Intended for
Western Energy Pty Ltd, a subsidiary of AGL Energy Limited

Document type
Report

Date
April 2025

Supporting Document to EPA Referral

Kwinana Swift Power Station Expansion – K2 Project

RAMBOLL Bright ideas. Sustainable change.

Confidential

Supporting Document to EPA Referral
Kwinana Swift Power Station Expansion – K2 Project

Project name	**Kwinana Swift Power Station Expansion Approvals**
Project no.	**318002114**
Recipient	**Western Energy Pty Ltd, a subsidiary of AGL Energy Limited**
Document type	**Supporting document to EPA referral**
Version	**V4.0**
Date	**16/04/2025**
Prepared by	**Nea Ferin-Durie, Marc Barendrecht**
Checked by	**Jeff Barham, Marc Barendrecht**
Approved by	**John Miragliotta**
Description	**Report to support referral of project to the EPA**

Ramboll
Level 7
41 St Georges Terrace
Perth
Western Australia 6000
Australia

T +61 8 9225 5199
https://ramboll.com

Revision	Date	Prepared by	Checked by	Approved by	Description
4.0	16/04/2025	NFD, MB	MB	JM	Final

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

Confidential

Contents

LIST OF TABLES

LIST OF FIGURES

Appendices

Executive Summary

Western Energy Pty Ltd (**Perth Energy**), a subsidiary of AGL Energy Limited (**AGL**) proposes to construct and operate an expansion (**K2 Project**) of the existing functional dual-fuel Kwinana Swift Power Station (**KSPS**) at 1 Burton Place, Kwinana Breach, Western Australia 6167 (Lot 13 DP39572) (**the Site**), in the City of Kwinana, Western Australia.

The K2 Project is to build and operate up to four new gas-powered turbine units and associated infrastructure, which would allow for additional generation capacity of up to 250 MW from the Site. Together with the existing operational units, the proposed turbine units would increase the total generation capacity of the Site to up to 370 MW.

Amongst other things, and for the reasons considered further in this document, the Proposal:

- is consistent with, and capable of authorisation under State legislative frameworks and as an expansion of an existing industrial land use which has operated since 2010 from the Site without incident;
- will provide the firming capacity necessary to support the roll out of renewables, and to achieve AGL's strategy to deliver a portfolio of flexible, low emissions generation;
- is aligned with State objectives for energy security in the transition from retiring coal powered electricity generation; and
- has the support of Energy Policy WA (a sub-department within the WA Department of Energy, Mines, Industry Regulation and Safety) as the most prospective of proposed gas projects that will be necessary to provide critical flexible firming capacity to the Wholesale Energy Market (WEM) and ensure reliability standards continue to be met.

This document has been prepared to provide supporting information for referral of the Proposal to the Environmental Protection Authority (**EPA**) under s. 38 of the *Environmental Protection Act 1986* (WA) (**EP Act**). It evaluates the feasibility and environmental implications of the Proposal, and emphasises the need for its progression to support Western Australia's emission reduction targets. The Proposal's environmental impacts have been assessed against the Environmental Protection Authority's (**EPA**) environmental factors and determined that only greenhouse gas emissions should be considered as a key environmental factor.

The Proposal has been designed and assessed to meet the requirements set forth by the EPA's updated Environmental Factor Guideline – Greenhouse Gas Emissions (2024) and the Safeguard Mechanism under the National Greenhouse and Energy Reporting (NGER) Scheme. By adhering to these guidelines, the project will systematically reduce greenhouse gas emissions, contributing to state and national targets of net-zero emissions by 2050.

Studies and assessments commissioned by Perth Energy demonstrate that the environmental impact of the project, particularly on greenhouse gas emissions, is projected to be insignificant at the state, national, and global levels. The project includes comprehensive mitigation measures and emission reduction targets, ensuring compliance with the EPA's objective to minimize environmental harm associated with climate change by reducing emissions as far as practicable.

Despite the specific gas turbine type not being confirmed at this stage of the Project's development, the assessments for greenhouse gas emissions, air quality, and noise have been conducted on a highly conservative basis. This implies that the modelling results consider a worst-case scenario by incorporating conservative assumptions, thus ensuring that the work undertaken remains robust and reliable for different potential turbine units. Such an approach guarantees that

any variance in the actual turbine units selected would still fall within the acceptable impact ranges defined in the assessments.

The Proposal serves as a crucial stepping stone towards transitioning away from coal-fired power generation to a renewable energy future. This transition aligns with the objectives of the State Emissions Reduction Strategy (**SERS**), promoting an overall reduction in cumulative greenhouse gas emissions over time and facilitating the integration of renewable energy sources.

The Proposal's alignment with environmental guidelines, its role in facilitating the transition to renewable energy, and its negligible impacts on the environment (supported by assessment against the EPA's environmental factors) support an Assessment on Referral Information (**ARI**).

Abbreviations, Definitions and Acronyms

Abbreviations	Definition
ACCU	Australian Carbon Credit Unit
ACMC	Aboriginal Cultural Materials Committee
AHD	Australian Height Datum
AEMO	Australian Energy Market Operator
AER	Annual Environmental Report
ARI	Assessment on Referral Information
CCGT	Combined Cycle Gas Turbine
CER	Clean Energy Regulator
CTAP	Climate Transition Action Plan
DCCEEW	Department of Climate Change, Energy, Environment and Water
DER	Department of Environment Regulation (currently known as DWER)
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EP Act	Environmental Protection Act 1986 (WA)
EPA	Environmental Protection Authority (WA)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
ESOO	Electricity Statement of Opportunities
GHG	Greenhouse Gas
GHGMP	Greenhouse Gas Management Plan
GKBAC	Gnaala Karla Booja Aboriginal Corporation
GLC	Ground Level Concentrations
ICROA	International Carbon Reduction and Offsetting Accreditation
IPCC	Intergovernmental Panel on Climate Change
JTSI	Department of Jobs, Tourism, Science and Innovation
KIA	Kwinana Industrial Area
KIC	Kwinana Industrial Council
KWRP	Kwinana Water Recycling Plant
LPS2	Town of Kwinana Local Planning Scheme no. 2
MNES	Matters of National Environmental Significance
MRS	Metropolitan Region Scheme
NDC	nationally determined contribution (in relation to the Paris Agreement)
NEPC	National Environmental Protection Council
NEPM	National Environment Protection Measure
OCGT	Open Cycle Gas Turbine
OEM	Original Equipment Manufacturer
OHP	Other Heritage Place.
The Paris agreement	A legally binding international treaty on climate change, which was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016.
PMST	Protected Matters Search Tool
SDOOL	Sepia Depression Ocean Outlet Line
SERS	Sectoral Emissions Reduction Strategy (for Western Australia)
SWIS	South West Interconnected System

WEM	Wholesale Energy Market

Confidential

1. Proposal

1.1 Overview

Western Energy Pty Ltd (**Perth Energy**), a subsidiary of AGL Energy Limited (**AGL**) proposes to construct and operate an expansion (**K2 Project**) of the existing functional dual-fuel Kwinana Swift Power Station (**KSPS**) at 1 Burton Place, Kwinana Breach, Western Australia 6167 (Lot 13 DP39572) (the **Site**), in the City of Kwinana, Western Australia.

As described below, the existing KSPS has a nameplate generation capacity of 120 MW. The K2 Project is to build and operate up to four new gas-powered turbine units and associated infrastructure, which would allow for additional generation capacity of up to 250 MW from the Site. Together with the existing operational units, the proposed turbine units would increase the total generation capacity of the Site to up to 370 MW. The Proposal referred does not include the existing KSPS units and operations, as further noted in sections 1.3.3 and 2.6.

Amongst other things, and for the reasons considered further in this document, the Proposal:

- is consistent with, and capable of authorisation under State legislative frameworks and as an expansion of an existing industrial land use which has operated since 2010 from the Site without incident;
- will provide the firming capacity necessary to support the roll out of renewables, and to achieve AGL's strategy to deliver a portfolio of flexible, low emissions generation;
- is aligned with State objectives for energy security in the transition from retiring coal powered electricity generation; and
- has the support of Energy Policy WA (a sub-department within the WA Department of Energy, Mines, Industry Regulation and Safety) as the most prospective of proposed gas projects that will be necessary to provide critical flexible firming capacity to the Wholesale Energy Market (**WEM**) and ensure reliability standards continue to be met.

1.2 Purpose and Scope

This document has been prepared to provide supporting information for referral of the Proposal to the Environmental Protection Authority (**EPA**) under s. 38 of the *Environmental Protection Act 1986* (**EP Act**), to enable the EPA to determine if environmental impact assessment is required under Part IV of the EP Act and if so, the level of assessment. This document provides the EPA with the following information:

- Definition of the Proposal and associated activities
- Simplified, technical project description
- Identification of key environmental factors and their potential impacts to the environment
- Identification of other environmental factors and their potential impacts to the environment
- Stakeholder engagement conducted
- Description of corporate and Proposal specific offsets possibilities
- Matters of National Environmental Significance (**MNES**) related to the Proposal
- Information about possible cumulative environmental impacts.

1.3 Proposal Content

Table 1-1 and Table 1-2 summarises the Proposal content and elements in accordance with EPA's *Instructions and template: How to identify the content of a proposal* (EPA, 2024a).

Table 1-1 General proposal content description.

Proposal title	K2 Project
Proponent name	Western Energy Pty Ltd
Short description	This Proposal is to expand the existing Kwinana Swift Power Station by up to 250 MW. Up to four new gas-powered turbine units and associated infrastructure is proposed to be built, which could be operational on natural gas, diesel, distillate, ethane, liquified natural gas (LNG), liquified petroleum gas, (LPG) and/or hydrogen. The total plant capacity, including the existing units (which are not part of this Proposal), will be up to 370 MW.

Table 1-2 Proposal content elements.

Proposal element	Location/description	Maximum extent, capacity or range
Physical elements		
Gas-powered turbine units and associated infrastructure	Figure 1-2	The development envelope is 3.55 ha. This area contains the four existing gas turbines and the footprint for the proposed gas turbines and associated infrastructure, being the subject of this application. The associated infrastructure includes an overflow evaporation pond and infrastructure linking the turbines to the substation area.
Substation area		Existing and proposed switchyards and power supply infrastructure required to convert the power supply to a form that can be accepted by the Western Power substation.
Balance of Plant		Area in the northern portion of the Site contains the existing support infrastructure including fuel storage, water treatment, offices, workshops, warehousing and auxiliary equipment.
Construction elements		
Laydown areas, workshops, car parks and worker amenities	N/A	A laydown area is required however the location has not yet been confirmed. We anticipate this will be within or near the Kwinana Industrial Area (**KIA**). The remaining construction requirements can be serviced by existing site facilities. Clearing of native vegetation will not occur as a result of this activity.

Confidential

Wastewater discharge pipeline		Augmentation of existing pipeline infrastructure to meet the expansion requirements.
Proposal element	**Location/description**	**Maximum extent, capacity or range**
Operational elements		
Gas-powered turbine units	Figure 1-2	Gas-powered turbine units with a capacity up to 250 MW.
Fuel supply (natural gas, diesel)	N/A	Dependent on the actual operating hours. Upper estimates range from 50 TJ/day (natural gas or diesel)
Water supply		Scheme water will be supplied from the Water Corporation at rate of 100m3 per hour
Wastewater effluent		Maximum of 720 kl/day expected during operations to be discharged Water Corporation's Kwinana Water Recycling Plant (**KWRP**) which includes a licenced discharged via the Sepia Depression Ocean Outlet Line (**SDOOL**).
Greenhouse gas emissions		
Construction elements:		
Scope 1	Not expected to be material.	
Scope 2		
Scope 3		
Operation elements (total for this Proposal only)		
Scope 1	195,659 t CO_2-e per annum (/a) on average 5,869,763 t CO_2e over the life of the Proposal	
Scope 2	530 t CO_2-e/a on average 11,660 t CO_2e total over the operation period	
Scope 3	22,937 t CO_2-e /a on average 688,122 t CO_2e	
Rehabilitation		
Once the operations cease, the site will be remediated and rehabilitated to ensure the premises are left in an environmentally acceptable, non-polluting, and safe condition.		
Commissioning		
Commissioning of the new gas-turbines is planned to start 18 months after construction commences and expected to take 9 months to complete. Commissioning will be executed according to the environmental commissioning plan. This plan will be submitted to Department of Water and Environmental Regulation (**DWER**) as part of the DWER Works Approvals application and assessment process under Part V of the EP Act.		
Decommissioning		
Once the operations cease, the site will be remediated and rehabilitated to ensure the premises are left in an environmentally acceptable, non-polluting and safe condition. A final decommissioning plan will be prepared and provided for EPA's consideration prior to the anticipated date of decommissioning.		
Other elements which affect extent of effects on the environment		
Proposal time	Maximum project life	Expected life of 47 years

	Construction phase	24-36 months
	Operations phase	45 years
	Decommissioning phase	End of Project life

1.3.1 Location Context

The Site is located approximately 40km south of Perth in the KIA, from which Perth Energy has operated the KSPS since August 2010 and pursuant to a lease agreement with Western Australian Land Authority (**Development WA**), and related approvals. The existing and authorised KSPS functions as a 120 MW open cycle aeroderivative gas turbine peaking plant.

The Site context is shown in **Figure 1-1**.

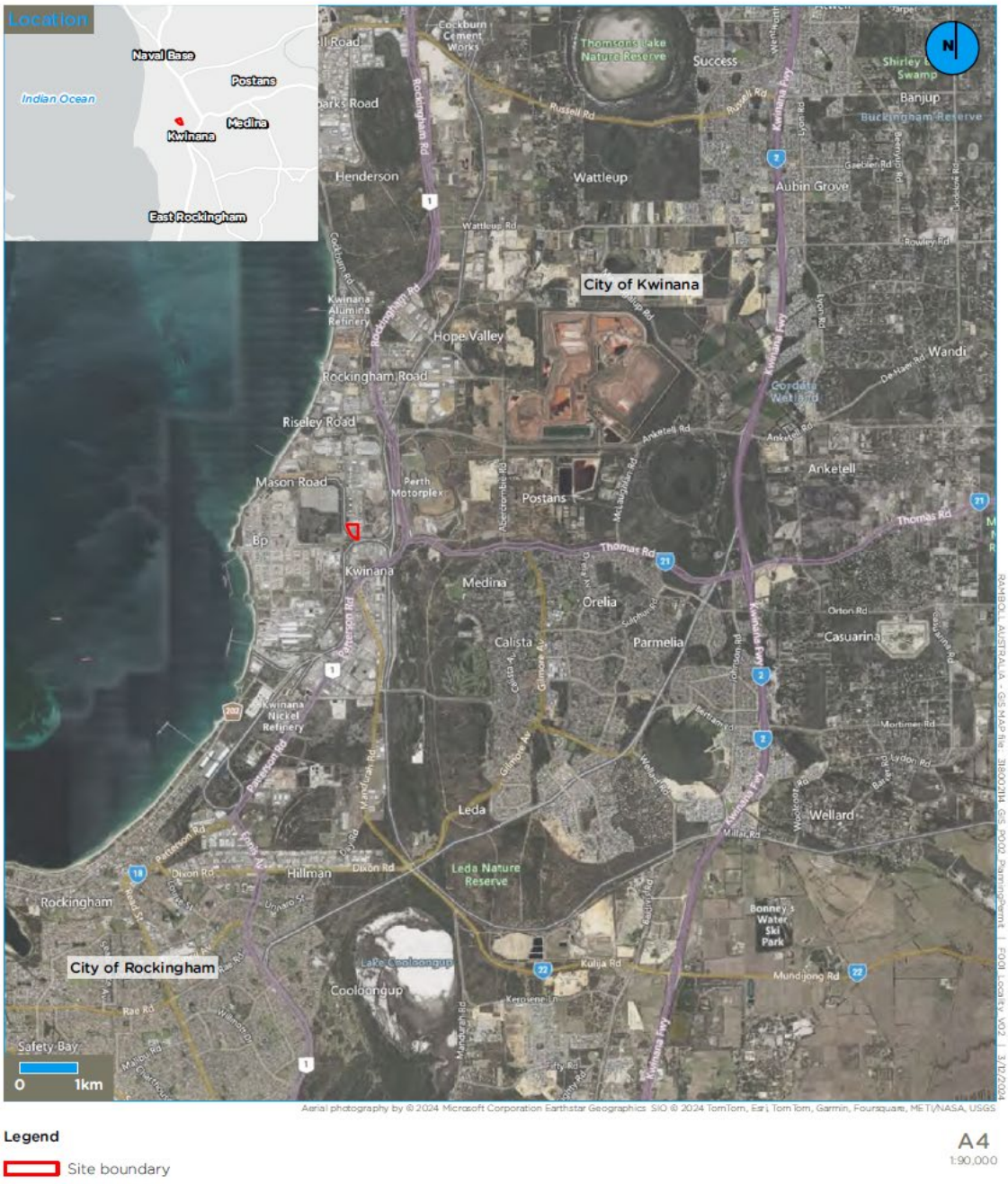


Figure 1-1: Site Context

Confidential

1.3.2 Project Description

Perth Energy is proposing to expand the current KSPS with an additional 250 MW of generation capacity. The project forms part of Perth Energy's strategy to deliver a portfolio of flexible, low-emissions generation to the energy market.

The Site is defined by three broad areas, as shown on **Figure 1-2**, and described further below.

- Gas turbines and auxiliary equipment area – this area contains the four existing gas turbines and the footprint for the proposed gas turbines subject of this application. The auxiliary infrastructure includes the overflow evaporation pond in the south of the Site and the infrastructure linking the turbines to the substation area.
- Substation area – this area is to the west of the gas turbines and contains the existing and proposed switchyards and power supply infrastructure required to convert the power supply to a form that can be accepted by the Western Power substation.
- The Balance of Plant area in the northern portion of the Site containing the existing support infrastructure including fuel storage, water treatment, offices, workshops, warehousing and auxiliary equipment.

A retention basin is in the southeast corner of the Site which receives stormwater runoff from across the Site. The water treatment plant on Site disposes wastewater from the operations into the KWRP, after which treated water discharges to the local Point Peron SDOOL, under a licence held by Water Corporation. Perth Energy would maintain the current agreement or enter a new agreement with the Water Corporation to meet water quality discharge requirements of the KWRP operating licence to allow it to be utilised for the Proposal's wastewater disposal.

To achieve the additional expected 250 MW, one or more (but no greater than four) new gas-powered turbine units and associated infrastructure are proposed to be built on the Site. These new gas-powered turbine units could be operational on natural gas, diesel, distillate, ethane, liquefied natural gas (**LNG**), liquefied petroleum gas (**LPG**) and/or hydrogen. Gas-powered turbines may to be able to operate as synchronous condensers. Each gas-powered turbine has one stack and thus, the total number of emission points depends on the number of turbine units built.

An indicative turbine unit is presented below in **Figure 1-3**. Several stack height configurations (from 18m – 30m) were modelled in the air quality assessment in order to inform preliminary design considerations. Currently, this Proposal is considering a stack height of 26.4m. The stack height that has been presented in the air quality assessment (**Appendix 4**) is 18m and the diameter is 3m. This configuration resulted in the 'worst case' scenario for impacts to air quality for the chosen turbine units and has been presented accordingly throughout this Proposal. It is anticipated that the chosen turbine units will not exceed these parameters. Accordingly, related impact studies have been undertaken on a highly conservative basis, and all potential environmental impacts have been considered for up to 4 units.

