 20 km/h.

4.2 Construction Schedule and Working Hours

Construction is proposed to commence in April 2024 during the routine scheduled maintenance shutdown of the Tallawarra A power station, following all required statutory approvals being secured. Construction of the proposal is anticipated to take approximately two months.

Upgrade activities would be undertaken during and outside of standard working hours. This would include work six days a week, with two shifts a day of 12 hours each. No work would be undertaken on Sunday after 6am.

As noted previously, similar maintenance work during major outages has been undertaken without complaint from the community. EnergyAustralia has advised that any potentially noisy work will be completed during standard construction hours.

5.0 Construction Noise Impact Assessment

A summary of the predicted construction noise levels with noise enhancing weather conditions (see **Table 8**) at the potentially most affected receivers in each NCA is shown in **Table 11**.

Table 11 Predicted Construction Noise Levels

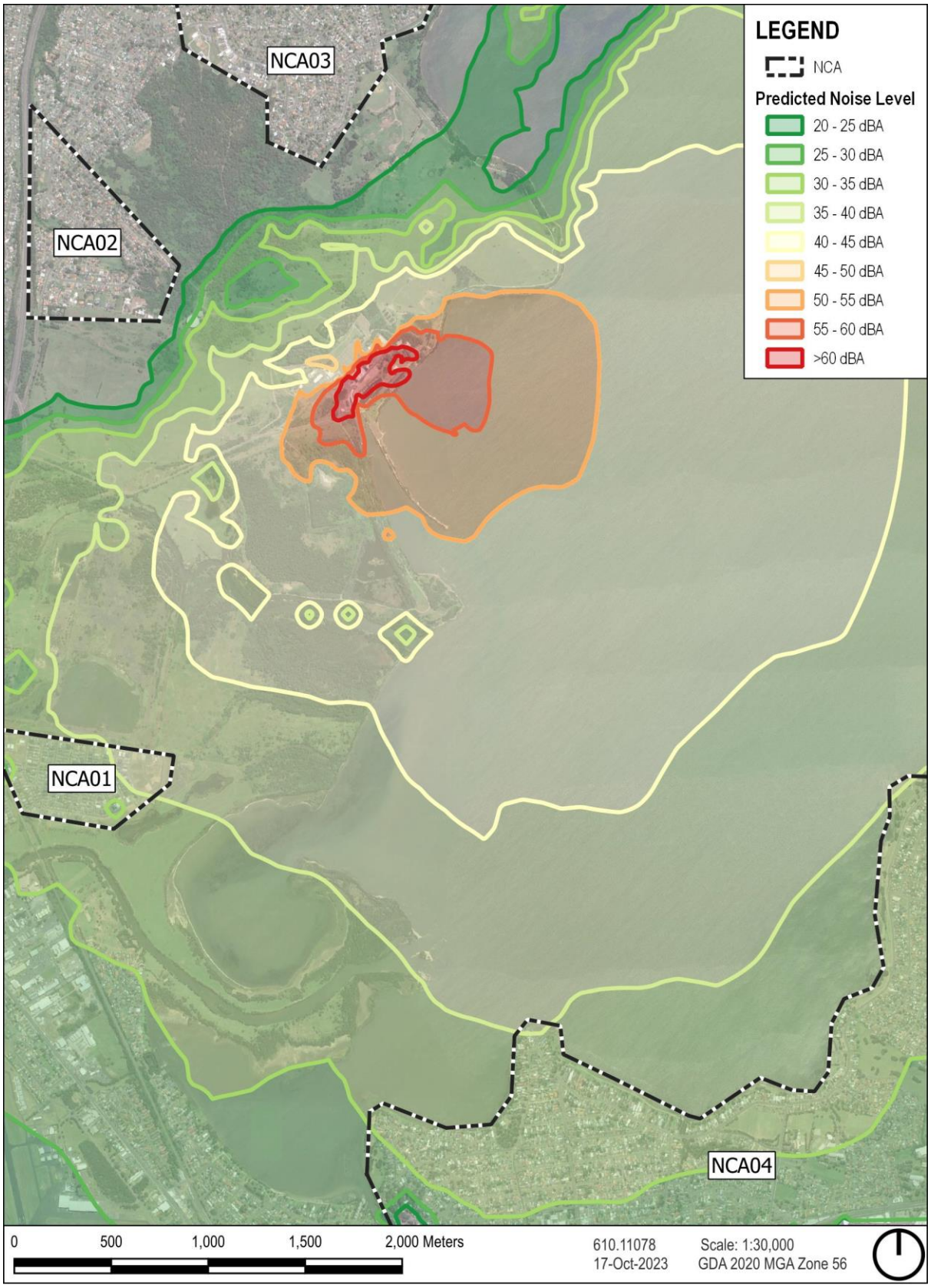
NCA	Period	Noise Level (dBA)					
		NML	Predicted $L_{Aeq(15minute)}$				Predicted L_{Amax}[1]
			W.01	W.02	W.03	W.04	
NCA01	Day	45	29	31	<20	36	43
	Day OOH	40					
	Evening	40					
	Night	39					
NCA02	Day	46	<20	20	<20	<20	27
	Day OOH	41					
	Evening	41					
	Night	39					
NCA03	Day	46	<20	<20	<20	<20	24
	Day OOH	41					
	Evening	39					
	Night	35					
NCA04	Day	45	27	29	<20	35	42
	Day OOH	40					
	Evening	40					
	Night	39					