Confidential

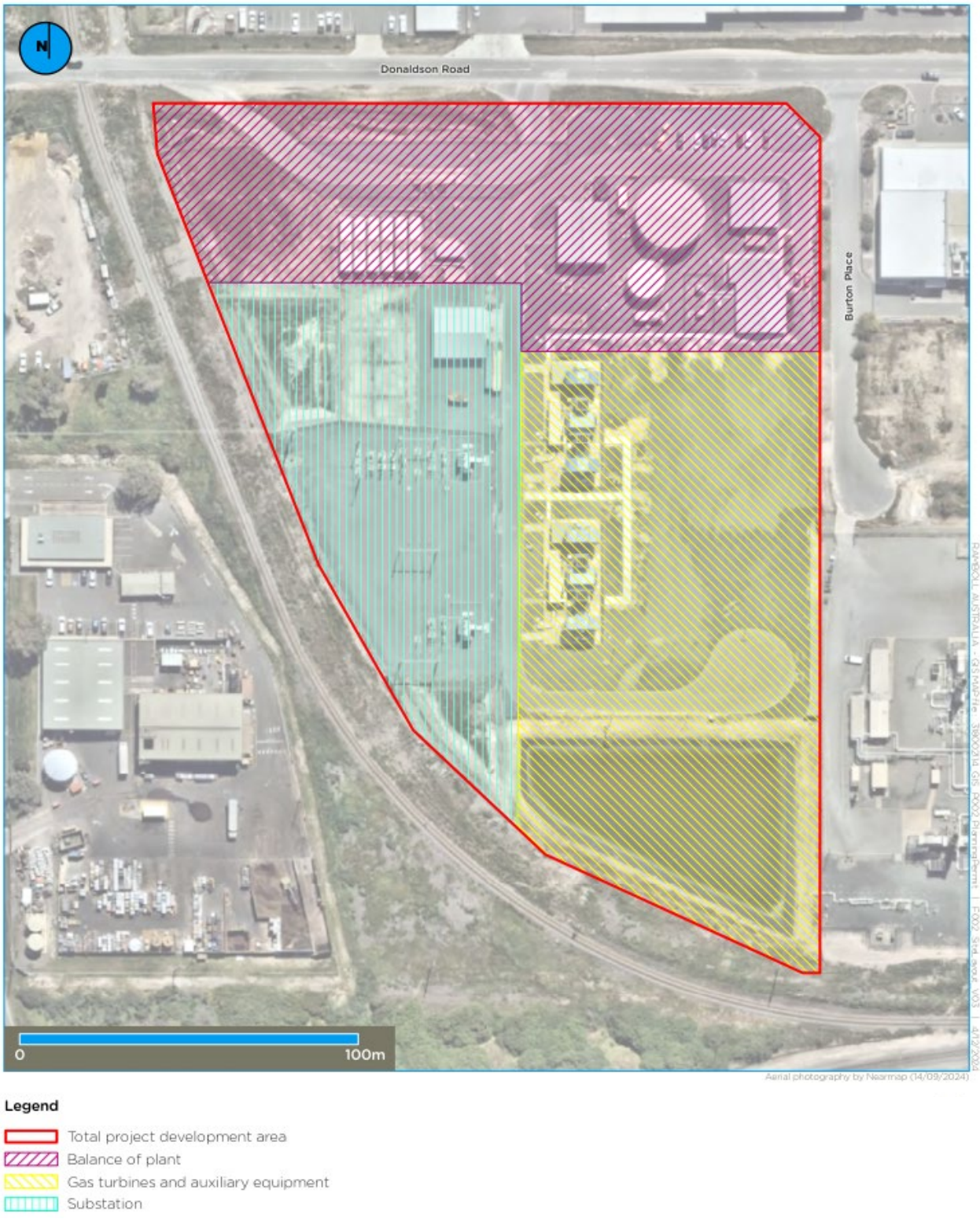


Figure 1-2 Indicative Site Plan.

Confidential

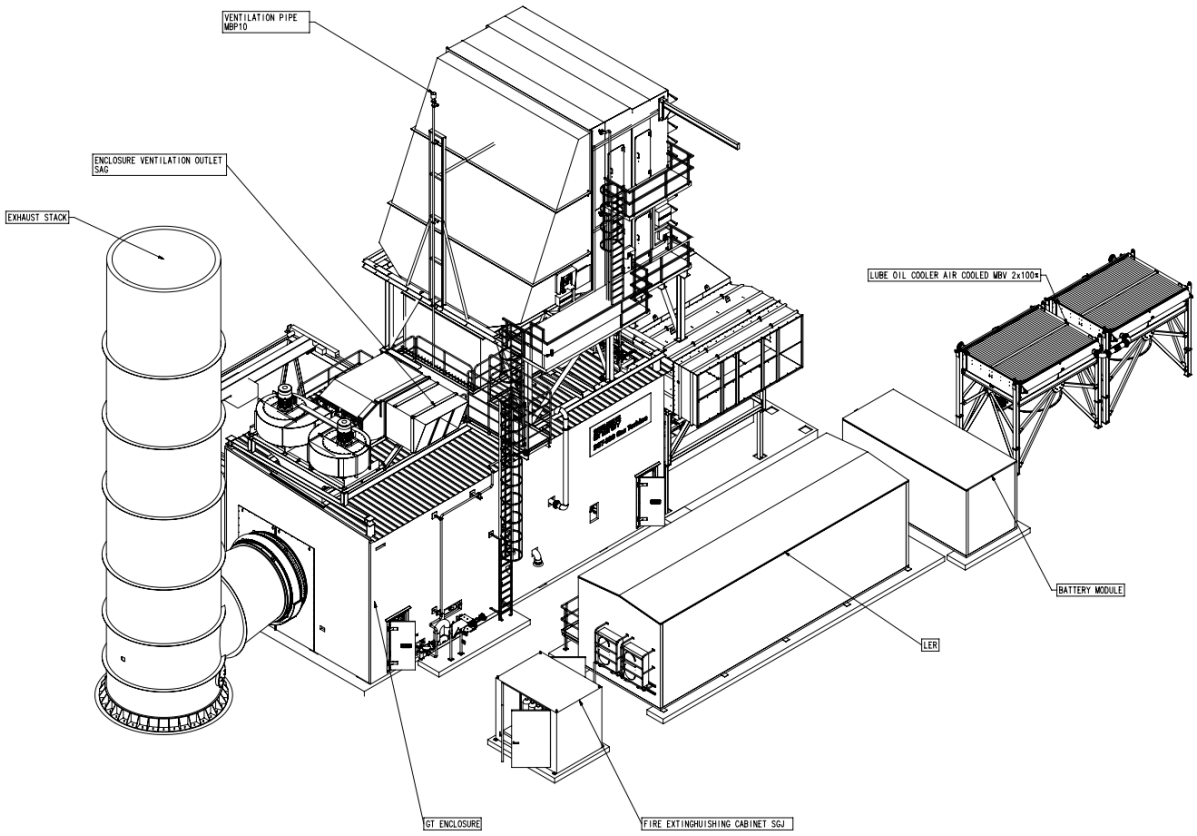


Figure 1-3 Typical gas-turbine unit.

In addition to the turbine units and associated Original Equipment Manufacturer (**OEM**) supplied skids on which they will be constructed, the following additional components are likely to be developed for the K2 expansion, and form part of this Proposal:

- Demolish, modify, reconfigure and/or augment any, or all, existing plant facilities.
- Demolish, modify, reconfigure and/or augment any, or all, existing high voltage (**HV**) connection assets or construct new HV connection to adjacent/nearby substation or to other existing or future substation as required by Western Power.
- Temporary site offices and laydown areas.
- Storage of equipment, chemicals, and machinery.
- New control room and buildings or augmentation of existing control room and office building, maintenance building and warehousing.
- All related and required site investigations, geotechnical studies, and preliminary site works.
- Fuel gas compression and fuel pre-treatment systems (including compression, regulation, heating, filtering, and pre-treatment) as required.
- Installation of required infrastructure to ensure that the plant is capable of combustion of hydrogen and future fuels.
- Power augmentation systems, evaporative cooling, chillers and/or wet compression systems and associated equipment.
- Electrical switch rooms, cabling, and associated infrastructure.
- High-voltage electrical substation equipment including Gas Insulated Switchgear (**GIS**) or Air Insulated Switchgear (**AIS**).
- Site access, internal roads and external roads, and car parking.

- Drainage and stormwater management – including evaporation pond/s considerations/requirements if required.
- Modify, augment, upgrade, reconfigure or replace existing security fencing, lighting, CCTV and associated infrastructure.
- Gas supply infrastructure new or modification/upgrade to existing infrastructure to increase gas delivery capacity.
- Connection into Western Power substation.
- Modify, augment, upgrade, reconfigure or replace existing water supply pipeline.
- Modify, augment, upgrade, reconfigure or replace existing water treatment, desalination and associated storage and reject water system augmentation.
- Modify, augment, upgrade, reconfigure or replace existing wastewater storage tanks and existing evaporation pond.
- Modify, augment, upgrade, reconfigure or replace existing KWRP wastewater pipeline.

1.3.3 Elements not forming part of Proposal

For clarity, the existing KSPS is not part of this Proposal. It is already subject to appropriate approvals and management with regulatory oversight.
The existing KSPS is currently operating at Lot 13 Burton Place. KSPS is a licenced Category 52 - Electric Power Generation facility in accordance with Part V of the EP Act. KSPS currently operates under licence L8471/2010/2 with an approved production capacity of 120 MWe per annual period. The EPA determined that KSPS did not require assessment under Part IV of the EP Act (see section 2.6). The licence includes requirements for six monthly groundwater quality monitoring at six monitoring bores and the preparation of Annual Environmental Reports (**AER**). The premises have been operating under this licence since 2010.

Current KSPS operations will not be reassessed as they are not proposed to be changed as an outcome of this Proposal.

1.4 Proposal Alternatives

1.4.1 Need for the Proposal

In the 2024 WEM Electricity Statement of Opportunities (**ESOO**), published on 18 June 2024, the Australian Energy Market Operator (**AEMO**) has signalled a capacity investment shortfall starting from the 2027-28 capacity year, largely driven by planned retirement of most of the existing coal fired generation fleet.

To respond to the urgency of this situation, the Proposal will contribute additional electricity supply to address forecast electricity capacity deficits resulting from increased demand and the retirement of thermal coal fire generation of State-owned Collie, Muja C and Muja D power stations. The Proposal would provide critical flexible firming capacity to the WEM.

In addition, the Proposal will be designed to meet AEMO's new Flexible Capacity criteria, which is designed to play a crucial role in flexible fast response generation to complement batteries and intermittent renewable generation.

1.4.2 Proposal siting

The development envelope was chosen based on several operational and environmental benefits that the area provides:

- The Proposal Site is an existing brownfield location and the environmental impacts will be significantly lessened in comparison to a greenfields site.
- Location within KIA:
  - An appropriately zoned area with an existing buffer zone to sensitive receptors.
  - Surrounding environment and its sensitive receptors are well-known.
- Utilisation of existing operational infrastructure (Western Power connections, wastewater treatment and disposal, Dampier to Bunbury Gas Pipeline connection and other Site amenities).
- Existing stakeholder relationships which will help any required mitigation measures to be delivered in a timely manner during all project phases.

In consideration of the above and the stakeholder engagement undertaken, Perth Energy has not investigated other potential locations for the Proposal.

1.5 Regional Context

As previously described, the existing KSPS is a 120 MW open cycle aeroderivative gas turbine peaking plant and is located 40 km south of Perth in the KIA.

The Site is generally bounded by Donaldson Road to the north, (being the Primary Street to the Site), Burton Place to the east, and a 'railway' reserve to the west and south.

The surrounding land is established as an intensive industry area with various operational industrial sites.

Surrounding land uses are shown on (**Figure 1-4)** as follows:
- Dampier Bunbury Gas Pipeline Compression Station
- Cleanaway waste management facility
- Kleenheat Production facility
- Metal recycling facility
- Battery re-cycling facility
- Railway reserve

In summary, the Site is densely surrounded by heavy industrial land use, which continues to the west meeting the coastline. Nearest sensitive land uses (residential areas) are located approximately 2 km southeast of the Site.

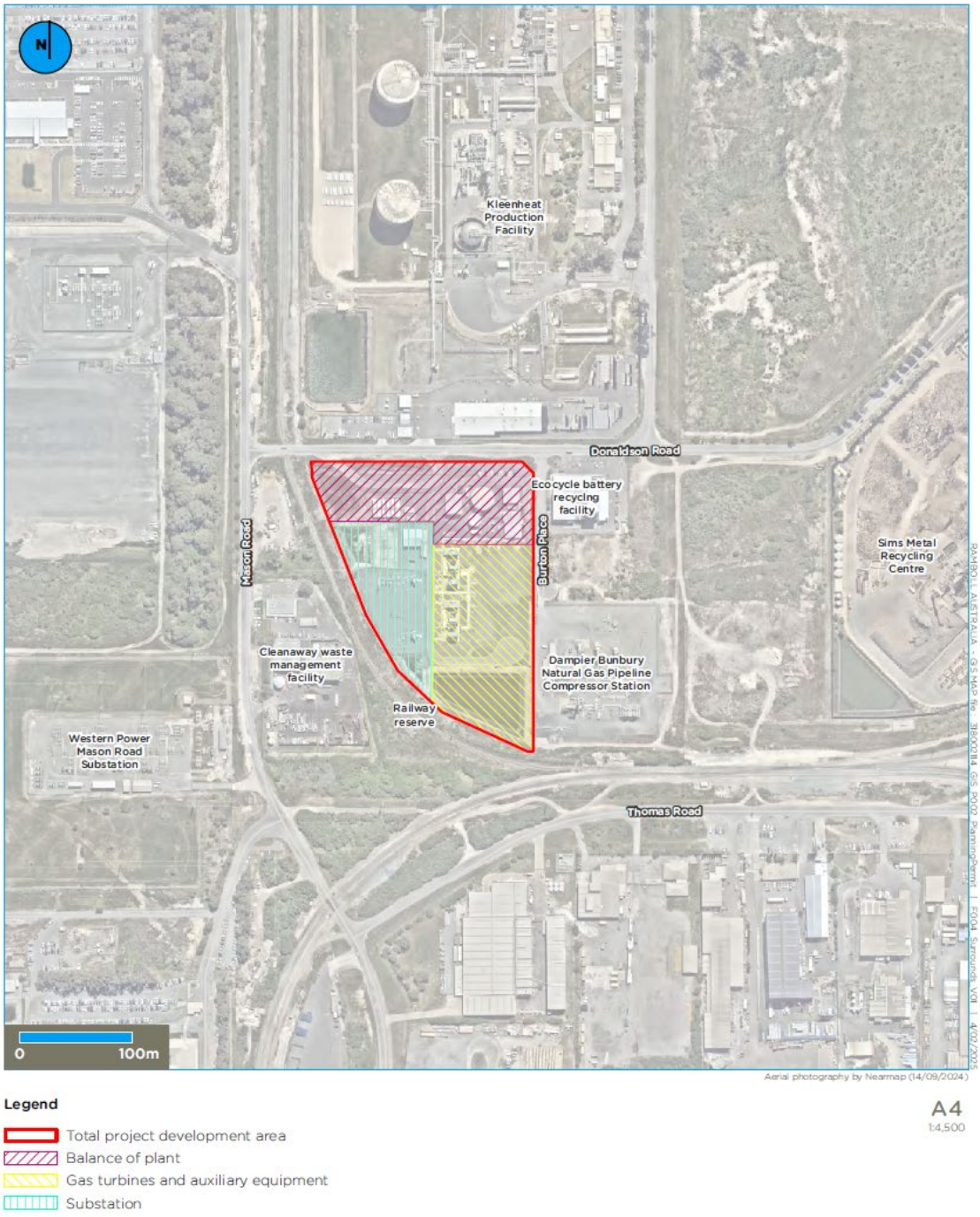


Figure 1.4: Surrounding uses
Kwinana Swift Power Station Expansion Approvals

Figure 1-4 Site boundary and surrounding land uses.

Confidential

1.5.1 Land use and industry groups

The Project will be located at Lot 13 (Deposited Plan 39572), which is broadly bound by Donaldson Road to the north, Burton Place to the east and a railway reserve to the west and south. The zoning of the land under the Kwinana Town Planning Scheme No. 2 is 'General Industry'.

The Site is zoned 'Industrial' under the Metropolitan Region Scheme (**MRS**). A narrow strip in the southwest of the Site is reserved under the MRS for 'Railways'.

These zonings are applicable to the intended use of the land and as such no change will be required. Planning approvals will be required from the City of Kwinana and the Western Australian Planning Commission.

The Certificate of Title relevant to the Site is subject to registered Lease K655398 to the Proponent (Perth Energy), which includes the grant of two easement benefits – being K794662 (for pipeline and carriageway purposes) and K795726 (for water and wastewater pipeline and telecommunication cable easement purposes).

Kwinana Industrial Area (KIA)
The KIA has existed for over 60 years and has been a major contributor to Western Australia's economy throughout the years. The heavy and supporting industries in KIA provide a large amount of employment opportunities directly and indirectly. KIA employs directly around 4,800 people of which roughly 64% live locally and indirectly around another 26,000 people. (City of Kwinana, 2024b).

Different types of heavy industries and their supporting functions operate in the KIA. These industries include, among others:

- Petroleum and mineral refineries
- Power stations
- Chemical plants
- Port functions

Kwinana Industries Council (KIC)
Kwinana Industries Council (**KIC**) is a non-profit incorporated business association with its membership drawn from the major industries and businesses in the KIA (KIC, 2024). The KIC was incorporated in 1991 with the original purpose of organising air and water monitoring within the buffer zone for the industries in KIA. Since then, the KIC has expanded its responsibilities so that its goals include:

- Promoting a positive image of Kwinana industries.
- Working towards the long-term viability of Kwinana industry.
- Coordinating and delivering a range of essential industry services including water quality, air quality monitoring and emergency management.
- Highlighting the contribution Kwinana industry makes to the community.
- Representing members with key stakeholders and decision makers including state and federal governments.
- Delivering education and training programs to grow the pipeline of local workers employed with member companies.

Western Trade Coast (WTC) Strategic Industrial Area

WTC Strategic Industrial Area (**SIA**) is located 30 minutes south of the Perth CBD. It is well-connected by major transport links, including deep-water bulk port facilities, high-wide and dangerous goods freight routes, and heavy rail. The strategic importance of the WTC SIA has been recognised by the Western Australian Government. The Department of Jobs, Tourism, Science, and Innovation (**JTSI**) is the lead agency for the area's development and Development WA is the estate manager of land owned by Development WA. WTC consists of four primary industrial areas, which are the KIA, Rockingham Industry Zone (**RIZ**), The Australian Marine Complex (**AMC**), and Latitude 32. The industrial areas collectively forming WTC are presented in Figure 1-5. The proposed project area is within KIA.

Confidential

Figure 1-5 Industrial areas that form the Western Trade Coast (WTC) (KIC, 2019).

1.5.2 Climate

The closest Bureau of Meteorology (BoM) station is Garden Island HSF (BoM site no 009256; latitude: 32.24°S, longitude: 115.68°E) 8 km to the west of the Site and the second closest station is Jandakot Aero (BoM site no 009172; latitude: 32.10°S, longitude: 115.88°E). A summary of both station's major climate statistics are presented below (Table 1-3). Garden Island HSF station is located on an island, whereas Jandakot Aero station is located approximately 11 km inland, which explains the differences in the stations' climate statistics. (BoM, 2024a; BoM 2024b)

Table 1-3 Major climate statistics from the closest BoM stations. Orange indicates the highest value and blue the lowest value in the row.

Statistics	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Garden Island HSF													
Mean max temperature (°C)	27.5	28.4	27.1	24.0	21.5	19.0	17.9	18.2	19.1	21.0	23.9	25.8	22.8
Mean min temperature (°C)	19.0	19.4	18.4	16.0	13.9	12.1	11.4	11.3	12.0	13.7	15.7	17.4	15.0
Mean rainfall (mm)	12.3	15.0	16.4	36.8	74.6	116.6	127.3	95.6	60.5	27.9	20.0	9.2	603.5
Jandakot Aero													
Mean max temperature (°C)	31.5	31.7	29.7	25.8	22.1	19.1	18.1	18.7	20.3	23.0	26.5	29.4	24.7
Mean min temperature (°C)	16.9	17.2	15.7	12.6	9.5	7.6	7.2	7.4	8.4	10.0	12.8	15.0	11.7
Mean rainfall (mm)	14.9	17.1	16.8	40.9	103.9	151.1	174.0	128.4	82.1	46.1	27.3	9.9	810.1

1.5.3 Landform, geology and soils

The surface geology of the Site is characterised by Safety Bay Sands which are part of the Quindalup Dune System and are mostly unconsolidated Aeolian calcareous dune sands high in lime, but low in soluble salts.

The Safety Bay Sands overlie the Tamala Limestone which is generally a calcareous cemented sand of varying degrees of cementation, often with a surface canker and is generally of Aeolian origin.

A shallow layer of imported fill such as cement clinker, red pea gravel and blast furnace slag covered most of the Site when it was surveyed in 2001 (Environ, 2008).

The Site is subject to Memorial K718986 made under s 58 of the *Contaminated Sites Act 2003* (WA) (**CS Act**). The function of the memorial on title is to identify that the Site has been classified as 'Possibly Contaminated – Investigation Required' under the CS Act.

A DWER Basic Summary of Records search result identifies that the reasons for the Site's classification relate to broader-scale and historical operations, which predate Perth Energy's construction and commencement of operation of the KSPS (circa 2010), and are in no way in connection with the current land use and development for which this application seeks to expand.

This classification was not imposed to reflect concerns arising from the KSPS (which post-dates the classification) and does not function to prohibit any form of development on the Site or impose any additional approvals or remediation obligation under the CS Act.

A desktop contamination assessment has been completed which confirms the suitability of the Site for the development of the Proposal. This is because:

- despite the historical classification of the Site under the CS Act and for reasons which pre-date, and are unrelated to the KSPS, the current land use and development on the Site (KSPS) has been authorised to proceed, is subject to conditions under Licence No. L8471/2010.2 (issued under Part V of the EP Act) which requires routine monitoring for contamination and reporting, and has operated without incident since 2010; and
- the Proposal subject of this application merely seeks to expand the existing land use and development, which is not of a sensitive nature, and is located within a purposely designated industrial precinct which has historically and continues to accommodate for State significant industrial assets.