Note 1: The predicted L_{Amax} is the maximum level in the NCA for all assessed work scenarios.

The assessment shows that the predicted construction noise levels are less than the management levels for all assessment periods. The maximum noise levels during the night-time are also predicted to be below the sleep disturbance screening level.

The predicted L_{Aeq} noise contours for Equipment Installation (W.04) are shown in **Figure 3**. The results show that receivers in NCA02 and NCA03 are shielded by the intervening ground elevation.

Figure 3 Predicted Construction Noise Contours



6.0 Mitigation and Management Measures

The assessment in **Section 5.0** shows that no construction noise impacts are predicted from the project. However, best practice work strategies should be applied to minimise potential noise emissions from the work in accordance with the ICNG.

Recommended work practices include:

- Site inductions and worker training to be promote awareness of noise generating activity the location of nearby sensitive receivers.
- Scheduling noisy work during standard daytime hours where reasonable and feasible.
- Provide a readily accessible contact point for community feedback or complaints.
- Locate any stationary noisy plant away from nearby receivers and maximise shielding from intervening structures where possible.

7.0 Conclusion

SLR Consulting has undertaken a construction noise impact assessment for the Tallawarra A Power Station Upgrade.

The maintenance work to be undertaken in April and May 2024 is consistent with four major outages completed since Tallawarra A was commissioned. EnergyAustralia has advised that there were no complaints from the community with regard to noise during these prior outages.

Modelling of the realistic peak expected construction activities shows that noise emissions from the project are expected to comply with the relevant management levels at the nearest surrounding residential receivers.

Appendix A Acoustic Terminology

Tallawarra A Power Station Upgrade

Construction Noise Impact Assessment

Aurecon Australia Pty Ltd

SLR Project No.: 610.11078.00001

20 October 2023

Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

Sound Power Level

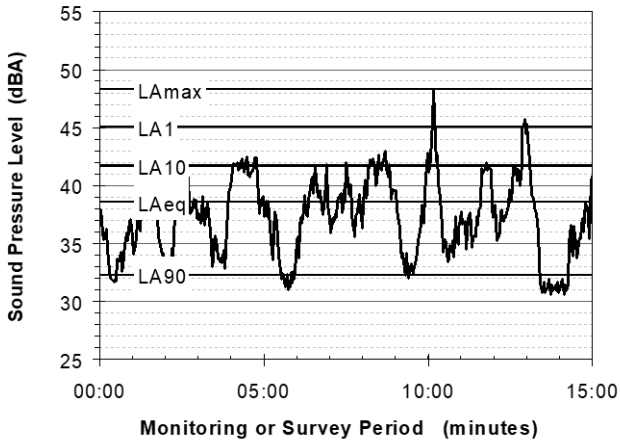
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

Frequency Analysis

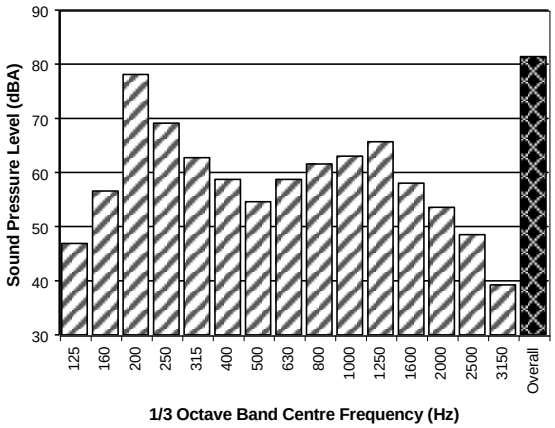
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- Tonality - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- Impulsiveness - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- Intermittency - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- Low Frequency Noise - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