Management of this process is occurring through assessment by DWER (Contaminated Sites branch) under the Part V of the EP Act and the City of Kwinana through local planning schemes.

1.5.4 Topography

The project area is predominantly flat and is largely paved due to the existing operations. A very slight upwards gradient exists from the north west corner towards the centre.

1.5.5 Hydrogeology and groundwater

Depth to groundwater at the Site is between 2.7 m to 5.4 m, decreasing in depth towards the western side of the Site and flowing westwards towards the ocean. The Site is within the Jandakot Mound Area and the groundwater in the area typically ranges in salinity from 500 mg/L to 1,000 mg/L Total Dissolved Solids (**TDS**) (Environ, 2010). Existing investigations identified pH of groundwater to be between 7.34 and 7.53 pH units, which is outside the marine ecosystem protection criteria range (Golder, 2007)[1].

There are no natural surface water features in the vicinity of the Site and there is little surface runoff as rainfall generally percolates through the sandy soils to the underlying Safety Bay aquifer (Environ, 2010).

Sampling undertaken in 2007 indicated that there is not widespread contamination at the Site that would pose a significant risk to human health.

Perth Energy has undertaken routine bi-annual groundwater monitoring in accordance with the Site's Licence issued under Part V of the EP Act. The annual Environmental Report prepared in 2020 concluded the Site was well maintained and groundwater quality had little changes from historical (pre-KSPS) levels.

[1] Golder Associates Pty Ltd, 2007. *Baseline Environmental Site Investigation*.

Recent bi-annual ground water monitoring at the Site conducted in February 2024 concluded groundwater quality had remained consistent with historical monitoring, with some minor increases (likely attributable to surrounding land uses within the KIP) and that groundwater did not represent risk to current or future Site users. Noting also that the nature of the land uses associated with the KSPS (which have operated without incidence since 2010), and proposed for expansion as part of the Proposal do not and will not involve any interaction with groundwater sources or other potential contamination sources or pathways within the KIP (if any).

1.5.6 Surface water and wetlands

There are no significant surface freshwater waterbodies in the surroundings of the project area.

The closest wetlands of international importance are Forrestdale and Thomson Lakes. Forrestdale Lake and Thomson Lake are located approximately 16.5 km northeast and 8.5 km northeast, respectively.

1.5.7 Marine environment

The project area is not within immediate vicinity of a marine environment. The Indian Ocean is the closest marine environment and is approximately 1.9 km west from the Proposal area.

Cockburn Sound is a sheltered marine embayment located south of the Swan-Canning river mouth at Fremantle and approximately 1.9 km west from the Proposal area. The marine embayment is 22 km long and its width ranges from 9 km to 15 km.

In 2005, the first State Environmental Policy for the protection of environmental quality in Cockburn was released. Since 2005, the policy has been updated and the most recent version was released in 2015. The policy identifies five environmental values, which are as follows:

1. Ecosystem health
2. Fishing and aquaculture
3. Recreation and aesthetics
4. Cultural and spiritual values
5. Industrial water supply

(Cockburn Sound Management Council, 2022)

Seagrass meadows are an important seafloor habitat providing habitat for fish and other aquatic organisms, contribute to improving water quality through nutrient recycling and sediment retention, and represent an important source of organic matter. Seagrasses respond rapidly to changes in surrounding environmental conditions, which makes them good environmental indicators of the state of the marine environment. (Cockburn Sound Management Council, 2022).

Annual monitoring of seagrass shoot density has been undertaken in Cockburn Sound since 1998. The monitoring has found no significant increasing trends in shoot densities that would indicate broad recovery of seagrass meadows at the ecosystem level. Historical declines in seagrass shoot densities continue at sites at Jervoise Bay, Woodman Point and northern Garden Island. The remainder of the seagrass sites in Cockburn Sound show no trends, potentially indicating that seagrass shoot densities have become more stable at these sites. (Cockburn Sound Management Council, 2022).

Monitoring of contaminants (e.g. metals, organometallics, non-metallic inorganics, organics and pesticides) in marine waters is not routinely undertaken in Cockburn Sound. Concentrations of potential contaminants were last comprehensively assessed in 2008; some site-specific targeted surveys have been undertaken since that time. Based on the available information, the marine waters of Cockburn Sound are generally of good quality. Contaminant concentrations were below the guidelines, below their respective detection limits or the Limits of Reporting where no guidelines were available, or present in low concentrations. Contaminants at concentrations above the Limits of Reporting but with no guidelines were within accepted international standards where these are available. (Cockburn Sound Management Council, 2022).

1.5.8 Heritage

No world or national heritages properties were identified in the project area or its immediate proximity during searches undertaken as part of an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) self-assessment utilising the Protected Matters Search Tool (**PMST**) (refer chapter 9).

An Indigenous heritage due diligence desktop assessment was conducted by Terra Rosa Consulting. The desktop study concluded no registered sites or other heritage places (**OHP**s) (lodged sites or historic data) were found in the Proposal area. There are several OHPs and registered places within 2km of the proposed project area, as listed in Table 1-4 below.

Table 1-4 Identified OHPs and registered places within 2 km radius from the Proposal site (Terra Rosa Consulting, 2024).

Name	Distance from the Proposal area	Description
NATGAS127	1.1 km east-southeast	Site comprised calcrete artefacts situated in a quarry area, but due to the Site's historic status it is unclear whether those features have been impacted or are still in situ.
Thomas Oval	1.6 km southeast	A camping ground utilised by local Aboriginal people in the 1920s.
Chalk Hills Camp	1.8 km southeast	A camping ground during 1950s and 1960s, which was used during the relocation from farms to urban environments. It is also one of the last places that a local council bulldozed an Aboriginal family's accommodation and property. Chalk Hill Camp is also associated with a string of freshwater lakes.
Indian Ocean	1.9 km west	Section of the Indian Ocean is represented by historic site Indian Ocean.

The desktop study concluded the proposed project area as 'low risk' of containing Aboriginal cultural material or sites based on previous surveys of the area and high ground disturbance levels which leaves little likelihood of Aboriginal cultural heritage being present.

The study recommended to design and implement a comprehensive stop-works procedure in case any cultural heritage material is encountered while conducting the proposed works, and to liaise with Gnaala Karla Booja Aboriginal Corporation (**GKBAC**) prior to commencing the works on the proposed project area. No further investigations or actions are recommended. Perth Energy will progress the recommended actions prior to commencement of construction.

No other heritage values (i.e. European) are present on Site. The completed desktop heritage assessment is presented as Appendix 1. Based on this assessment, the Proposal is not expected to have any impact on heritage matters.

1.5.9 Flora and fauna

As a result of historical vegetation clearing and disturbance from previous land uses (which pre-date the construction and operation of KSPS at the Site), no significant native fauna habitats exist on Site (Environ, 2010).

Subsequent and continued use of the Site for the KSPS since 2010 for electricity generation has not resulted in any additional vegetation clearance. No further vegetation clearance will occur as part of the Proposal.

In any event, the Site is considered to have a low likelihood of supporting any threatened fauna and flora for the following reasons:

- The property and surrounding area's land use is industrial and has been of an industrial nature for the last 70 years.
- The land and surrounding areas have been cleared of most vegetation.
- There is a significant distance between the proposed Site and watercourses.
- There will be no direct discharge from the operations into the marine environment.
- The likelihood of threatened species to occur in this area under the above conditions is limited.

1.5.10 Sensitive receptors

The closest sensitive receptors are detailed in Table 1-5 and their locations demonstrated in Figure 1-6. Of the listed sensitive receptors, the nearest is a recreational oval (approximately 1.5 km northeast). The nearest residential receptors are 2.3 km to the southeast.

Table 1-5 The nearest sensitive receptors to the proposed project site.

Receptor		Distance from the proposed project area
Name	Type	
Wells Park	Recreation & heritage	3.0 km to southwest
Kwinana Golf Course	Recreation	2.6 km to southeast
Thomas Oval	Recreation & heritage	1.6 km southeast
Oval	Recreation	1.5 km northeast
North Rockingham	Recreation	4.9 km to southwest
Residence	Residential	2.3 km to southeast
Hope Valley	Suburb	3.0 km northeast
Calista Primary School	School	3.6 km to southeast
Wombat Wallow Childcare Centre	Childcare	2.6 km southeast
South Lake AQMS	Air Quality Monitoring Station	13.6 km to northeast

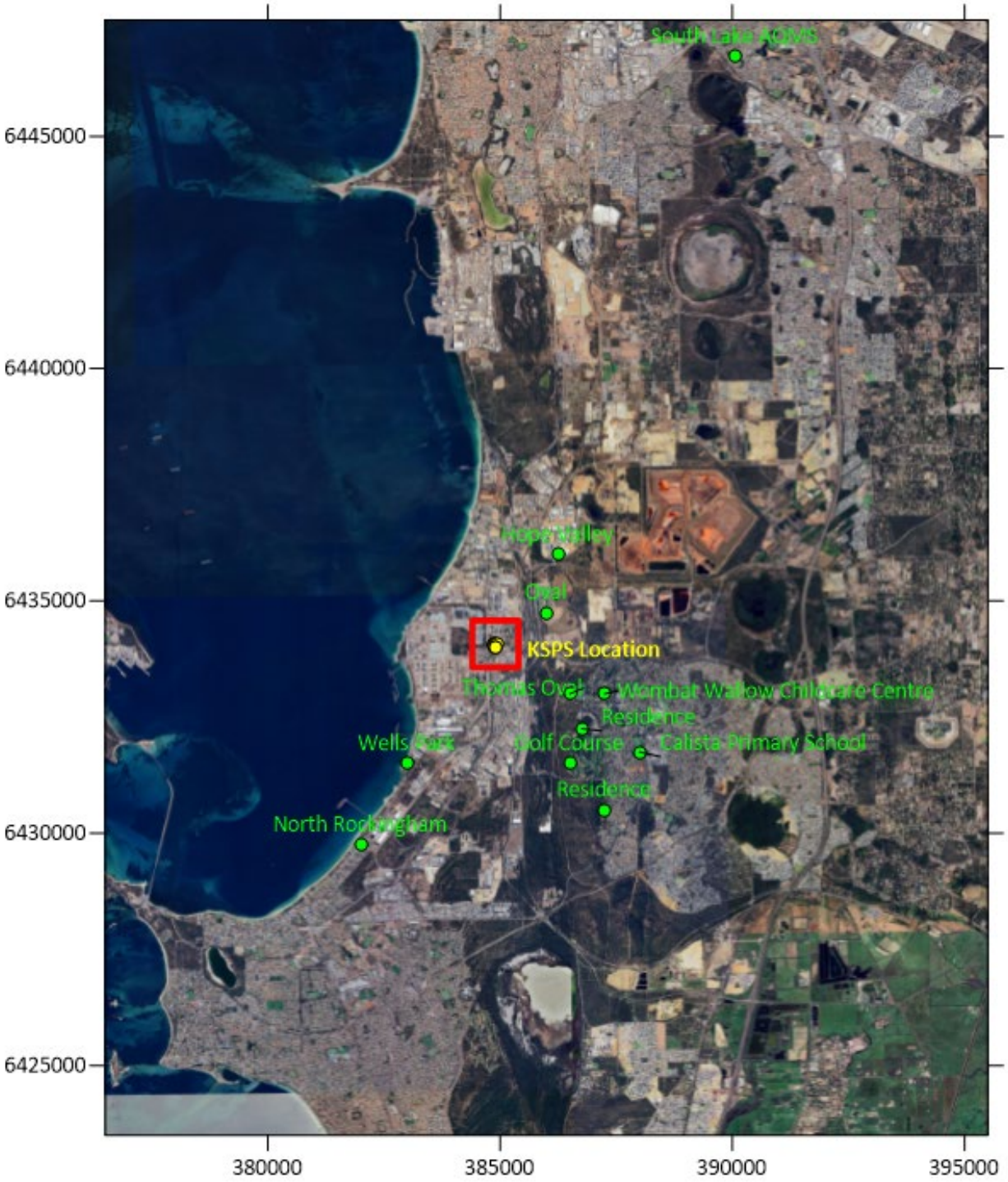


Figure 1-6 The nearest sensitive receptors to the proposed project site.

Confidential

2. Legislative Context

2.1 Environmental Impact Assessment Processes

Environmental impact assessment (**EIA**) in WA is conducted under the EP Act for matters within the WA jurisdiction and under the EPBC Act for 'matters of national environmental significance' (**MNES**) at the Commonwealth level.

2.1.1 Environmental Protection Act 1986

The EP Act is the primary environmental legislation that governs environmental protection and EIA in Western Australia. Part IV, Division 1 of the EP Act, provides for the referral and assessment of proposals likely, if implemented, to have a significant effect on the environment.

This supporting document has been prepared in accordance with the relevant EPA instructions and guidelines, including:

- *Instructions and template: How to identify the content of a proposal, March 2024*
- *Instructions: How to prepare an environmental review document, March 2024*
- *Environmental impact Assessment (Part IV Divisions 1 and 2) Procedures Manual, October 2021*
- *Environmental Factor Guideline: Greenhouse Gas Emissions, November 2024*
- *Environmental Factor Guideline: Air Quality, April 2020.*

This supporting document demonstrates that potential impacts of the proposal can be managed in accordance with the measures outlined in this document and Appendices and within the framework of the other approvals and regulation noted below.

2.2 Environmental Protection and Biodiversity Conservation Act 1999

The Environmental Protection and Biodiversity Conservation (EPBC) Act and regulations are Australia's main national environmental legislation. They provide for the protection and management of nationally and internationally important plants, animals, habitats, and places that need protecting as 'matters of national environmental significance (MNES)'. Currently there are nine MNES:

1. World Heritage Areas
2. Commonwealth Heritage Places
3. wetlands of international importance (listed under the Ramsar Convention)
4. listed threatened species and listed ecological communities
5. listed migratory species (protected under international agreements)
6. Commonwealth marine areas
7. Great Barrier Reef Marine Park
8. nuclear actions (including uranium mines)
9. water resources (relating to coal seam gas development and large coal mining development)

The EPBC Act also applies when actions are taken on commonwealth land likely to have a significant impact on the environment by the Commonwealth or a Commonwealth agency.

Any proposal that may be likely to have a significant impact on MNES must be referred to the Minister for the Environment and Water for decision whether assessment under the EPBC Act is required.

The Proposal will not likely have a significant impact on any MNES or Commonwealth land and thus, has not been referred under the EPBC Act (refer to Section 9).

2.3 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting* (**NGER**) Scheme was established under the NGER Act. Under the NGER Scheme the GHG emissions, energy production and consumption of facilities/companies exceeding GHG emission thresholds must be reported to the Clean Energy Regulator (**CER**) on an annual basis.

The methods and criteria for calculating GHG emissions are described in the *National Greenhouse and Energy Reporting (Measurement)* Determination.

The KSPS currently meets the NGER threshold and AGL reports on the KSPS annually under the NGER Scheme. This Proposal will also be reported on under the NGER Scheme.

2.4 Safeguard Mechanism

The Safeguard Mechanism is the Australian Government's program for reducing emissions within its framework, a sectoral baseline applies to grid-connected electricity generators. The KSPS and the Proposal come under this sectoral baseline.

The NGER Act and Safeguard Mechanism provide a contemporary, robust, transparent and enforceable legislative regime to deliver GHG emissions reductions which align with Australia's international obligations. These regulatory measures will appropriately manage GHG emissions associated with the proposal alongside Perth Energy's internal Greenhouse Gas Management Plan (**GHGMP**).

2.5 Other Approvals and Regulation

Other approvals relevant to this proposal are outlined below:

Table 2-1 Other Approvals relevant to this Proposal.

Authority	Legislation	Approval	Details
City of Kwinana and Western Australian Planning Commission (**WAPC**)	Planning and Development Act 2005, the City of Kwinana Local Planning Scheme No. 2 and the Metropolitan Region Scheme	Development Approval	Development Approval is required to conduct activities specified in the Development Approval application on a particular piece of land. Development Approval Application has been prepared and submitted in parallel to this Proposal.

DWER	Environmental Protection Act, Part V	Works Approval	Part V Works Approval required for Category 52 Electric power generation for the construction and commissioning of the proposed activities. Works Approval Application has been prepared and submitted in parallel to this Proposal.
DWER	Environmental Protection Act, Part V	Environmental Licence	Environmental Licence is required to operate proposed industrial activities which classifies the premises as a 'prescribed premises' under the *Environmental Protection Regulations 1987.* The Site has an Operating Licence (L8471/2010/2) for its current operations and it applies to the whole of the Site. When the Proposal moves from construction to operation an amendment to the existing Licence will be sought to cover the industrial activities included in this Proposal.
DEMIRS	Dangerous Goods Safety (Storage and Handling of non-explosives) Regulations 2007	Dangerous Goods Site Licence	Dangerous Goods Site Licence is required if the quantity of dangerous goods stored and handled at the premises exceed the thresholds defined in the Schedule 1 of the *Dangerous Goods Safety (Storage and Handling of non-explosives) Regulations 2007.* The Site has a Dangerous Goods Site Licence for its existing operations, which will be amended to include the storing and handling of dangerous goods under this Proposal.

As previously discussed, Perth Energy will maintain their current agreement with Water Corporation, or enter a new agreement, to meet water quality discharge requirements of the

KWRP operating licence to allow it to be utilised for the Proposal's wastewater disposal. Accordingly, approval to discharge wastewater from the Project is not required.

The Site's treatment systems establish and operate in accordance with the Health Department and City of Kwinana requirements.

2.6 Existing Approvals

The Proposal does not have any existing approvals or licences. As noted above, a Works Approval Application for the K2 Project under Part V of EP Act has been submitted to DWER concurrently with this Proposal. Applications for development approval have also been submitted to the City of Kwinana and the WAPC.

A summary of approvals for the KSPS operations is contained below.

A referral for a 120 MW CCGT Base Load Plant was submitted to the EPA under Section 38(1) of the EP Act in November 2002 by Perth Energy. The EPA assessment report determined that the project could be assessed as an Assessment on referral Information (ARI) and released its advice as Bulletin 1080 in December 2002. Ministerial Statement (no 625) was granted on 23 May 2003. This project was not progressed, and Ministerial Statement 625 was rescinded in 2008.

The Kwinana 120 MW OCGT Peaking Plant (the current KSPS operation) was referred to the EPA in March 2008. However, the Proponent received a formal notice from the EPA that the proposal was 'Not Assessed' and that the project could be managed under Part V of the EP Act.

On 2 September 2010, the premises received its Operating Licence (L8471/2010/1), which was amended (L8471/2010/2) and reissued on 3 September 2015, for category 52 premises: '*Electric power generation: premises (other than premises within category 53 or an emergency or standby power generating plant) on which electrical power is generated using a fuel.'*

Confidential

3. Stakeholder Engagement

3.1 Key Stakeholders

Key stakeholders have been identified in the early stages of the project to ensure they are engaged and informed properly as the project develops. Stakeholders have been identified based on interest, proximity to the Proposal, surrounding land use and the potential impacts and risks.

Table 3-1 Key stakeholders.

Stakeholder	Area of interest
Environmental Protection Authority (EPA)	• Administration of the EP Act Part IV Impact Assessment
Department of Water and Environmental Regulation (DWER)	• Administration of the EP Act Part V Works Approval and Licence application • Existing licence
Department of Planning, Lands and Heritage (DPLH)	• Administration of the Planning and Development Act
Kwinana City Council	• Development Approval for the Proposal • Use of local infrastructure
Kwinana Industries Council	• Promotion and support of industries in the KIA • Long-term viability of KIA • Coordination and delivery of several essential industry services, including versatile monitoring services • Delivery of education and training programs to increase the involvement of local workers at KIA
Energy Policy WA	• WA Government's Energy Transformation Strategy
Western Power	• Infrastructure connections and grid requirements

Engagement with the broader community and stakeholders will be reviewed based on regulators' advice and feedback received during the public advertising period of this Proposal.

3.2 Stakeholder Engagement Process

Perth Energy has maintained an open dialogue with stakeholders while preparing the Proposal for the EPA, to understand and consider their expectations, concerns, and interests. Perth Energy will remain available for stakeholder engagement during and post the Proposal assessment.

3.3 Stakeholder Consultation Outcomes

Perth Energy has had broad discussions to engage with key stakeholders of the Proposal. The stakeholder consultation conducted to date is presented below (Table 3-2).

Table 3-2 Stakeholder consultation to date.

Stakeholder	Date	Issues/topics raised	Proponent response/outcome
Australian Gas Infrastructure Group (AGIG)	26 Jul 24	Project introduction and next steps/requirements to progress the project and gas connection.	To keep AGIG informed, no further actions at this stage.
Western Power (WP)	23 Aug 24	Project introduction and next steps/requirements to progress the project and high voltage electrical connection.	To keep WP informed, no further actions at this stage.
State Development Assessment Unit (SDAU) – Land Use Planning	27 Aug 24	Overview of project focusing on the criteria of state significance (SS).	Linked AGL with State Referral Co-ordination unit (SCRU).
State Referral Coordination Unit (SCRU)	3 Sept 24	Overview of project focusing on planning approval pathways.	SCRU is happy to assist when/as required. Provided suggestions of Agencies to meet with.
Kwinana City Council	9 Sept 24	Overview of project focusing on planning approval pathways.	Ongoing engagement regarding lodgement of planning approval.
EPA/DWER (Part IV)	16 Sept 24	Overview of project focussing on Part IV.	DWER advised a Scoping meeting with Part V team should occur.
Kwinana Council Mayor AGL - CEO	19 Sept 24	Overview of project focusing on planning approval pathways.	Council should be kept updated with DA timing.
EPA/DWER (Part V)	20 Sept 24	Overview of project focusing on Part V.	Further discussions as needed.
Westport	14 October 2024	AGL/Ramboll presented the project to Westport.	Project is of interest but no significant impacts or concerns to Westport.
Contaminated Sites Branch (CSB)	02 October 24	Telephone conversation with CSB team member	Confirmed an assessment of land contamination issues would occur through the EP Act Part V process.

4. Object and Principles of the EP Act

The object of the EP Act is to protect the environment of the State having regard to the following five principles:

1. The precautionary principle.
2. The principle of intergenerational equity.
3. The principle of the conservation of biological diversity and ecological integrity.
4. Principles relating to improved valuation, pricing and incentive mechanisms.
5. The principle of waste minimisation.

An assessment of the Proposal against these principles according to the EPA's *Statement of environmental principles, factors, objectives and aims of EIA* (**Statement of Principles**) is provided in Table 4-1.

Table 4-1 Principles of the EP Act.

Principle	Consideration
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.* *In the application of the precautionary principle, decisions should be guided by:* *(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *(b) an assessment of the risk-weighted consequences of various options.*	The precautionary principle was considered during the planning for the Proposal. There is uncertainty around specific threats and impacts to WA's environment from GHG emissions, which Perth Energy acknowledges. To minimise the environmental risks arising from the GHG emissions, the GHGMP was prepared. The GHGMP provides guidance to control and manage the Proposal's GHG emissions in a manner that is aligned with WA's current climate targets.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity, and productivity of the environment is maintained or enhanced for the benefit of future generations.*	Perth Energy recognises that climate change poses a risk to future generations. Perth Energy is committed to execute all the mitigation measures listed in Section 6.5, and to offset remaining GHG emissions to achieve required reductions in GHG emissions.
3. The principle of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The proposed activities do not require clearing of native vegetation. The proposed Project area is a brownfields site within an existing industrial area, where the direct adverse impacts on biological diversity and ecological integrity are considered minimal. Perth Energy acknowledges that climate change can affect biological diversity and ecological integrity, and therefore the GHG and other air emissions may indirectly have adverse

	impacts on the biological diversity and ecological integrity. Therefore, Perth Energy is committed to implement all mitigation measures outlined in this Proposal and the GHGMP to minimise the risk of environmental harm and impacts on the conservation of biological diversity and ecological integrity.
4. Principles relating to improved valuation, pricing and incentive mechanisms *(a) Environmental factors should be included in the valuation of assets and services.* *(b) The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement.* *(c) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.* *(d) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.*	Valuation of the alternatives for assets and services to be purchased is a mandatory part of Perth Energy's procurement procedure. Valuation process includes technical, economic, social, and environmental aspects of the purchased goods and services. Where structural abatement techniques are insufficient to meet the proposed emission reduction targets, additional actions will be taken in the form of offsetting to ensure the set targets are met. Corporate and proposal level offset policies and commitments are described more in detailed in Section 8. Perth Energy is committed to review the GHGMP at set intervals to ensure it is up-to-date, corresponds with the current operating environment and is aligned with the applicable guidelines and legislative requirements that may change from time to time.
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	It is a standard practice at Perth Energy to apply the waste management hierarchy (avoidance, reuse, recycling, recovery of energy, treatment, containment, and disposal) to all their activities and consequently it will be applied for this Proposal as well.

5. Environmental Factors and Objectives

The EPA's Statement of Principles outlines the EPA's environmental factors and objectives, which are presented in Table 5-1. The EPA will have regard to these objectives when determining whether the environmental impact of a proposal or scheme may be significant, and at most other stages of EIA.

Perth Energy has considered all 14 environmental factors and their significance to the proposal, using the following classifications:

- **Key environmental factor** – the Proposal may cause a significant impact to the environmental factor
- **Other environmental factor** – the Proposal has the potential to interact with the environmental factor but is not anticipated to result in significant impacts
- **Not relevant** - the Proposal is not anticipated to result in any impacts to the environmental factor

The summary of considered environmental factors and reasoning for their classification is presented in the below table (Table 5-1). Only greenhouse gas emissions were considered as a key environmental factor and is discussed further in Section 6. All other relevant environmental factors are discussed in Section 7 and MNES in Section 9. Cumulative impacts are addressed in Section 11.

Table 5-1 EPA Environmental Factors and Objectives.

Theme	Factor	Objectives	Classification	Consideration
Sea	Benthic communities and habitats	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	Not relevant	The project area is not in immediate vicinity of a marine environment. The nearest coastline is approximately 1.9 km west from the project area.
	Coastal processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.	Not relevant	The project area is not in immediate vicinity of a marine environment. The nearest coastline is approximately 1.9 km west from the project area.
	Marine environmental quality	To maintain the quality of water, sediment and biota so that environmental values are protected.	Not relevant	The project area is not in immediate vicinity of a marine environment. The nearest coastline is approximately 1.9 km west from the project area.
	Marine fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.	Not relevant	The project area is not in immediate vicinity of a marine environment. The nearest coastline is approximately 1.9 km west from the project area.
Land	Flora and vegetation	To protect flora and vegetation so that biological diversity and	Not relevant	Expansion project on a brownfields site – No clearing to occur, capacity will be

Confidential

Theme	Factor	Objectives	Classification	Consideration
		ecological integrity are maintained.		increased by constructing within an already cleared area in the existing industrial precinct.
	Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	Not relevant	Expansion project on a brownfields site – No clearing to occur, capacity will be increased by constructing within an already cleared area in the existing industrial precinct.
	Subterranean fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	Not relevant	Expansion project on a brownfields site – No clearing to occur, capacity will be increased by constructing within an already cleared area in the existing industrial precinct.
	Terrestrial environmental quality	To maintain the quality of land and soils so that environmental values are protected.	Not relevant	Expansion project on a brownfields site – No clearing to occur, capacity will be increased by constructing within an already cleared area in the existing industrial precinct.
	Terrestrial fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	Not relevant	Expansion project on a brownfields site – No clearing to occur, capacity will be increased by constructing within an already cleared area in the existing industrial precinct.
Water	Inland waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	Not relevant	Expansion project on a brownfields site –Surface water and groundwater related environmental risks are addressed through the Part V process.
Air	Air quality	To maintain air quality and minimise emissions so that environmental values are protected.	Other environmental factor	Air emissions are formed in electricity generation, and they may impact the surrounding environment and human health. Air emissions are not considered to be a key environmental factor, but as another environmental factor and are assessed in Section 7.1.

Theme	Factor	Objectives	Classification	Consideration
	Greenhouse gas emissions	To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.	Key environmental factor	Greenhouse gas emissions are a key environmental factor for the Proposal and are assessed in Section 6.
People	Social surroundings	To protect social surroundings from significant harm.	Other environmental factor	The Proposal has potential impacts on amenity through air emissions and noise. Also, heritage matters were considered as part of the social surroundings. This environmental factor is not considered to be a key environmental factor, because the Proposal is located within an existing industrial area within a buffer zone.
	Human health	To protect human health from significant harm.	Other environmental factor	The Proposal has potential impacts on human health through air emissions. These potential impacts would not be material and able to be managed under Part V of the EP Act. This environmental factor is not considered to be a key environmental factor, because the Proposal is located within an existing industrial area with a buffer zone.

Confidential

6. Key Environmental Factor: Greenhouse Gas

6.1 EPA Objective

The EPA's *Environmental Factor Guideline: Greenhouse Gas Emissions* (GHG Factor Guideline) provides the environmental objective of the GHG emissions factor is (EPA, 2024b):

'To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable'

6.2 Relevant Policy and Guidance

GHG Factor Guideline
In accordance with EPA's *Environmental Factor Guideline: Greenhouse Gas Emissions,* GHG emissions from a proposal will be considered where they are reasonably likely to exceed:

- 100,000 tonnes CO2e of scope 1 emissions in any year; or
- 100,000 tonnes CO2e of scope 2 emissions in any year.

Scope 1 GHG emissions are defined in the EPA's Guideline as '*those released to the atmosphere as a direct result of an activity, or a series of activities, which are part of a proposal being considered by the EPA'.* Whereas scope 2 GHG emissions are defined as '*those from the independent consumption of an energy product by the proposal*.' It is acknowledged that scope 2 emissions from a proposal are also the scope 1 emissions from an independent energy proposal, but they are considered relevant where the proponent has control over its choice of independent energy quantity and source.

The Sectoral Emissions Reduction Strategy for Western Australia (**SERS**)
SERS was released in December 2023. SERS outlines the key priorities, benchmarks and milestones for WA's transition to net zero emissions while supporting the decarbonisation of our region. SERS notes that by 2050, 96% of energy consumed is projected to come from renewable generation, compared with 34% currently in the South West Interconnected System (**SWIS**).

This transition to renewable generation will include the need for additional back-up supply from plants such as this Proposal. This will ensure the SWIS receives reliable power supply and the reliance on coal and diesel power will be reduced. The Proposal is centred around providing the aforementioned stepping stone to emissions reduction until renewables have been fully integrated and therefore aligns with the SERS (Preston Consulting, 2024).

Western Australian Climate Policy: A plan to position Western Australia for a prosperous and resilient low-carbon future (WA Climate Policy)
The WA Climate Policy highlights the most significant, high-impact actions which are taken in preparation for climate change and to achieve the aspiration of net zero emissions by 2050. Action is outlined in the following themes:

- Clean manufacturing and future industries
- Transforming energy generation and use
- Storing carbon and caring for our landscapes
- Lower-carbon transport
- Resilient cities and regions
- Government leadership

(DWER, 2020)

The Proposal will contribute to the transition towards a less emission intensive economy by providing additional electricity supply to compensate the predicted electricity capacity deficits resulting from shutting down of the thermal coal fire generation power stations in Collie, WA.

Greenhouse Gas Emissions Policy for Major Project (GHG Major Projects Policy)
The GHG Major Projects Policy was updated on 15 October 2024. The updated policy reforms the Safeguard Mechanism and established a nationally consistent approach to reducing greenhouse gas emissions for Australia's largest emitters. The focus is on removing duplication and it does not change Western Australia's target of achieving net zero GHG emissions by 2050.

6.3 Receiving Environment

Australia is committed to reduce emissions to 43% below 2005 levels by 2030 and to net zero by 2050, as reflected in Australia's nationally determined contribution (NDC) under the *Paris Agreement* (DCCEEW, 2024a). The next NDCs are to be submitted in 2025 including post 2030 emission reduction targets and reflection of parties' highest possible ambition.

Below is presented state and territory specific GHG inventories for financial years 2004/2005 and 2021/2022 and the corresponding percentual change in the GHG emission levels. The GHG estimates are calculated on a United Nations Framework Convention on Climate Change (UNFCCC) accounting basis using the global warming potentials from the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report.

Table 6-1 State and territory specific GHG emission estimates (DCCEEW, 2024b).

State/Territory	FY 2004/-05 (Mt CO_2e)	FY 2021/-22 (Mt CO_2e)*	Change (%) between FY 2004/-05 and FY 2021/-22
New South Wales	152.74	111.00	-27.3 %
Queensland	191.94	124.10	-35.3 %
Victoria	123.23	84.72	-31.3 %
Western Australia	76.23	82.54	8.3 %
South Australia	36.53	15.82	-56.7 %
Northern Territory	11.21	16.73	49.2 %
Tasmania	15.50	-4.34	-128.0 %
Australian Capital Territory	1.42	1.28	-9.9 %
Total	**608.8**	**431.85**	**-29.1 %**

*Most recent GHG emission estimates available for Australia calculated on a UNFCCC accounting basis.

6.4 Potential Environmental Impacts

The potential impact of the Proposal is dependent on Perth Energy's customers electricity demand, as the proposed expansion project is a peaking power station.

The demand for electricity from the Proposal is based on a number of factors, such as consumers, environmental conditions and the rate at which coal and diesel based power generation is retired

and build-out of new solar and wind generation. There is therefore uncertainty about the Proposal's operational throughput and resulting emissions trajectory.

The emissions trajectory presented here and in the GHGMP has been calculated based on consumer demand projections and grid demand, factoring in the retirement of old technology. Demand for power from the Proposal will fluctuate but will be enduring and persist beyond 2050.

6.4.1 Estimated GHG emissions

The Proposal emissions estimates (operational) and the background calculations used to assess the GHG emissions estimates are provided in more detail in Appendix 2 *Greenhouse Gas Management Plan (GHGMP)* prepared by Preston Consulting Pty Ltd. The major GHG emissions from the Proposal are carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4).

The GHG Protocol Corporate Accounting and Reporting Standard (**GHG Protocol**) was applied to estimate the Proposal's GHG emissions. In the GHG Protocol GHG emissions are classified as Scope 1, Scope 2, and Scope 3. The global warming potentials (GWPs) from the IPCC's Fifth Assessment report were used in this assessment (Table 6-2).

Table 6-2 100 year global warming potential of GHGs.

Greenhouse gas (GHG)	Global warming potential (GWP)
CO_2	1
CH_4	28
N_2O	265

The following key assumptions (Table 6-3) were applied to the calculation and modelling of GHG emissions for the Proposal.

Table 6-3 Key assumptions applied to estimate the Proposal's GHG emissions.

General assumptions
• The Proposal will operate below the maximum operating scenario; and • The Proposal demand will be subject to grid requirements and will fluctuate over the life of the Proposal.
Scope 1

• No vegetation clearing is required;
• Aero-derivative or light industrial gas fired turbine units will be used;
• Turbines are installed and operated in an open cycle configuration;
• Projected power generation and emissions estimates consider site specific operating conditions, including:
  ○ Evaporative cooling;
  ○ Wet compression and fogging;
  ○ NO_x control and injection;
  ○ An average temperature of 41°C and relative humidity of 15%; and
  ○ Operations are at sea level.

Scope 2
• It is assumed that the Proposal will purchase 1 MWh of electricity per annum to maintain connection during maintenance and shutdowns. No other Scope 2 emissions will be generated during the operating phase.

Scope 3
• Natural gas and diesel will be sourced from a provider that complies with the required standards; • NGER emissions factors are suitable for the calculation of scope 3 emissions from the supply of natural gas, diesel and the transmission of electrical energy via the SWIS; and • Supply of natural gas and diesel will be direct to the Proposal Site.
Exclusions

The following sources of emissions are excluded from the Proposal emissions estimate:
• Other projects that Perth Energy has planned or proposed are not considered;
• Perth Energy planned or proposed future development of the Proposal, including future stages;
• Perth Energy's other facilities outside of the Proposal (e.g. offices in Perth, etc.) are not included in this assessment;
• Specific Scope 3 emissions including:
  ○ Business Travel;
  ○ Franchises and investments; and
• Fugitive emissions – e.g. equipment leaks from joints, seals, packing, and gaskets; hydrofluorocarbon emissions during the use of refrigeration and air conditioning equipment; and CH_4 leakages from gas transport have also been excluded.

Construction activities are expected to be limited and include the assembly of infrastructure (turbines and generators) on cleared/prepared land and, the movement of vehicles and equipment to Site. Construction emissions are not expected to be material (i.e., well below the EPA's 100,000 t CO_2-e/a) and any estimate provided at this stage would be highly speculative. On this basis, construction GHG emissions estimates have not been calculated.

It is also noted again that the Proposal, and the GHGMP, does not include the existing KSPS.

A summary of the Proposal Scope 1, 2 and 3 GHG emissions estimates for the operational phase is provided in Table 6-4.

Table 6-4 Emissions estimates (t CO_2e) for the Proposal.

	Emissions (t CO_2e)			
	Construction	**Operation**	**Annual average**	**Peak Emissions (Year)**
Scope 1	Not estimated, refer above.	5,869,763	195,659	281,871 (2036)
Scope 2		11,660	530	530 (any year)
Scope 3		688,122	22,937	32,822 (2036)

The Proposal's annual GHG emissions estimates over the life of the Proposal are visualised below (Figure 6-1). Scope 1 and 3 emissions will be produced from 2029 onwards once construction is complete. Scope 2 emissions have been excluded from this figure due to their relative insignificance. The quantitative annual GHG estimates (t CO_2e/a) are presented in Section 3.1.1 of the GHGMP.

Figure 6-1 GHG emissions over the operational life of the Proposal (Preston Consulting, 2024).

6.5 Mitigation

Perth Energy has prepared a GHGMP that demonstrates how the Proposal related GHG emissions will be decreased over time to meet the EPA's and State Government's net-zero targets by 2050.

The EPA's mitigation hierarchy for the greenhouse gas emissions factor has been reflected in the planned mitigation measures in the following order of priority:

- Avoidance: Emissions will be avoided where possible through best-practice design. A benchmarking exercise was undertaken showing that emissions from the Proposal compare favourably with other similar operations.
- Reduce: Perth Energy will implement the GHGMP for the Proposal which describes how emissions will be reduced such that net zero carbon emissions are achieved by 2050 (summarised below).
- Offset: Where avoidance and reduction is not possible, Perth Energy will develop and implement an offset strategy to offset residual emissions in accordance with required emissions reductions.

The following mitigation measures will be implemented over the life of the Proposal to avoid or reduce this Proposal's Scope 1 emissions.

Best-practice Design

During the design phase, Perth Energy investigated several gas turbine generator technology options to identify the best practice technology suitable for the Proposal. Parameters that were considered include but not limited to:

- High energy density MW/m^2;

- Low nitrogen oxide (NOx) emissions;
- High efficiency;
- Flexible and reliable operation;
- Fast-start;
- Very-low minimal-generation;
- Sync-con functionality and contribution to system stability;
- Dual fuel (natural gas and diesel);
- Low cost against generation ($/MW);
- Low maintenance and operational requirements;
- High availability;
- Firm generation (when renewables not generating);
- Proven technology in WA (for construction and operation);
- Ability to operate on hydrogen in the future; and
- Ability to operate on bio-diesel fuel in the future.

Additionally, the Proposal commits to consider the following parameters over its' life:

- Use of new high-efficiency aero-derivative or light industrial gas turbine technology;
- Select world-leading original equipment manufacturer (OEM) for gas turbine supply and commissioning;
- Through-life emissions/efficiency part of technology selection process; and
- Performance Guarantees in construction and operation.

Perth Energy is determined to utilise the best-practice technology that is suitable for the Proposal application. The choice of technology is limited by site-specific factors including climate, availability, packaging and compliance with other environmental constraints such as air quality. The chosen technology may therefore not represent best-practice in a global context of power generation; however, the Proposal will use the latest models of the chosen technology where possible which is expected to be competitive with other power generation technology and is considered best-practice in the context of the Proposal.

Site Selection

Perth Energy has decided to co-locate the Proposal with the existing power station. This approach has several emissions avoidance benefits including:

- Avoiding the need to clear native vegetation;
- Maximising the use of limited existing network transmission capacity;
- Efficiencies in commuting and supply of equipment for maintenance that is required for both plants; and
- Avoiding the need to develop and clear vegetation for additional supply and transmission infrastructure.

Low Carbon Fuel Alternatives

Perth Energy has not yet identified the specific turbines to be installed at the Proposal. A decarbonisation opportunity exists to utilise low carbon fuel such as biodiesel or hydrogen in place of natural gas however a reliable, cost competitive source of either has not been identified.

Despite the above, the ability to utilise biodiesel and or hydrogen for power generation is a key consideration in the selection of turbine technology. Perth Energy will continue to explore the opportunity to use low carbon fuel sources over the life of the Proposal.

In addition to the mitigation measures of Scope 1, Scope 2 and 3 emissions have their own mitigation measures.

The Proposal will generate minor Scope 2 emissions during the operations. A minor amount of electricity will be purchased from the SWIS to maintain connection to the grid while the plant is not operating during the maintenance and shutdowns. Perth Energy will investigate electricity supply options and factor in the carbon footprint of supply. Preference will be given to those suppliers with a lower carbon intensity product and clear commitments and pathways to decarbonisation.