Human Perception of Vibration

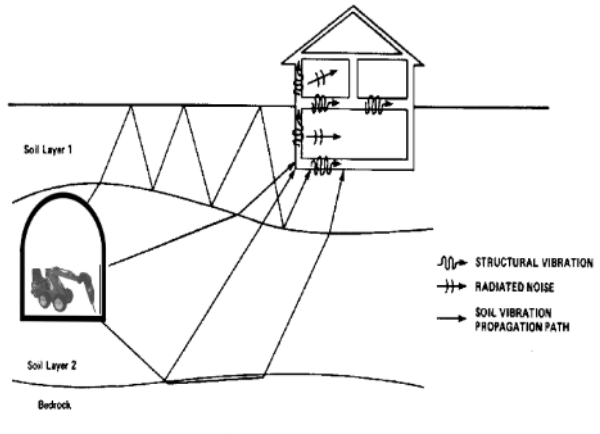
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

Ground-borne Noise, Structure-borne Noise and Regenerated Noise

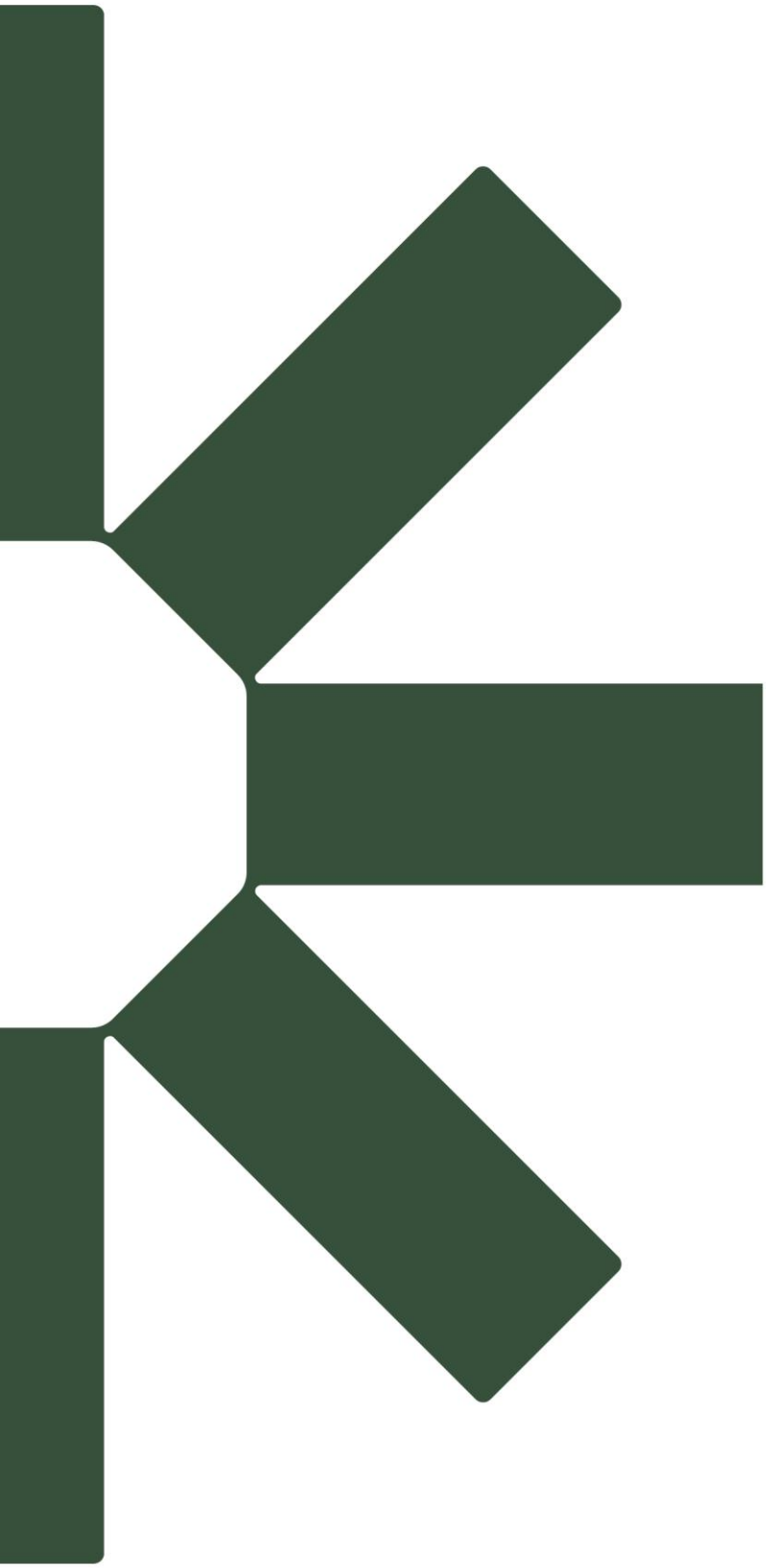
Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.