Scope 3 emissions for the Proposal include those associated with the purchased goods and services (natural gas and diesel), and downstream distribution of electricity. Perth Energy has limited control over the emissions associated with these sources. However, it is committed to exploring opportunities for decarbonisation. The Proponent will consider options to reduce the quantity and Scope 3 emissions relating to the delivery of natural gas and diesel by using:

- New high-efficiency aero-derivative or light industrial gas turbine technology;
- Selected world-leading OEM for gas turbine supply and commissioning;
- Through-life emissions/efficiency part of technology selection process; and
- Performance Guarantees in construction and operation.

Perth Energy will investigate third party supply options for gas and diesel supply and factor in the carbon footprint of supply. Similarly with Scope 2 mitigation measures, preference will be given to those suppliers with a lower carbon intensity product and clear commitments and pathways to decarbonisation.

Perth Energy's offsetting strategy for the Proposal has been described in Section 8.

Statutory decision-making processes

Table 6-5 below summarises other statutory decision-making processes that can mitigate the potential environmental impacts arising from the GHG emissions of this Proposal.

Table 6-5 Statutory decision-making processes that can mitigate potential environmental impacts.

Potential impact	Statutory decision-making process that can mitigate the potential impact	Reasoning
Generation of GHG emissions	NGER Act	Annual emissions reporting, which will require the Proponent to track their emissions and take actions to keep them below set thresholds.
	Safeguard Mechanism	The NGER Act regulates the emissions of grid-connected electricity generators, such as K2. Specifically, for the purpose of the NGER Act, the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 (Cth) requires the Clean Energy Regulator to monitor scope 1 emissions for all grid-connected electricity generators each financial year, and should those

		emissions exceed the 'sectoral' baseline of 198,000,000 t CO2-e: • this is to be published at least 4 months prior to the start of the next financial year; and • site-specific (rather than sectoral) baselines will then apply for the following financial year, which decline at a set rate.

6.5.1 Assessment and significance of residual impact

The average annual GHG emissions estimate (Scope 1) for the Proposal is 195,659 t CO_2e, which corresponds to approximately 0.2% of Western Australia's annual GHG emissions and 0.05% of Australia's GHG emissions (based on the latest available reporting year, FY 2021/-22). This contribution is not significant.

Since the publication of the EPA's updated *Environmental Factor Guideline – Greenhouse Gas Emissions (2024)*, the EPA no longer requires a GHG environmental management plan but will still accept GHG related information in the format of a GHGMP.

A GHGMP was prepared for this Proposal to provide more detailed information of the GHG emissions estimates' calculation method and Perth Energy's commitments to reduce operational GHG emissions. The GHGMP outlines how Proposal emissions will be mitigated to minimise the risk of environmental harm from emissions. Perth Energy considered that the residual impacts of the Proposal are not significant and will be appropriately managed through the GHGMP to achieve the EPA objective for GHG emissions.

6.5.2 Predicted environmental outcome

The Proposal will produce on average 195,659 t CO_2e of Scope 1, 530 t CO_2e of Scope 2 and 22,937 t CO2e of Scope 3 emissions per annum. Total Scope 1 emissions over the life of the Proposal will be 5,869,763 t CO_2e.

To manage and reduce the predicted environmental outcome, the proposed activities will comply with several legislative requirements, such annual reporting requirements under NGER Scheme and within the Safeguard Mechanism sectoral baseline.

Annual GHG emissions will be monitored under the NGER Scheme. GHG emission will be calculated in accordance with the *National Greenhouse and Energy Reporting (Measurement) Determination*, which specifies the calculation methods and criteria to be used.

The GHGMP will be implemented and used as an additional monitoring tool to track the Proposal's GHG emissions and reductions.

The Proposal is a necessary interim step that facilitates decarbonisation of the SWIS. As the proportion of renewable power generation and storage connected to the SWIS increases, reliance

on the Proposal for power generation will reduce and so will the GHG emissions (Preston Consulting, 2024). Hence, the environmental outcome will reduce further over time.

Considering all the proposed mitigation measures and proposed GHG emission reduction targets, the Proposal is expected to meet EPA's objective for the GHG emissions.

7. Other Environmental Factors or Matters

Environmental factors considered relevant to the Proposal but unlikely to experience a significant impact include:

- Air quality; and
- Social surroundings.

A summary of the environmental factor assessment is presented below (Table 7-1). The factors under the themes 'Sea', 'Land' or 'Water' were not considered relevant for this Proposal and are not part of the environmental factor assessment presented below.

Table 7-1 Assessment of other environmental factors.

Factor	EPA Objective and Guidance	Receiving environment	Assessment of potential impact	Proposed mitigation
Theme: Air				
Air Quality	For air quality, refer to Section 7.1.			
Theme: People				
Social surroundings	Objective: *To protect social surroundings from significant harm.* Guidance: *Environmental Factor Guideline: Social Surroundings (EPA, 2023)*	Sensitive receptors are presented in Section 1.5.10. The closest sensitive noise receptors are residential buildings 2.3 km to southeast. The *Environmental Protection (Noise) Regulations 1997* defines the allowed noise levels in the surroundings of the premises, which were reflected in the noise modelling and assessment.	**Noise** assessment was completed, which indicates that noise received at the residences, when the power station is operating on its full capacity, could comply with the regulatory requirements during the day and evening periods, but could exceed these requirements during the night period by +2 dB(A). However, it is understood, that the noise levels are lower during the nights due to the lower demand and the lower ambient temperature resulting in less air required for cooling. The noise assessment is presented in Appendix 3. For **air quality**, refer to Section 7.1. An Indigenous heritage due diligence desktop assessment was conducted by Terra Rosa Consulting to identify and address potential impacts on cultural heritage sites, which could have further impacts on social surroundings. For the conducted **heritage assessment**, refer to Section 1.5.8 and Appendix 1	**Noise** Necessary noise mitigations measures will be assessed in the detailed design phase with the chosen technology provider. Noise mitigation measures, such as directing noise sources away from the sensitive receptors and/or installing noise protection structures (such as baffles), will be implemented if needed based on the final plant design, in order to meet regulatory requirements. **Air Quality** For air quality, refer to Section 7.1. **Heritage** For heritage matters, refer to Appendix 1.

Confidential

Human health	Objective: *To protect human health from significant harm.* Guidance: *Environmental Factor Guideline: Human Health (EPA, 2016)*		Human health impacts from this Proposal may result from air emissions and noise but would not be material. Air emissions are assessed in detail in Section 7.1 and noise impacts discussed under Social Surroundings above. The impacts from air emissions and noise will be further managed under Part V of the EP Act.	Refer to discussion on proposed mitigation measures above.

7.1 Air Quality

According to EPA's *Environmental Factor Guideline: Air Quality* the environmental objective of the air quality factor is:

'To maintain air quality and minimise emissions so that environmental values are protected'

7.1.1 Relevant Policy and Guidance

Air Quality factor Guideline
The focus and objective of EPA's *Environmental Factor Guideline: Air quality* is:

- the impacts of emissions on air quality and other environmental values
- how discharges of waste into the air is avoided and managed
- how any discharge of waste will significantly impact on air quality and the environmental values that air quality supports.

There are inherent links between the *Air Quality* factor and other environmental factors. For example, changes to the air quality can affect human health and social surroundings, which has been considered in this referral document, too.

National Environment Protection (Ambient Air Quality) Measure 2021 (NEPM)
The air quality criteria of the NEPM was applied when assessing the Proposal's potential environmental impact on air quality. The desired environmental outcome of NEPM is '*ambient air quality that allows for the adequate protection of human health and well-being*' (NEPC, 2022).

7.1.2 Receiving environment

The proposed Project is in the KIA, which has been operational for over 60 years being the main contributor to area's ambient air quality. The DWER conduct ongoing ambient air quality monitoring within the Kwinana region for NO_2. The closest air quality monitoring station (**AQMS**) to the KIA is at the North Rockingham AQMS. Another nearby AQMS is South Lake, which is located to the northeast from the proposed project Site.

Data from the North Rockingham station was obtained for the modelled period (1st July 2023 and 30th June 2024). A summary of the monitored data is presented in Table 7-2 below, representing ambient air quality concentrations.

Table 7-2: Monitored Concentrations at North Rockingham AQMS (1st July 2023 and 30th June 2024)

Data Availability	Concentration µg/m³						
	Max 1-hour[2]	99th percentile 1- hour	98th percentile 1-hour	95th percentile 1-hour	90th percentile 1-hour	70th percentile 1-hour	Annual Average[3]
95.8%	59.8	40.2	35.4	28.1	20.3	8.3	8.1

Notes
1. Referenced to 25ºC, and 101.3 kPa.
2. 1-hour average NO_2 criteria – 151 µg/m³
3. Annual average NO_2 criteria – 28 µg/m³

The DWER published the Guidance Statement for Risk Assessments in February 2017 (DER, 2017) and the draft Guideline: Air Emissions in October 2019 (DWER, 2019), which refer to air quality criteria that may be considered in determining public health and environment impacts. The publication containing air quality criteria relevant to this Proposal is the National Environment Protection (Ambient Air Quality) Measure (NEPM) (NEPC, 2015 & 2021)

A summary of the current applicable air quality criteria for NO_2 is presented in Table 7-3. When comparing the North Rockingham AQMS results to the ambient air quality criteria, the results show that the monitored concentrations at this AQMS were well below the ambient air quality guideline values.

Table 7-3 Ambient Air Quality Criteria.

Compound	Averaging Period	Concentration (µg/m³)[1]	Reference
NO_2	1-hr	151	NEPC (2021)
	Annual	28	

Notes
1. Referenced to 25ºC, and 101.3 kPa.

The nearest sensitive receptors and AQMSs are presented in Table 1-5 and their locations on the map in Figure 1-6.

7.1.3 Potential environmental impacts and proposed mitigation

An air quality assessment has been undertaken for the Proposal and is presented in the report titled Kwinana Swift Power Station Expansion: Air Quality Assessment (Ramboll, 2024), provided as **Appendix 4**.

The potential air quality impacts were assessed by the CALPUFF modelling system. The assessment included modelling potential air quality impacts arising from emissions of concern which in this instance is oxides of nitrogen (NOx) (expressed as nitrogen dioxide (NO_2)). Emissions of carbon monoxide and particulates are also expected to be emitted from the turbines. However, the concentrations of these emissions are negligible in the context of ambient air quality guidelines and have not been assessed further as part of this assessment. Five (5) scenarios were modelled to consider all project stages. These scenarios were:

Scenario 1 – Existing
Scenario 1 included all known significant existing operations in the KIA excluding current and proposed Perth Energy sources that were operating during the modelled period between 1st July 2023 and 30th June 2024.

The sources that were included in the existing scenario included the following sources:

- AGR's sodium cyanide plant;
- CSBP's nitric acid plant;
- CSBP's ammonia plant;
- Synergy's HEGT facility;
- Alcoa's refinery including the powerhouse, calciner and liquor burner;
- Newgen power station;
- Cockburn 2 power station;
- The Kleenheat gas processing facility; and

- Nickel West's refinery.

Scenario 2 – Future Sources
Scenario 2 included the emissions and background concentrations as outlined in Scenario 1 but with the addition of future approved (yet to operate) and expected operational sources in the KIA. This included the addition of the following sources:

- CSBP's ammonia plant expansion;
- The Kwinana waste to energy facility;
- The East Rockingham waste to energy facility;
- The Covalent lithium plant;
- The Tianqui lithium plant; and
- The BP renewable energy project.

Scenario 3a – Normal Operations in Isolation
The normal operations in isolation scenario included emissions estimates and stack parameters from this Proposal in isolation. Emissions of NOx from four proposed turbines operating on natural gas/diesel were included under the normal operations scenario.

Scenario 3b – Normal Operations, Cumulative
The proposed normal operations scenario included emissions from all emissions sources and background concentrations as outlined in Scenario 2. It included emissions estimates and stack parameters from the existing KSPS that were based on conservative results from stack testing data undertaken at the facility. Emissions of NOx from the four proposed turbines (from this Proposal) were as described in Scenario 3a.

Scenario 4 – Startup Operations
Emissions from the proposed turbines under a startup scenario were assessed using the emissions provided by the manufacturers. Like the normal operations scenario (Scenario 3b), emissions under this scenario were considered cumulatively with emissions and background concentrations as described in Scenario 2 as well as with emissions from the existing KSPS operating in a normal mode. Startup emissions are expected to occur over a 10-minute period. It was conservatively assumed that normal operations were occurring for the other 50 minutes in an hour.

Scenario 5 – Shut Down Operations
Emissions from the proposed turbines under a shutdown scenario were assessed using the emissions information provided by the manufacturers with other sources as described in Scenario 4. Like the startup emissions, shutdown emissions are expected to occur over a 10-minute period. It was conservatively assumed that normal operations were occurring for the other 50 minutes in an hour.

Emission estimates and stack parameters are described more in detail in the Air Quality Assessment (Appendix 4).

Predicted maximum 1-hour average and annual average concentrations at the nominated receptor locations are presented in Table 7-4 below. The results presented at the nominated receptor locations are all below the relevant NO_2 criteria. Contour plots of the predicted ground level concentrations (GLCs) were made for each of the scenarios and relevant averaging periods are presented in the Air Quality Assessment (Appendix 4). For clarity, contour plots of the predicted GLCs for Scenario 3b demonstrating predicted maximum 1-hour and annual averages are presented in Figure 7-1 and Figure 7-2, respectively.

Confidential

The contour plots show that in general all the predicted concentrations are below the relevant criteria except for some isolated exceedances of the 1-hour average NO_2 criteria predicted to occur in close vicinity to various sources including the KSPS. No exceedances were predicted of the annual average NO_2 criteria at any location in the modelled domain.

An exceedance of the 1-hour average NO_2 criteria was predicted for the normal operations, shutdown, and startup scenarios to the east of the KSPS facility at approximately 3 km although the exceedance was predicted to occur in an industrial area and not over sensitive receptor locations. The maximum predicted cumulative 1-hour average concentrations at this location for normal operations, shutdown operations and startup operations were 158 µg/m^3, 164 µg/m^3 and 168 µg/m^3 respectively. Analysis of the number of exceedances predicted at this location indicated that only a single hour of exceedance was predicted at this location.

Confidential

Table 7-4 Summary of Predicted Cumulative Maximum 1-hour Average and Annual Average Predicted GLCs at Sensitive Receptor Locations

Maximum 1-hour Average Ground Level Concentrations												
Receptor	Criteria	Sc 1 - Existing		Sc 2 - Future Approved		Sc 3a - Normal Ops Isolation		Sc 3b - Normal Ops Cumulative		Sc 4 - Shutdown		Sc 5 - Startup	
		µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria
Wells Park	151	83	55%	83	55%	21	14%	84	55%	84	56%	84	56%
Golf Course		70	47%	78	52%	83	55%	131	86%	132	88%	133	88%
Thomas Oval		83	55%	88	58%	52	34%	109	72%	110	73%	110	73%
Oval		99	66%	99	66%	65	43%	128	85%	130	86%	130	86%
Residence		81	54%	85	57%	49	32%	107	71%	114	75%	115	76%
North Rockingham AQMS		75	49%	70	47%	26	18%	72	47%	72	48%	72	48%
Residence		69	46%	69	46%	55	36%	110	73%	120	80%	123	82%
Hope Valley		96	64%	94	63%	47	31%	101	67%	102	68%	102	68%
Calista Primary School		78	52%	80	53%	25	17%	101	67%	101	67%	101	67%
Wombat Wallow Childcare Centre		95	63%	95	63%	43	28%	100	66%	100	66%	100	66%
South Lake AQMS		61	41%	55	37%	6	4%	61	41%	62	41%	62	41%
Annual Average Ground Level Concentrations													
Receptor	Criteria	Sc 1 - Existing		Sc 2 - Future Approved		Sc 3a - Normal Ops Isolation		Sc 3b - Normal Ops Cumulative		Sc 4 - Shutdown		Sc 5 - Startup	
		µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria
Wells Park	28	14.6	52%	14.7	52%	0.2	1%	15.0	54%	15.1	54%	15.1	54%
Golf Course		14.0	50%	14.2	51%	0.2	1%	14.6	52%	14.6	52%	14.6	52%
Thomas Oval		14.2	51%	14.6	52%	0.3	1%	15.2	54%	15.2	54%	15.2	54%
Oval		15.0	54%	15.6	56%	1.1	4%	17.3	62%	17.5	62%	17.5	62%
Residence		14.0	50%	14.3	51%	0.2	1%	14.7	53%	14.7	53%	14.8	53%
North Rockingham AQMS		13.9	50%	14.1	50%	0.2	1%	14.3	51%	14.3	51%	14.4	51%
Residence		13.7	49%	13.9	50%	0.2	1%	14.2	51%	14.2	51%	14.2	51%
Hope Valley		15.0	54%	15.5	55%	0.6	2%	16.6	59%	16.7	60%	16.7	60%
Calista Primary School		13.8	49%	13.9	50%	0.2	1%	14.3	51%	14.3	51%	14.3	51%
Wombat Wallow Childcare Centre		14.1	50%	14.3	51%	0.3	1%	14.7	53%	14.8	53%	14.8	53%
South Lake AQMS		13.8	49%	13.7	49%	0.1	0%	13.9	50%	13.9	50%	14.0	50%

Confidential

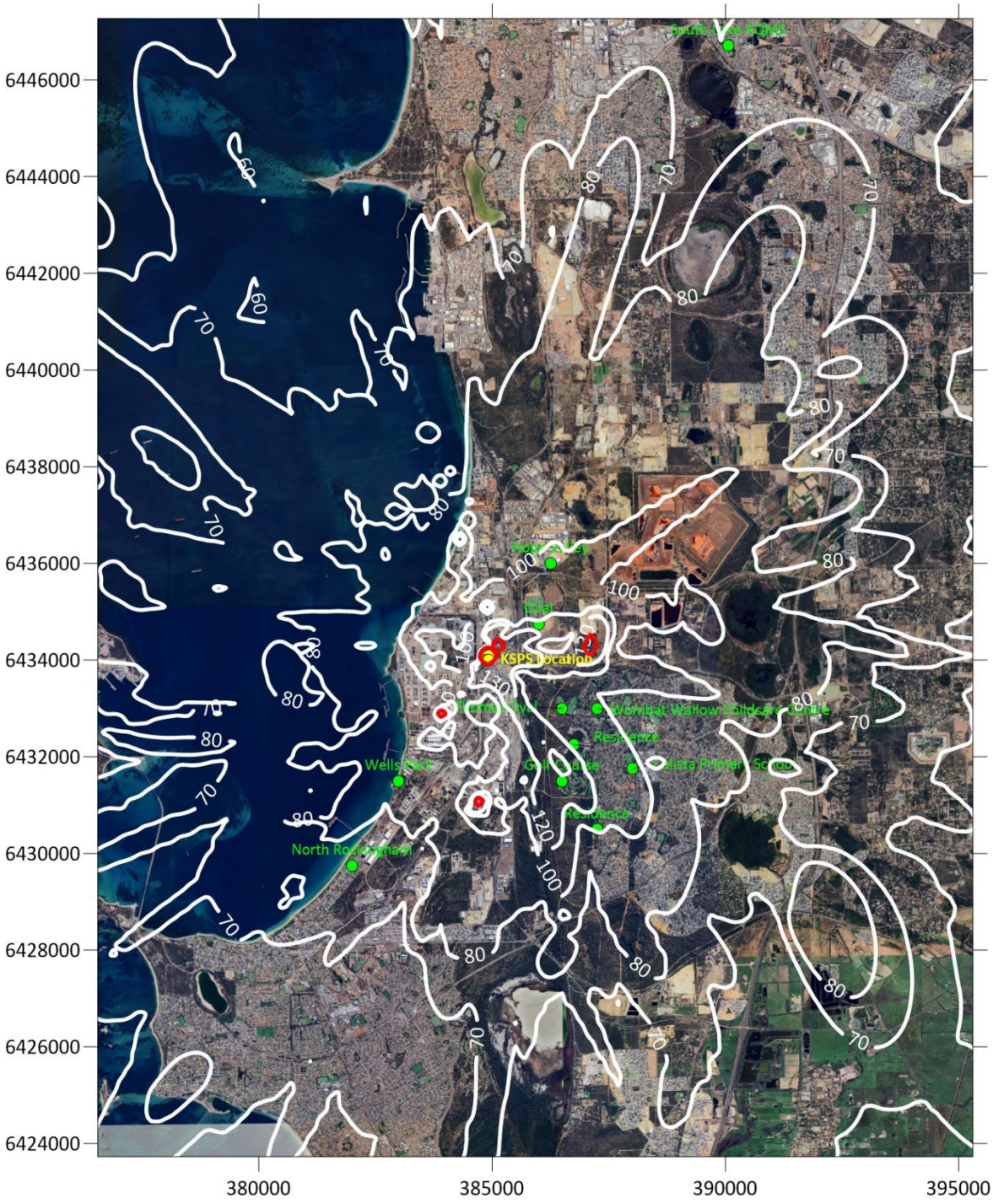


Figure 7-1 Predicted Maximum 1-hour Average GLCs of NO2 (Across Modelled Domain) – Scenario 3b: Normal Operations - Cumulative

Confidential

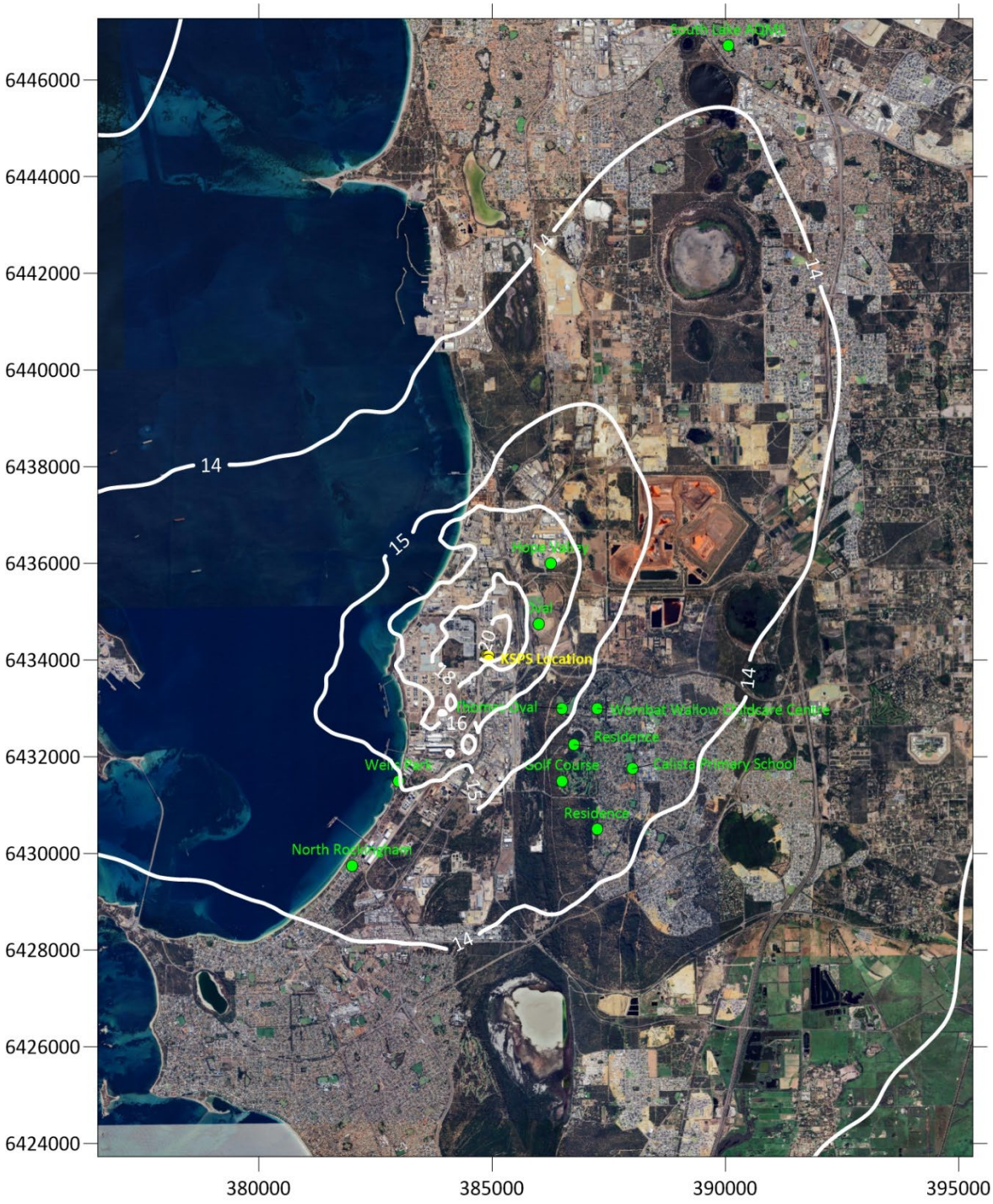


Figure 7-2 Predicted Annual Average GLCs of NO2 (Across Modelled Domain) – Scenario 3b: Normal Operations – Cumulative

7.1.4 Mitigation measures

At this stage of the Project design, detailed mitigation measures for management of air quality emissions have not been considered in detail. Perth Energy will consider minimisation of air quality emissions through the following measures:

- Start-up and shut-down procedures;
- Turbines chosen will utilise low NOx technology;
- Conduct of maintenance in line with OEM requirements; and
- Development of appropriate operating procedures for plant operation.

The K2 Project has applied for approval under Part V of the EP Act concurrently with this Proposal. Perth Energy expects management of atmospheric emissions would be managed through this process. Compliance with air quality guidelines will be achieved and managed under this process.

7.1.5 Environmental outcomes

No exceedances of the annual average criteria were predicted at any location within the modelled domain. Exceedances of the 1-hour average criteria were recorded near the Proposal site, and a single 1-hour average exceedance was predicted in an industrial area 3 km to the east of the Proposal site for normal operations as well as the startup and shutdown scenarios.

The assessment has incorporated several conservative assumptions including the following which indicate that the results of the modelling could be considered a conservative estimate of worst case GLCs in the region:

- Emissions from the plant assumed worst case NOx concentrations as guaranteed by vendors. Emissions concentrations of NOx from the proposed turbines are expected to be significantly lower than those that were modelled.
- Modelling was undertaken assuming continuous operation of the KSPS when it is expected to operate for approximately 25% of the year.
- Emissions from shutdown and startup operations are expected to be sporadic and despite these operations only occurring for 10 minutes on each occasion it has been assumed that emissions from the plant continued for the other 50 minutes.
- Background concentrations from non-industrial sources were based on a worst-case year.
- The model validation showed that when using an assumed background concentration of NO_2, the model was slightly overpredicting the highest predicted concentrations of NO_2 when compared to the monitored data at North Rockingham.

Based on the outcomes of the air dispersion modelling and considering the inherent conservativity incorporated into the assessment, the Proposal likely presents a low risk of impacting health at sensitive receptors in the region.

Based on the conducted air quality assessment it is expected that the NO_x emissions will be within the latest NEPM guidelines and conform to the future reduction in NEPM guidelines. The expected emissions from the proposal may be managed with reference to existing controls as regulated under Part V of the EP Act by DWER. It is considered that the EPA's objective for emissions and air quality will be met.

8. Offsets

8.1 Corporate level offsets

Perth Energy, as a subsidiary of AGL Limited, has a corporate level *Carbon Offsets Policy (effective from Aug 2024),* which outlines AGL Energy's planned use of carbon offsets toward achieving the greenhouse gas emissions targets outlined in AGL Energy's Climate Transition Action Plan (**CTAP**) published in September 2022, including their overall role, and approach to sourcing and verifying carbon offsets.

AGL Energy's Scope 1 and 2 greenhouse gas emissions decarbonisation strategy as set out in its CTAP relies predominantly on achieving absolute reductions in its Scope 1 and 2 emissions, through the sequential and responsible closure of AGL Energy's operated coal-fired power stations. These coal-fired power stations accounted for over 95% of AGL Energy's annual operated Scope 1 and 2 emissions in June 2024.

To achieve AGL Energy's net emissions reduction targets, carbon offsets will be used to address residual emissions where necessary, subject to availability and viability.

8.2 Proposal specific offsets

AGL Energy has committed to reach net zero emissions by 2050 for this Proposal, with the intent of only using offsets (i.e., carbon credits) as a temporary solution while the technology or innovation required to completely decarbonise is developed.

Based on the targets and emissions estimates presented in the GHGMP the Proposal will need to offset emissions in 2048 and the years beyond. A total of 430,574 t CO_2e emissions will need to be offset to 2050 and then an average of 176,401 t CO_2e / a will need to be offset thereafter (based on current projections) (Preston Consulting, 2024).

AGL Energy will offset GHG emissions above the target with tangible offsets. Potential tangible offset options include but are not limited to undertaking additional re-vegetation activities on land held by AGL Energy to generate carbon credits, investing in carbon offset projects and purchasing, and surrendering carbon credits that meet the Australian Government's Climate Active Carbon Neutral Standard's offsets integrity principles (Preston Consulting, 2024).

Preference will be given to Australian Carbon Credit Units (ACCUs) and other Nature-Based Solutions carbon credits that aim to protect and enhance natural ecosystems, benefit local communities and improve biodiversity. The exact proportion of ACCUs and other Nature-Based Solution carbon credits within the overall offsets portfolio will be determined each period based on forecast residual emissions and monitoring of offset markets. Offsets will be certified, accredited and registered under Standards within the International Carbon Reduction and Offsetting Accreditation (ICROA) Code of Best Practice. (Preston Consulting, 2024)

9. Matters of National Environmental Significance

An EPBC self-assessment was undertaken in accordance with the *Significant Impact Guidelines 1.1. – Matters of National Environmental Significance* from Australian Government, Department of the Environment, and DCCEEW's self-assessment guide. The primary objective of the EPBC self-assessment is to document whether potential impacts on MNES are likely to be significant and further to identify if an official referral to the DCCEEW under the EPBC Act is required.

DCCEEW's PMST was used to identify potential MNES in the project area and its surroundings. A PMST search was undertaken on 30th October 2024 with a 300 m buffer around the project area (Figure 9-1). A summary of the PMST results is presented in Table 9-1. (Ramboll, 2024)

Figure 9-1 Project area and defined buffer zone with radius of 300 m from the premises boundary.

Table 9-1 Assessment of MNES likelihood of occurrence and potential impact of the Proposal.

MNES	Potential presence within project footprint
World heritage properties	None present
National heritage properties	None present
Wetlands of international importance (listed under the Ramsar Convention)	1
Great Barrier Reef Marine Park	None present
Commonwealth marine areas	None present
Listed Threatened Ecological Communities	3
Listed Threatened Species	21
Listed migratory species (protected under international agreements)	14

Nuclear actions (including uranium mining)	Not applicable
Water resources in relation to coal seam gas development and large coal mining development	Not applicable

The EPBC self-assessment concluded that the Proposal is not expected to have a significant impact on:

- The world heritage values of a declared World Heritage property.
- The ecological character of a declared Ramsar wetland.
- The members of a listed threatened species or any threatened ecological community, or their habitat.
- The members of a listed migratory species or their habitat.
- The environment in part of the Commonwealth marine area.
- The environment on Commonwealth land.

The low impact status of this project is due to the following reasons:

- The property and surrounding area's land use is industrial and has been of an industrial nature for the last 60 years.
- The land and surrounding areas have been cleared of most vegetation.
- There is a significant distance between the proposed Site and watercourses.
- There will be no direct discharge from the operations into the marine environment.
- The likelihood of threatened species to occur in this area under the above conditions is limited.

Based on the completed EPBC self-assessment, the Proposal will not have a significant impact on MNES or Commonwealth land and thus, it has not been referred to the DCCEEW under the EPBC Act. This conclusion is supported by the previously conducted referrals in the vicinity of the Site, which were not considered a 'controlled action' under the EPBC Act.

Confidential

10. Holistic Impact Assessment

According to EPA's *Instructions: How to prepare an environmental review document (2024)* a holistic impact assessment is required where *'the combination of the environmental effect of two or more environmental factors or values has the potential to result in a significant impact'*. GHG emissions have been identified as the only key environmental factor for this Proposal, and therefore AGL Energy considers that there are no such interactions between GHG emissions and any other environmental factors where the combination has the potential to result in a significant impact.

11. Cumulative Environmental Impact Assessment

In accordance with EPA's *Instructions: How to prepare an environmental review document* (2024) cumulative environmental impacts are defined as '*successive, incremental and interactive impacts on the environment of a proposal with one or more past, present and reasonably foreseeable future activities'*.

The ProposalSite is located in the KIA, which has a 60 year history of industrial operations. KIA is designed for heavy industry and possible significant impacts originating from the industrial operations have been also considered in the area's zoning, i.e. requirements of implementation of adequate buffer zones. Due to the project area's location, cumulative impacts of most of the environmental factors (factors under the themes 'Sea', 'Land', 'Water' and 'People') are considered unlikely to cause significant impacts.

This Proposal's potential impact on air quality has been assessed in Section 7.1 but it is not classified as a 'key environmental factor' for this Proposal. When further considering the area's baseline air quality, including several existing and planned industrial operators, this Proposal's contribution (in terms of air quality) to the cumulative impacts is minor and not likely to cause significant impacts.

GHG emissions are the only key environmental factor (refer Section 6) for the Proposal and the only environmental factor that is considered likely to have significant cumulative impacts on the environment.

The Proposal is estimated to generate 195,659 t CO_2e Scope 1 emissions, 530 t CO_2e Scope 2 emissions and 22,937 t CO_2e Scope 3 emissions on average annually (Table 6-4, Section 6.4.1). The Scope 1 emissions correspond to approximately 0.2% of Western Australia's GHG emissions and 0.05% of Australia-wide GHG emissions (comparison was conducted based on the latest available reporting year, FY 2021/-22). The Scope 2 emissions correspond to a negligible portion of state (WA) and national level GHG emissions. This Proposal's impact on GHG emissions on a state, national and global level is considered insignificant. It is acknowledged that this Proposal is important in allowing the State to transition away from existing coal-fired power generation towards a renewable energy future, and as such allows for an overall reduction in cumulative GHG emissions over time.

Cumulative impacts arising from the GHG emissions resulting from this Proposal will be managed and reduced according to the GHGMP (Appendix 2).

References

BoM. 2024a. Climate Statistics for Australian Locations – Summary Statistics of Garden Island HSF. Available from: http://www.bom.gov.au/climate/averages/tables/cw_009256.shtml Accessed 5.11.2024.

BoM. 2024b. Climate Statistics for Australian Locations – Summary Statistics of Jandakot Aero. Available from: http://www.bom.gov.au/climate/averages/tables/cw_009172.shtml Accessed 5.11.2024.

City of Kwinana. 2024a. History and Heritage. Available from: https://www.kwinana.wa.gov.au/city-life/about-kwinana/history-and-heritage Accessed 5.11.2024.

City of Kwinana. 2024b. Kwinana Industrial Area. Available from: https://www.kwinana.wa.gov.au/business-and-development/economic-data/kwinana-industrial-area Cited 25.10.2024 Accessed 25.10.2024.

Cockburn Sound Management Council. 2022. State of Cockburn Sound Marine Area Report. Available from: https://www.wa.gov.au/system/files/2023-07/state-of-cockburn-sound-marine-area-report-2022.pdf Accessed 5.11.2024.

DCCEEW. 2024a. Australia's emissions projections 2024. Available from: www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2024.pdf Accessed 19.12.2024.

DCCEEW. 2024b. State and Territory greenhouse gas inventories: 2022 emissions. Available from: https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-2022/state-and-territory-greenhouse-gas-inventories-2022-emissions Accessed 19.12.2024.

DER. 2017. Guidance Statement: Risk Assessments.

DWER. 2019. Redetermination of maximum permissible sulfur dioxide quantities under the Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999.

Environ Australia Pty Ltd. 2008. *Environmental referral – Kwinana 120 MW Open Cycle Gas Turbine Peaking Power Plant*.

EPA. 2020. Environmental Factor Guideline: Air Quality. Available from: www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EFG%20-%20Air%20Quality%20-%2003.04.2020.pdf Accessed 29.11.2024.

EPA. 2024a. Instructions and template: How to identify the content of a proposal. Available from: https://www.epa.wa.gov.au/sites/default/files/Forms_and_Templates/Instruction-%20How%20to%20identify%20the%20content%20of%20a%20proposal_0.pdf Accessed 20.1.2025.

EPA. 2024b. Environmental Factor Guideline: Greenhouse Gas Emissions. Available from: www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Guideline%20%E2%80%93%20GHG%20Emissions%20-%20November%202024.pdf Accessed 27.11.2024.

EPA. 2024c. Instructions: How to prepare an environmental review document. Available from: www.epa.wa.gov.au/sites/default/files/Forms_and_Templates/Instructions-%20How%20to%20prepare%20an%20Environmental%20Review%20Document_0.pdf Accessed 11.12.2024.

Kwinana Industries Council (KIC). 2024. About Kwinana Industries Council. Available from: https://kic.org.au/about/ Accessed 25.10.2024.

Kwinana Industries Council (KIC). 2019. Western Trade Coast Precincts. Available from: https://kic.org.au/wp-content/uploads/2020/2020/05/WTC-Precinct-Plan_MP_March-2019.pdf Accessed 8.11.2024.

NEPC. 2021. National Environmental Protection (Ambient Air Quality Measure). National Environmental Protection Council, December 2021.

National Environmental Protection Council (NEPC). 2022. National Environmental Protection (Ambient Air Quality) Measure. Available from: https://www.nepc.gov.au/nepms/ambient-air-quality Accessed 26.3.2025.

Preston Consulting Pty Ltd. 2024. Kwinana Swift Power Station Expansion Project – Greenhouse Gas Management Plan.

Ramboll Australia. 2024. EPBC self-assessment.

Terra Rosa Consulting. 2024. Desktop due diligence assessment of the proposed AGL power station expansion project for Ramboll Australia Pty Ltd.

Appendix 1

Indigenous Heritage Due Diligence Desktop Assessment

TERRA ROSA
CONSULTING

Desktop due diligence assessment of the proposed AGL power station expansion project for Western Energy Pty Ltd

December 2024

Acknowledgement of Country

Terra Rosa acknowledge the Gnaala Karla Booja people, who are the Traditional Custodians of the Country described in this document, and to the Whadjuk Noongar people, who are the Traditional Custodians of the Country in which Terra Rosa's office is situated.

We pay our respects to their Elders past, present, and emerging, and recognise the continued cultural and spiritual connections to their lands.

TRC ref

GKB2402

CONTENTS

INTRODUCTION

Western Energy Pty Ltd (Western Energy) intends to use land within Gnaala Karla Booja area of the South West Native Title Settlement (WCD2021/010) which is covered by Indigenous Land Use Agreement ILUA (WI2015/005) in the South West region of Western Australia for the Kwinana Swift Power Station (KSPS) Project Expansion.

To minimise the likelihood of breaching the *Aboriginal Heritage Act 1972 (WA)* (the Act), Western Energy commissioned a heritage desktop due diligence over this project area.

The purpose of such a desktop review is to identify any knowledge gaps pertaining to heritage works within the project area, the results of which will highlight any areas requiring further archaeological and ethnographic survey and consultation with appropriate Traditional Owners and Knowledge Holders.

The KSPS Expansion project area covers 3.55 ha, encompassing Lot 13 at Burton Place in Kwinana. The project area is located in an existing industrial area about 1.9 km inland from the Indian Ocean and 1.1 km southwest of the Kwinana Motorplex.

Kwinana Swift Project Area map, provided by Western Energy

Kwinana Swift

05/06/2024

1:7,109

- Impacted neighbour parcels
- Point_of_Interest
- Interface points
- Gas Pipe Route to GT1 & GT2
- Area available for expansion
- Project site
- Transmission substation
- Power stations
- Site Connection - Existing 132kV Overhead
- Site Waste Water Pipeline (Existing)
- Local cadastre
- World Imagery
- Low Resolution 15m Imagery
- High Resolution 60cm Imagery
- High Resolution 30cm Imagery
- Citations
- 2.4m Resolution Metadata

0 0.07 0.15 0.3 mi

0 0.1 0.2 0.4 km

Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Maxar

GNAALA KARLA BOOJA COUNTRY

Gnaala Karla Booja Country straddles the coastline running between Kwinana and Capel in Western Australia. This Country is bordered by the Ballardong People to the east, the Wagyl Kaip People to the south, and the Whadjuk People to the north. Gnaala Karla Booja land comprises one territory of the Noongar Peoples located in the southwest of Western Australia and, “refers to the Noongar language or dialectical groups of the **Binjareb / Pinjarup**, **Wilman**, and **Ganeang**” (Gnaala Karla Booja Aboriginal Corporation 2023).

In terms of rough spatial reference, the northeastern corner of Gnaala Karla Booja territory is located near Corrigin, and travels in a south-westerly direction past the western side of Wagin to Kojonup. The boundary then moves west across Boyup Brook and Greenbushes, then northwest towards Capel. The boundary extends from Capel west out into the ocean, then follows north along the coast, terminating due west of Byford over Kwinana and Garden Island.

As such, Gnaala Karla Booja Country features a large stretch of coastline in the southwest of Western Australia including Yalgorup National Park, as well as large swaths of native forests and woodlands further inland.

Gnaala Karla Booja Country is currently administered and managed under an Indigenous Land Use Agreement (ILUA), which was entered into on 17 October 2018 with the Federal Court (WI2015/005).

Previously, Gnaala Karla Booja Country was administered under a Native Title Claim (WC1998/058), granted in 1998 by the Federal Court (WAD 6274/1998 – Federal Court number). This claim was originally lodged on 17 September 1998 by the Noongar Land Council on behalf of Gnaala Kaala Booja applicants (Native Title Tribunal, 2000). This application was amended twice, and passed

the registration test under s190A of the Native Title Act 1993 on 3 March 1999 (Native Title Tribunal 2000).