Making Sustainability Happen

Appendix F: BDAR waiver

Department of Planning and Environment

Our ref: Tallawarra A Power Station Upgrade (SSD-60938959)

Amanda Jones
Planning & Approvals Specialist
EnergyAustralia Development Pty Ltd

31 August 2023

Subject: Request to waive requirement for Biodiversity Development Assessment Report

Dear Ms Jones

I refer to your correspondence dated 5 July requesting to waive the requirement for a Biodiversity Development Assessment Report (BDAR) to be lodged with the development application for the Tallawarra A Power Station Upgrade (SSD-60938959).

The Department has reviewed the information provided in the BDAR waiver application and has consulted with the Biodiversity and Conservation Division (BCD). BCD has determined that the proposed development is not likely to have a significant impact on biodiversity values. The application, therefore, does not need to be accompanied by a BDAR. A copy of BCD's determination is attached.

Accordingly, as delegate for the Planning Secretary, I have determined that a waiver under section 7.9 of the *Biodiversity Conservation Act 2016* is granted for the proposed development.

Please note that if the proposed development is changed so that it is no longer as described in Schedule 1 of BCD's determination report, you will need to a lodge a new BDAR waiver request or prepare a BDAR.

Additionally, please note that there are no other changes to the Secretary's Environmental Assessment Requirements (SEARs) issued for the proposed development on 25 August 2023.

If you wish to discuss the matter further, please contact Thomas Cocks on 02 9228 6168

Yours sincerely

Gen Lucas
A/Director - Resource Assessments
as delegate for the Planning Secretary

Attached:
BCD Waiver Letter
BCD Waiver Determination

Determination template – BDAR not required

Determination under clause 7.9(2) of the Biodiversity Conservation Act 2016

I, Stefan Kraus, A/Director South East in the Biodiversity Conservation Division of the Department of Planning and Environment, under clause 7.9(2) of the *Biodiversity Conservation Act 2016*, determine that the proposed development is not likely to have any significant impact on biodiversity values and therefore a Biodiversity Development Assessment Report (BDAR) **is not required**.

Proposed development means the development as described in Schedule 1. If the proposed development changes so that it is no longer consistent with this description, a further request to waive the requirement for a BDAR must be lodged or a BDAR prepared.

If you do not lodge the development application related to this determination for the proposed development within 2 years of the issue date of this determination, you must either prepare a BDAR or lodge a new request to have the BDAR requirement waived.

25/08/2023

Stefan Kraus
A/Director
South East Branch
Biodiversity and Conservation Division
Department of Planning and Environment

Date

Our reference: DOC23/709295

SCHEDULE 1 – Description of the proposed development

The Project at Tallawarra A power station, Tallawarra (SSD-60938959) proposes to upgrade some of the internal components of the gas turbine that are housed within the main turbine hall (the proposal). The proposal would occur during a scheduled routine maintenance outage. The proposal would provide design improvements and allow for new technology to increase:

- Efficiency of the power station, by minimising natural gas consumption
- Stability of network voltage to within a standard range across the NSW electricity network
- Strength of the NSW electricity network and the National Electricity Market (NEM) with three of the five major coal fired power stations scheduled for closure over the next 6 years
- Reliability of the power station by improving critical components to extend major outage intervals from five years to eight years, and minimising power station downtime.

Key features of the proposal include:

- Upgrade of the existing compressor and turbine by replacing the old blades and vanes with a new design that reduces emissions intensity and increases operational reliability
- Upgrade of the existing combustion process by replacing existing hardware components with newer technology to reduce the consumption of natural gas required for the same output
- Upgrade the steam cycle and steam turbine internal components to increase the power stations overall combined cycle efficiency.

The proposal would increase the nominal output of the power station from approximately 400MW to 440MW and would require that the network maximum output capacity registered with the Australian Energy Market Operator (AEMO) be increased from 440MW to 480MW.

The proposal would also make the power station 'hydrogen capable' which would enable future opportunities to further reduce carbon emissions (subject to separate approval).

Document prepared by

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