This Native Title Claim was active until 2021, when Gnaala Karla Booja representatives entered into the South West Settlement Claim (WCD2021/010) with other Noongar Nations. The Act of entering this overarching claim rendered the original Native Title Claim established in 1998 void.

The South West Settlement Claim (also known as Bennell v State of Western Australia) affected the following Native Title Claims and Noongar Nations that signed onto the joint agreement:

- Harris Family (WC1996/041)
- Southern Noongar (WC1996/109)
- Yued (WC1997/071)
- Gnaala Karla Booja (WC1998/058)
- Wagyl Kaip (1998/070)
- Ballardong People (WC2000/007)
- Single Noongar Claim (Area 1) (WC2003/006)
- Single Noongar Claim (Area 2) (WC2003/007)
- South West Boojarah #2 (WC2006/004)
- Wagyl Kaip – Dillon Bay (WC2007/001); and
- Whadjuk People (WC2011/009)

In signing onto the joint claim, these respective Noongar Nations with their associated Native Title Claims agreed to extinguish their Native Title rights to their respective Native Title Claim areas (Federal Court of Australia, 2021). As such, the official decision handed down by the Federal Court was that Native Title does not exist in the claim area.

The ILUA that Gnaala Karla Booja hold over their Country (WI2015/005) has superseded their official Native Title Rights, however, it provides Gnaala Karla Booja with additional and ongoing management and community opportunities, as well as greater control over the activities that occur on Gnaala Karla Booja County.

This ILUA (in addition to those of the Noongar Nations mentioned above) binds State Government Departments and certain State

Government agencies to, “enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities (resource development) enter into the NSHA when conducting Aboriginal Heritage Surveys in ILUA areas” (DPLH AHIS 2023). The negotiation of a NSHA prior to any ground disturbance works provides the Gnaala Karla Booja People with critical information regarding the nature of these works and therefore allows the Gnaala Karla Booja People to make informed decisions regarding the projects occurring on their Country.

Landscape and waterways

The traditional lands of the Gnaala Karla Booja People are diverse and extend from the coast south of Kwinana approximately 200 km inland towards Wagin. Due to the diversity of the landscape within Gnaala Karla Booja Country, the traditional lands of the Gnaala Karla Booja People cross several of the Interim Biogeographic Regionalisation for Australia (IBRA) bioregions as defined by Thackway and Cresswell (1995). These IBRA bioregions include: SWA02 (Swan Coastal Plain), JAF01 (Northern Jarrah Forest), JAF02 (Southern Jarrah Forest), and AVW02 (Avon Wheatbelt) (TR ArcGIS 2023).

The project area discussed in this report is situated in the Swan Coastal Plain, which features a complex series of seasonal wetlands but is typified by a low-lying landscape covered with woodland. This bioregion covers an area of approximately 15,257 km^2 and spreads across a 30 km wide strip adjacent to the Indian Ocean and west of the Darling Scarp, running from the city of Perth to Cape Naturaliste in the south (Chisholm et al. 2016).

The ground surface within the Swan Coastal Plain varies, but includes colluvial and aeolian sands, alluvial river flats, and coastal limestone. The plain rises to the east to duricrusted Mesozoic sediments dominated by Jarrah (*Eucalyptus marginata*) woodland (Thackway and Cressell 1995). The outwash plains, once dominated by *A. obesa-marri* woodlands and Melaleuca shrublands, are extensive only to the south and Paperbark trees (*Melaleuca rhaphiophylla*) can typically be found in swampy areas (Thackway and Cresswell 1995). Heathlands and / or Tuart

(*Eucalyptus gomphocephala*) woodlands can be found situated over areas featuring limestone, while various *Banksia spp*. or Tuart tend to dominate the sandy soils (Thackway and Cresswell 1995).

Prior to European settlement, the Swan Coastal Plain comprised a series of freshwater wetlands, the majority of which have been drained, filled, or cleared since 1832 (Chisholm et al. 2016). Wetlands, estuary systems, and waterways existing in the Swan Coastal Plain and that are of significance to the Gnaala Karla Booja People include: the Serpentine River (DPLH ID 3582), Harvey Estuary / Peel Inlet (DPLH OHP ID 32696), Lake Cliffton, Lake Yalgorup, Lake Preston (DPLH OHP ID 5614), Kooallup Lagoon, the Collie River / Leschenault Inlet (DPLH ID: 16713: Collie River Waugal), as well as the coastline along this stretch of land itself.

Watersources are of a high cultural and spiritual significance to the Gnaala Karla Booja Traditional Owners as they are often associated with specific creation stories. The health of these waterways also often directly reflects the health of these creation spirits, and therefore the health of Country and the Gnaala Karla Booja People as a whole (Barber and Jackson 2011).

In addition to the Collie and Serpentine Rivers, one of the primary geographic features of this bioregion is the Swan River (DPLH ID 3536) which drains into the Indian Ocean near Perth. Although not located directly within Gnaala Karla Booja territory, the Swan River is a place of high mythological significance to the Noongar Nations of the southwest of Western Australia. Both the Swan and Canning Rivers are believed to have been created by the Rainbow Serpent or *Waugal*, a dreamtime being. The *Waugal* is said to have created the creeklines, waterholes, lakes, and valleys while on its journey to the ocean, and many First Nations People believe that permanent water sources contain a resting *Waugal* that usually bears the same name as the site it is associated with (Hughes-Hallet 2010; Kingsford 1982; Shaw and Martin 2011).

As such, water sources continue to play a crucial role in Gnaala Karla Booja culture, not just for their role as a subsistence source, but for being intrinsically tied to the very creation of the world as the Gnaala Karla Booja people know it.

Noongar culture and connection to Country

As previously discussed, the Gnaala Karla Booja People form one of Noongar Nations of the southwest of Western Australia. These Noongar Nations maintain a strong connection to Country, and each have their own customs, beliefs, and traditional practices still utilised today to ensure knowledge of Country is passed on to the younger generations, and that the overall health of Country is maintained.

Oral histories and lore are one of the key mechanisms utilised to maintain this knowledge. These lore stories speak of the connection between Country and the Noongar Peoples, and of how the Country was originally created by spirit beings. Noel Nannup, a Noongar man, speaks of how Noongar spirituality is intrinsically tied to Country by saying:

“Noongar spirituality lies in the belief of a cultural landscape and the connection between the human and spiritual realms. Everything in our vast landscape has meaning and purpose. Life is a web of inter-relationships where *maam* and *yok* (men and women) and nature are partners, and where *kura* (long ago, the past) is always connected to *yey* (present). Through our paintings, music, and *koroboree/kobori* (dance) we are paying respect to our ancestral creators, and at the same time, strengthening our belief systems. Noongar connection with nature and *boodja* (country) signified a close relationship with spiritual beings associated with the land. We express this through our caring for *boodja* and observing Noongar lore through an oral traditional of story-telling. Noongar spirituality is one of many *kaartdijin* (knowledge) systems within Aboriginal Australia, and like other knowledge systems, there is diversity in our Noongar interpretations.”

(Nannup sourced from SWALSC 2023a)

The beliefs, stories, and customs surrounding the Dreamtime are of a high cultural significance to the Gnaala Karla Booja Traditional Owners, and are intrinsic to Noongar spirituality, as Nannup mentioned above. The following excerpts and information regarding Noongar beliefs surround the Dreaming and Dreamtime spirits have been taken directly from SWALSC’s website (2023a) as one of the representative bodies for the Gnaala Karla Booja People.

"The Nyitting *or Dreaming means 'cold,' 'cold time' or 'ancestral times.' Noongar people know it as the Creation time. It is the time before time when spirits rose from the earth and descended from the sky to create the land forms and all living things.* Nyitting *stories laid down the lore for social and moral order and established cultural patterns and customs. Our Noongar Elders have the ability to comprehend the knowledge and to maintain it in an unchanging way. Noongar creation stories can vary from region to region but they are part of the connection between all living things."*

*"*Waugal *or* waug *means soul, spirit, or breath. The* Waugal *is the major spirit for Noongar people and central to our beliefs and customs.* Waugal *has many different spellings, including* Waakal*,* Wagyl*,* Wawgal*,* Waugal*,* Wogggal*, and* Waagal*. The* Waugal *is a snake or rainbow serpent recognised by Noongar as the giver of life*, *maintaining all fresh water sources. It was the* Waugal *that made Noongar people custodians of the land. Noongar people believe that the* Waugal *dominates the earth and the sky and makes the* koondarnangor *(thunder),* babanginy *(lightning), and* boroong *(rain)."*

"During the Nyitting*, it created the fresh waterways such as the* bilya/beelier *(river),* pinjar *(swamps, lakes), and* ngamma *(waterhole). The Darling Scarp represents the body of the* Waugal*, which created the curves and contours of the hills and gullies. As the* Waugal *slithered over the land, its track shaped the sand dunes, its body scoured out the course of the rivers, where it occasionally stopped for a rest, and created bays and lakes. The* Waugal *rose up from* Ga-ra-katta *(Mt Eliza at the foot of Kings Park), and formed the* Derbarl Yerrigan *and the* Djarlgarro Beelier *(the Swan and Canning Rivers). It also created other waterways and landforms around Perth and the south-west of Western Australia. The* Waugal *also joins up with wetlands such as Herdsman Lake and Lake Monger, and resides deep beneath underground springs."*

"When the great Waugal *created the* boodja*, he ensured that there was* wirrin *or spirits to look after the land and all that it encompassed. Some places such as the* karda *(hills), and* ngamar *(waterholes),* boya *(rocks),* bilya/beelier *(rivers) and* boorn *(trees) were created as sacred sites and hold* wirn *(spirits), both* wara/mambaritj *(bad) and* kwop *(good)."*

“Noongar spiritual obligations to our spirit ancestors are maintained according to the totems that live in our environment. Some examples of Noongar totems are jirda *(birds),* kwooyar *(frogs),* gooljak, kooljark, koolyak *(swans),* yoorn/yoondarn *(goannas) and* karda/caarda *(lizards). Every individual has a spirit totem or an animal which we have a responsibility for and must treat them with respect. We do not eat the animal of our totem. Children are still given totem animals today to look after and preserve. It is part of maintaining our cultural traditions and a connection to all living things.”*

As Noel Nannup explains, some regional variation exists within these beliefs amongst the different Noongar Nations. The importance of Country, however, and the intrinsic connection between Country, spirituality, and the People, is ever present and highly significant.

Legacy post-contact

Perth was officially settled in 1829, and the early contact between Aboriginal people and European settlers had mixed outcomes (WAM 1979). Some interactions were positive, with Aboriginal People often assisting Europeans during the early years of settlement, guiding pastoralists and settlers to various water sources and resources (Hughes-Hallet 2010). Certain supplies, such as tea, tobacco, and sugar were used as payment for the assistance of the Noongar Nations (Chisholm et al 2016). Berndt (1979) notes that the practise of paying Aboriginal People with supplies or rations altered traditional lifestyles resulting in increased interaction of both populations and an exchange of knowledge and culture.

Many interactions, however, were not positive. Several conflicts occurred over land seizure and dispossession between southwest Aboriginal populations and European settlers which resulted in extreme violence towards Aboriginal populations, including several massacres. One such massacre occurred at Pinjarra on Gnaala Karla Booja Country on 28 October 1834.

The Pinjarra massacre resulted in the deaths of 15 to 80 Binjareb People and one British colonist (Harris 2010). The encounter was led by Captain James Stirling who gathered a party of policemen,

soldiers, and settlers, and headed out to Pinjarra in retaliation against Binjareb resistance to the spread of European colonisation in the area (Curthoys and Konishi 2022). Stirling led his party to surround a Binjareb camp, where they surrounded and ambushed Binjareb People along a river, resulting in the deaths of anywhere from 15 to 80 Binjareb men, women and children (Cuthoys and Konishi 2022). Several other massacres occurred in the southwest of Western Australia but were not as well documented as the one that occurred at Pinjarra in 1834 after backlash from the British Parliament against the actions of Stirling and his men.

As European populations continued to grow, Aboriginal populations were slowly pushed off their traditional lands, and a greater demand for labour saw Traditional Owners often employed at various settlements such as pastoral stations (Berndt 1979). Noongar men often became wage labourers such as station hands and drovers while Noongar women typically performed unpaid or poorly paid domestic tasks within the household or camp (Chisholm et al. 2016; Hodson 1993).

Additionally, the establishment of various government policies saw a large number of Noongar children forced onto missions such as New Norcia to the north-northeast of Perth (Chisholm et al. 2016). Missions were run in conjunction with government legislation, ensuring the removal of children from their parents and placement in institutions for educational purposes that would ultimately feed viable workers back into the labour market (Chisholm et al. 2016; Kidd 1997). Many of the missions were marred by abuse, still functioning up until the 1960s in some areas (Chisholm et al 2016; Kidd 1997).

Margaret Gentle, a Noongar woman, recalls her experiences of the Wandering Mission:

> "There's a lot of old people who have been through there (Wandering Mission) over the years and their spirits will come back to that place. Sometimes, we will talk about that…we won't talk about that in

the night time though. Yes, it had everything. Wandering has everything and there was sadness there too… Yes, there was that too and there's those old people who died and who keep coming back to see their children. Their spirits keep coming back. A lot of children were there before I went there [with Joe Walley in the 1970s]… Yeah, God only knows what happened before me and Joe got there."

(SWALSC 2023)

These Acts and policies were designed to remove Noongar People from their culture and traditions, and continue to have far-reaching effects on Noongar identity and society today. Various programs are in place, however, to re-generate cultural and intergenerational learning amongst the Gnaala Karla Booja People. The South West Land and Sea Council is currently working in collaboration with the Association of Independent Schools of WA to develop learning materials to be introduced into the curriculum surrounding Noongar knowledge, stories, culture, and history (SWALSC 2023c).

SWALSC has also been working in collaboration with Noongar Elders to form the Noongar Leadership Business Unit which has five core branches being the Noongar Leadership Directory, Walk with Us – Partnerships, Program Development and Delivery, Accreditation, and Evaluation (SWALSC 2023d). This business unit delivers a range of community programs aimed at transferring knowledge surrounding Noongar culture and traditional practices. These programs also focus on training Noongar People in leadership and specific community-based roles that serve to strengthen the community overall and provide Noongar People with a stronger voice when making decisions about the works and activities that are occurring on their Country.

DESKTOP METHOD

Registered Aboriginal sites are heritage places that have been assessed by the ACHC as constituting **sites** under sections 5 and 39 of the Act.

Other heritage places include places for which data has been **lodged** with the DPLH but are pending assessment by the ACHC, and places that have already been assessed by the ACHC as not constituting an Aboriginal site under the meaning of the Act (listed as **historic data / not a site**).

A desktop assessment was completed to understand the extent of heritage research undertaken to date within the project area. This research relies largely on the Aboriginal Cultural Heritage Directory maintained by the DPLH, which is a catalogue of previously recorded heritage places and prior heritage surveys within the area and submitted to the DPLH.

A shapefile of the scoped project area (Lot 13) was entered into the DPLH's Aboriginal Cultural Heritage Inquiry System (ACHIS) to learn whether any heritage surveys have previously been conducted and whether any sites are known to exist in the area.

Relevant site files and survey reports were requested from the DPLH for review, and where possible were reviewed and summarised to provide an understanding of the cultural landscape context of the project area. These reviews considered the following points:

- Whether Traditional Owners were present during the survey;
- the year a heritage survey took place;
- the scope of works informing the purpose of the survey;
- the fieldwork methodology applied during the survey;
- the results of the fieldwork; and
- the recommendations made for management of any heritage values identified.

Some of the information held by the DPLH was not accessible due to file restriction or delays due to the DPLH's administrative processes. In such cases, the inability to access information is noted in the heritage assessment results for the relevant ACH.

Any other relevant unpublished material (such as heritage reports not registered with the DPLH) was also reviewed where available and included in the heritage assessment results where relevant.

The results of the desktop assessment are provided in the 'Desktop Assessment Outcomes' section below.

Assessing risk

Following an examination of previous works conducted in the area and the heritage places known to exist in the area, the project area was designated with a ‘risk rating’, to indicate if the area had low, moderate, or high likelihood of containing cultural materials.

A predictive modelling technique was utilised to inform this risk rating, combining the body of archaeological and ethnographic research undertaken in the region with geological data, historical vegetation data, and hydrological information. Information about historical disturbance to the project area was also taken into consideration.

Common site types in the landscape surrounding the project area include artefact scatters (commonly comprising quartz artefacts and commonly recorded surrounding permanent or ephemeral water sources), scarred trees, historic camp or reserve areas, and landforms associated with dreaming narratives.

Areas defined as being of **high risk** were determined by proximity to known sites and landforms associated with known site types. Areas are also of a higher risk of containing cultural material if they have been relatively undisturbed or if there is recorded ethnographic commentary relating to specific historic use of the area, associated stories, or dreaming narratives.

Moderate risk areas were defined by their proximity to high risk areas, as well as by the potential for these areas to represent spaces where ancestral Gnaala Karla Booja people moved between key landscape features. Additionally, weight was given to areas situated within flood ways, where objects may have collected following inundation events.

Low risk areas were defined by their low likelihood of containing cultural material. These areas are located further from key landscape features or have been heavily disturbed by historic industry or development.

The results of this risk assessment are presented in the results maps in the ‘Desktop assessment outcomes’ section of this report and are explained further in the ‘Discussion’ section below.

LEGISLATION

Aboriginal Heritage Act 1972

Aboriginal and Torres Strait Islander Heritage Protection Act 1984

Information contained within this report has been developed in primary consideration of the amended *Aboriginal Heritage Act 1972*. The AH Act provides statutory protection to Aboriginal heritage places in Western Australia, as well as a statutory pathway for development activities that may cause harm to Aboriginal heritage sites.

Consideration is also given to the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHPA), which is Federal legislation that may provide additional protection for areas and objects of particular significance to Aboriginal and Torres Strait Islander people.

DESKTOP ASSESSMENT OUTCOMES

At the completion of the desktop survey, the following results were identified in relation to the Project Area:

- **No** ACHIS registered Aboriginal sites are located within the Project Area;
- **no** other places of Aboriginal cultural heritage are currently known to exist within the Project Area;
- **five** ACHIS registered previous surveys were found to intersect the Project Area and of these,
    - **four** were broad scale reports covering a large portion of the Perth Metro area that did not contain specific reference to the Project Area, and
    - **one** survey (regarding Kwinana Quay) was fine grain but unable to be accessed at the time of reporting; and
- **one** identified heritage report not listed on ACHIS is deemed relevant to the Project Area.

Several environmental reports supplied by Western Energy were also reviewed for consideration of heritage values for this report. These results are illustrated in the below maps of the KSPS Project Area. Following from analysis of these results, the Lot 13 KSPS project area was determined to be at **low risk** of containing Aboriginal cultural heritage. An examination and discussion of these results and their associated implications in relation to the project area are extrapolated in the Discussion and Recommendations sections below.

Limitations

Western Energy should note that previously identified heritage sites may exist within the Project Area that have not been registered on ACHIS, and as such, are not reflected in the ACHIS search results. Heritage sites may also exist within the Project Area that have not

yet been identified. As such, Western Energy should note that the results of this desktop assessment are not infallible and have been provided in good faith with the knowledge available at the time of assessment.

The identification of heritage sites is also often directly related to areas where targeted heritage surveys have taken place. As such, if survey coverage has been ‘patchy’ or too broadscale, there is increased likelihood that there are heritage sites present within the survey area that are not reflected in the ACHIS search results.

The predictive modelling techniques used to predict risk can be a powerful planning tool but carry several intrinsic limitations. First, the availability and quality of existing archaeological site data is likely to be biased toward more easily discovered or studied sites. For example, surface artefact scatters may be the most commonly encountered site type in the region because subsurface cultural material is rarely unearthed except for accidental disturbance. Secondly, past archaeological research was often undertaken without consulting the relevant Traditional Owner group on whose land sites were located. Ignoring the input and expertise of Indigenous communities’ risks producing models that lack cultural sensitivity or relevance. A collaborative approach involving Indigenous communities and centred on the principal of informed consent can mitigate some of this risk.

Known Heritage Sites in Surrounding Area of Proposed Project Area

Job №: GKB2402 **Coordinate System: GDA94 MGA Zone 50**

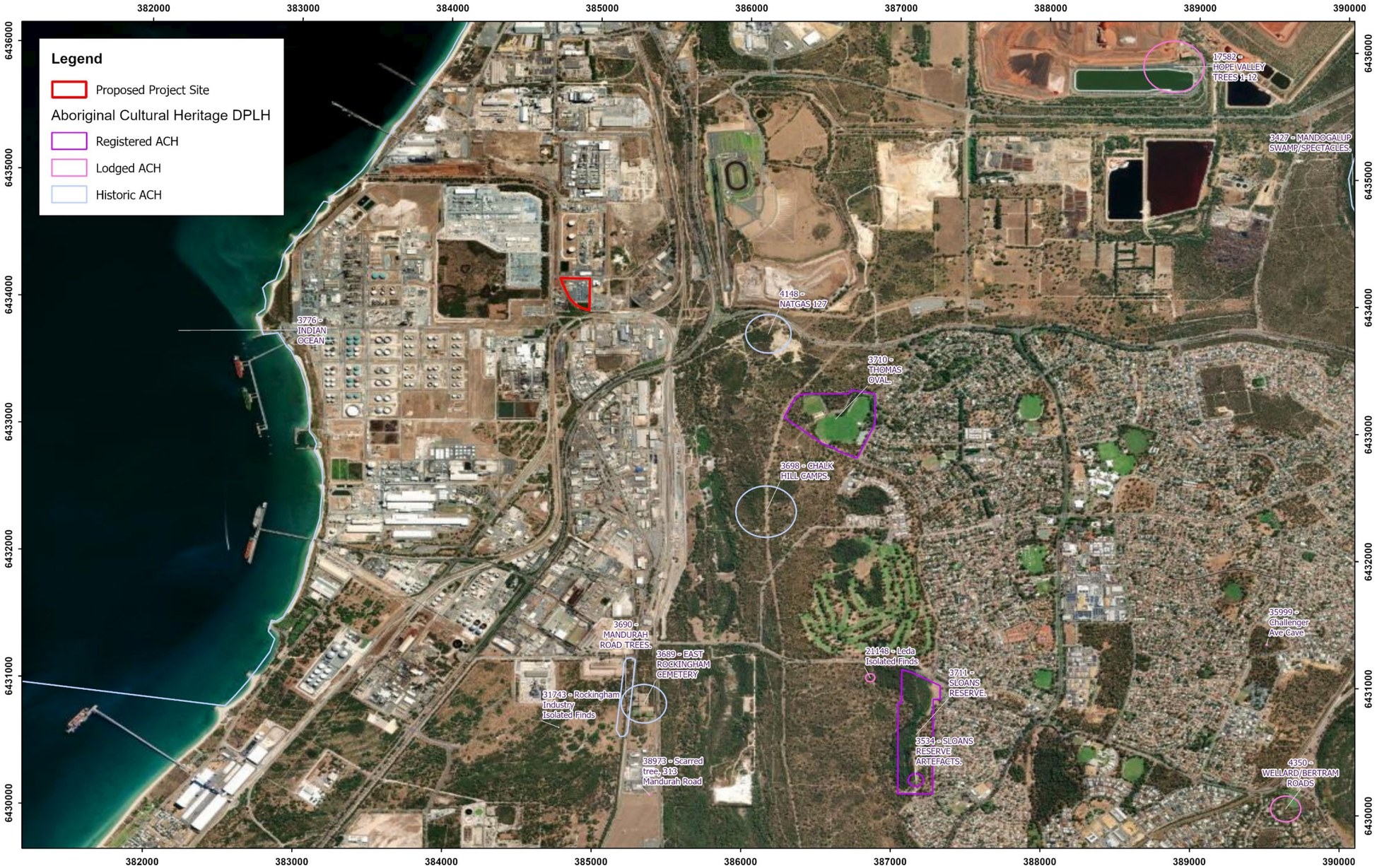
Date: 29/11/2024 **Author:** HernandoTangjaya

Disclaimer: The information in this map is accurate as at the date of issue. Spatial accuracy level of +/- 15m unless otherwise noted.

N

Scale
1:27,000
0 0.25 0.5 1 1.5
Kilometers

TERRA ROSA CONSULTING



Proposed Project Site Map

Job №: GKB2402 **Coordinate System: GDA94 MGA Zone 50**

Date: 29/11/2024 **Author:** HernandoTangjaya

Disclaimer: *The information in this map is accurate as at the date of issue. Spatial accuracy level of +/- 15m unless otherwise noted.*

N

Scale
1:7,000
0 0.25 0.5
Kilometers

TERRA ROSA CONSULTING

DISCUSSION

Of the different survey reports reviewed for this report, the 2008 ethnographic investigation undertaken by O'Connor and archaeological investigation undertaken by Quartermaine in the same year are the most directly relevant. These reports were not listed on the ACHIS database and were supplied to Terra Rosa by Western Energy. These investigations were undertaken prior to the initial construction of the Power Station and noted the high level of previous ground surface disturbance visible at Lot 13. O'Connor reviewed previous publications, including those of early anthropologists Hammond, Bates, and Tindale, and found no direct references to the project area. The site was physically inspected by Quartermaine, who noted that the extensive ground disturbance would leave little likelihood for any Aboriginal cultural material to remain in situ. Neither O'Connor nor Quartermaine consulted with Gnaala Karla Booja people during their investigations and both recommended that no further heritage investigation be required prior to construction of the Power Station due to the low likelihood for the presence of Aboriginal sites or cultural material.

Review of the heritage reports listed on ACHIS found five that intersect the project area. Of these, two relate to the same broadscale ethnographic investigation undertaken by Machin in 1994, covering the area from Rockingham to Two Rocks and extending into the Indian Ocean to the west and the Darling Scarp to the east (Machin 1994a, Machin 1994b). Two other reports are similarly broad in scope, covering much of the Perth Metropolitan area, and don't contain any specific references to the project area (O'Connor 1985, University of Western Australia 1971). One report (Fisher 2008) covers a roughly six km stretch of the coast, extending back to Rockingham Road, with the Lot 13 project area being situated in its southernmost extent. This report was unable to be accessed at the time of reporting due to administrative delays associated with requesting files from the DPLH. The Fisher report may contain relevant contextual information for the broader area, but as it was published in the same year as the Quartermaine and O'Connor investigations and covered a much broader area, it's unlikely to supply any directly relevant information not explored by Quartermaine and O'Connor.

No registered sites or OHPs (lodged sites or historic data) were found to intersect the Project Area when the Lot 13 shapefile was input to ACHIS. There are, however, several OHPs and registered places within two kilometres of the Project Area. NATGAS127 (DPLH OHP ID 4148) is located 1.1 km east-southeast of Lot 13 and was discussed in Quartermaine's 2008 analysis of the project area. At the time of recording, the site comprised calcrete artefacts situated in a quarry area, but due to the site's historic status it is unclear whether those features have been impacted or are still in situ. Further to the southeast is registered site Thomas Oval (DPLH ID 3710), a camping ground utilised by local Aboriginal people in the 1920s, located 1.6 km from the project area. Another historic site, Chalk Hills Camp (DPLH OHP ID 3698), is located 1.8 km southeast of the project area. This camping ground was utilised in the 1950s and 1960s

during a period of relocation from farms to urban environments and is also of note as one of the last places that a local council bulldozed an Aboriginal family's accommodation and property (c. 1960s). Notably, the Chalk Hill Camp is associated with a string of freshwater lakes. 1.9 km to the west of the project area, a section of the Indian Ocean is represented by historic site Indian Ocean (DPLH OHP ID 3776).

Analysis of pre-contact vegetation and significant landforms can speak to the ways that ancestral Gnaala Karla Booja people utilised and moved across the landscape and can inform predictions of where cultural material may persist. Historic vegetation data indicates that around the time of European contact, the project area existed as a mixed coastal heath landscape scattered with tall shrubs (*Acacia spp., Proteaceae, and Myrtaceae*). Beginning roughly half a kilometre further inland from the project area, taller Myrtaceae like Jarrah and Marri would have become more dominant. Ancestral Gnaala Karla Booja people moved between seasonally available resources in the hills and coastal plains, often following stream courses between nodal camping places centred around sources of permanent water (Hallam 1975). Ethnohistorical accounts from the early 1800s describe local Aboriginal groups coming down from a winter season in the hills and gathering in larger groups to camp around permanent or semi-permanent fresh water sources on the coastal plain in the summer (University of Western Australia 1971). There are no such fresh water sources immediately proximate to the project area- the closest significant water sources are Paperbark Swamp (5 km to the east), Bollard Bulrush Swamp (6 km southeast), and Long Swamp (7.7 km northeast). These places are far more likely to have supported the lifeways of Aboriginal people moving through the landscape, and it is unlikely that long-term habitation would have been supported at the project area.

The ground's surface within the project area comprises a white, calcareous, fine to medium-grained sand known as Safety Bay Sand (Golder Associates 2007). Gnaala Karla Booja people have memories and oral histories of burials in coastal sand dunes, and there is some limited possibility that one such internment exists within the project area. There are several known burials of this type in the area at the registered Thomas Road site (DPLH ID 38661) 7 km to the east of the project area and the lodged Rockingham burial site (DPLH ID 22889, file unable to be accessed) located 9.5 km to the southwest. If a burial is encountered during the course of the proposed works, an immediate stop-works procedure should be triggered and both the Western Australian Police (in following with state law) and the Gnaala Karla Booja Aboriginal Corporation should be notified.

The environmental reports provided by Western Energy supply a detailed history of land use within the project area and describe significant disturbance to the ground's surface. Unsealed roads are visible in aerial photographs as early as 1953, and the project area was utilised for the crushing of blast furnace slag by CSR Readymix between 1970 and up to at least 1997 (Golder 2007). Quartermaine also notes the extensive disturbance in his 2008 report, reporting that the full extent of Lot 13 has experienced surface disturbance. Following his conclusions, it is highly improbable that any Aboriginal cultural material remains that may have once existed

on the ground's surface. As the level of subsurface disturbance is unclear, however, there is still some level of risk for subsurface cultural material to remain.

Due to the extensive levels of historic and recent disturbance, the lack of accessible fresh water or other significant landforms, and the lack of remnant vegetation, the Lot 13 project area has been designated as **low risk** for containing Aboriginal cultural heritage that may be harmed by the proposed power station upgrades. To mitigate the remaining risk of accidental disturbance to subsurface materials or a burial place, a comprehensive stop-works procedure should be drafted and any contractors or employees working at the site be made aware of potential risks to Aboriginal cultural heritage. The Gnaala Karla Booja Aboriginal Corporation should also be contacted before any works begin and supplied with details of the proposed works to ensure clear and open communication as the project moves forward.

RECOMMENDATIONS

Western Energy is advised that following review of available data, the Lot 13 project area is considered to be at low risk of containing Aboriginal cultural material or sites

1

The desktop analysis for the KSPS expansion project weighed available archaeological, ethnographic, and environmental reports alongside geological, hydrological, and historic vegetation data to find a very low likelihood of the presence of cultural material at the project area. No further archaeological or ethnographic investigation is considered to be necessary. While low, risk is not non-existent, and the following recommendations outline further risk management and mitigation to be implemented.

Western Energy is advised to liaise with Gnaala Karla Booja Aboriginal Corporation (GKBAC) prior to the commencement of the proposed works

2

As no direct consultation with Gnaala Karla Booja occurred during the initial heritage investigation for the KSPS, it is recommended that Western Energy contacts GKBAC to supply information about the planned works and provide opportunity for comment. The establishment of an open line of communication prior to the beginning of works will greatly assist in the event cultural material is encountered during works.

Western Energy is advised to design and implement a comprehensive stop-works procedure to be triggered if any cultural heritage material is encountered during the course of the proposed works

3

This stop-works procedure will ensure that any accidently uncovered or disturbed cultural materials are appropriately identified and managed. In the case of discovery of human remains, both the Western Australia Police and GKBAC should immediately be notified.

BIBLIOGRAPHY

Australia ICOMOS 2013, *The Burra Charter: The Australia ICOMOS charter for places of cultural significance 2013*, viewed 16 January 2024, http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf

Barber, M., and Jackson, S., 2011, *Indigenous water values and water planning in the Upper Roper River, Northern Territory*, CSIRO: Water for a Healthy Country National Research Flagship.

Berndt, RM. and Berndt, C., 1979, *Aborigines of the west: their past and their present,* 1st ed, University of Western Australia Press for the Education Committee of the 150th Anniversary Celebrations, Nedlands, W.A.

Chisholm, S., Coutant, D., Howard, C., and O'Brien, J., 2016, *Report detailing a desktop heritage assessment of Wungong Cell H held by Exal Group Pty Ltd, conducted by Terra Rosa Consulting for People Places Planet*, accessed 9 February 2023 from <https://developmentwa.com.au/docs/planning-and-approvals/planning-documents/wungong-urban/precinct-17-h/20220407-Appendix-08---Aboriginal-Heritage-Assessment.pdf>.

Collard, L., M., 2005, '*Djidi Djidi, Wardong, Kulbardi, Walitji and Wetitj: Nyungar Dream Time Messengers*', Westerly: the best writing from the west vol 54, issue 2, pp. 7-27.

Commonwealth of Australia 2002, A*ustralian Natural Heritage Charter 2002*, 2nd edn, viewed 16 January 2024, http://www.environment.gov.au/heritage/ahc/publications/commission/books/pubs/australian-natural-heritage-charter.pdf

Curthoys, A., and Konishi, S., 2022, '*The Pinjarra Massacre in the Age of the Statue Wars'*, Journal of Genocide Research, Vol 24, no. 4, pp.511-528.

Federal Court of Australia, 2021, *Bennell v State of Western Australia* [2021] FCA 1508, accessed 7 February 2023 from <https://www.judgments.fedcourt.gov.au/judgments/Judgments/fca/single/2021/2021fca1508>.

Gnaala Karla Booja Aboriginal Corporation, 2023, About the Gnaala Karla Booja Aboriginal Corporation, accessed 9 February 2023 from <https://gkb.org.au/about-the-corporation>.

Harris, J., 2010, '*Memorials and Trauma: Pinjarra 1834'* in Broderick, M., and Traverso, A., 2010 *Trauma, Media, Art: New perspectives*, Cambridge Scholars Publishing, pp. 36-60.

Hodson, S., 1993, *'Nyungars and Work: Aboriginal experiences in the rural economy of the Great Southern Region of Western Australia' Aboriginal History*, vol. 17, pp. 73-92.

Hughes-Hallett, D., 2010, *Indigenous history of the Swan and Canning rivers*, paper prepared for the Curtain University.

Kidd, R., 1997, *The way we civilise: Aboriginal affairs – the untold story*, St Lucia, Queensland University of Queensland Press.

Kingsford, R., 1982, *Yamadyi law: the continuing significance of traditional Aboriginal culture in the Murchison region, Western Australia.*

Native Title Tribunal, 2000, *Registration Test – Reasons for Decision (Web edited version), Decision – Gnaala Karla Booja* – WC98.58, accessed 7 February 2023 from

<http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/Pages/details.aspx?NTDA_Fileno=WC1998/058>.

Nannup, N., 2011, Noel Nannup – *A Nyoongar perspective on spirituality,* Youtube, Available online from: https://www.youtube.com/watch?v=2-k3WGOar_4

Terra Rosa ArcGIS 2023, accessed online from https://trco.maps.arcgis.com/apps/webappviewer/index.html?id=456f7b8975bb44b4b40200fd08ffef42 >.

Thackway, R., and Cresswell, I., D., 1995, *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves*, Version 4.0, Australian Nature Conservation Agency, Canberra.

Shaw, B., C., and Martin, J., 2011, *Joan Martin (Yarma): a Widi woman*, Aboriginal Studies Press, Acton, ACT.

SWALSC 2015. Retrieved from httpp://www.noongar.org.au/noongar-people-history.phb SWALSC 2023a, Spirituality, accessed 9 February 2023 from <https://www.noongarculture.org.au/spirituality/>.

SWALSC 2023b, About the Gnaala Karla Booja Region, accessed 27 February 2023 from <https://www.noongarculture.org.au/gnaala-karla-booja/>.

SWALSC 2023c, Education, accessed 28 February 2023 from https://www.noongarculture.org.au/education/>.

SWALSC 2023d, *Noongar Leadership*, accessed 28 February 2023 from < https://www.noongarculture.org.au/leadership-learning/>.

Western Australian Museum (WAM) 1979, *Dampier to Perth gas pipeline route: a survey of Aboriginal sites,* Unpublished report prepared for the State Emergency Commission by the Department of Aboriginal Sites of the Western Australian Museum.

Legislation

Aboriginal Heritage Act 1972 (Western Australia), viewed 29 November 2024, http://www.austlii.edu.au/au/legis/wa/consol_act/aha1972164/

Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth of Australia), viewed 29 November 2024, http://www.comlaw.gov.au/Details/C2010C00807

Relevant reports

Environ Environmental Referral, 2008, *Kwinana 120 MW Open Cycle Gas Turbine Peaking Power Plant*, for Western Energy Pty Ltd

Fisher, Stuart, 2008, *Report on an Aboriginal Heritage Survey of the proposed Kwinana Quay, Town of Kwinana / City of Cockburn, WA,* DPLH ID 23099. (not accessed due to administrative delays).

Golder Associates Pty Ltd, 2007, *Report on Baseline Environmental Site Assessment Corner Donaldson Road and Burton Road Kwinana*, for Perth Energy.

Hallam, S. J., 1975, *Fire and Hearth,* Canberra: Australian Institute of Aboriginal Studies.

Machin, B., 1994, *Ballaruk (Traditional Owners) Aboriginal Site Recording Project*, prepared for National Estates Program, Heritage Council of Western Australia. DPLH ID 21817.

Machin, B., 1994, *Ballaruk (Traditional Owners of Whadjuk Territorial Boundaries the Lands of the Ballaruk Peoples) Aboriginal Site Recording Project: Additional Material,* prepared for National Estates Program, Heritage Council of Western Australia. DPLH ID 21818.

O'Connor, R., 1985, *Preliminary Report on the Survey of Aboriginal Areas of Significance in the Perth Metropolitan & Murray River Regions*, DPLH ID 102670.

O'Connor, R., 2008, *Report on an Ethnographic Analysis of a Proposed Power Station Site at Kwinana.* Unpublished report prepared on behalf of Perth Energy Pty Ltd.

Quartermaine, G., 2008, *Report on an Archaeological Investigation for Aboriginal Sites Proposed Perth Energy Kwinana Combined Cycle Power Station Site.* Unpublished report prepared by Quartermaine Consultants on behalf of Perth Energy Pty Ltd.

University of Western Australia Department of Anthropology, 1971, *An Archaeological Survey Project the Perth Area, Western Australia*, prepared for the Australian Institute of Aboriginal Studies, DPLH ID 103564.

APPENDICES

Appendix A – Project contacts

Appendix B – Acronyms and definitions

Appendix A – Project contacts

The contact details of the heritage project stakeholders are provided below.

Terra Rosa Consulting

Address	45 Wood Street, Fremantle, WA 6160
Email	info@trco.com.au
Report authors	Anna Swenson
Editor	Ibrahim Omeri
Executive sign-off	Scott Chisholm

Western Energy Pty Ltd

Contact	Jeff Barham (jbarham@ramboll.com)
Address	41 St Georges Terrace, Perth WA 6000

Appendix B – Acronyms and definitions

The following terms and acronyms are used in this report. Definitions are provided below for reference

Term / abbreviation	Definition
Aboriginal object	An object that is a tangible element of Aboriginal cultural heritage, to which the AH Act applies under section 6.
Aboriginal place / heritage place / heritage site	An area in which tangible elements of Aboriginal cultural heritage are present. Note: heritage place / heritage site may be used interchangeably with Aboriginal place throughout this report.
ACH	Aboriginal Cultural Heritage
AH Act	*Aboriginal Heritage Act 1972 (WA)*
ACHC	Aboriginal Cultural Heritage Council
ACHIS	Aboriginal Cultural Heritage Information System
ACHknowledge	The DPLH's online submission portal for their Directory of ACH.
CHMP	Cultural heritage management plan.
Cultural landscape	A group of areas interconnected through tangible and/or intangible elements of Aboriginal cultural heritage.
DPLH	Department of Planning, Lands and Heritage
GIS	Geographic information system
GPS	Global positioning system
Historic ACH	Historic ACH are heritage places classified by the DPLH as: • An archived boundary for a heritage place; or • A heritage place that did not meet the definition of an Aboriginal site under the meaning of s5 of the *Aboriginal Heritage Act 1972*. This evaluation may have been undertaken regardless of the significance placed on the site by the Traditional Owners. In some instances, where no developmental works have impacted on or destroyed those places, heritage values associated with stored OHPs may still remain in situ.
Isolated artefacts	Cultural material with insufficient density or context to constitute a Aboriginal place / heritage place / heritage site, but is recorded at the request of the Traditional Owners.
Lodged ACH	Lodged ACH are heritage places that have been submitted to the DPLH for consideration under s5 and s39 of the AH Act, but have not yet been evaluated by the ACHC for registration.
MGA	Map grid of Australia
NNTT	National Native Title Tribunal
Registered ACH	Registered ACH are heritage places that have been evaluated by the ACHC and have been assessed as meeting the requirements for registration under s5 and s39 of the AH Act.
Terra Rosa	Terra Rosa Consulting
Traditional Owners	Marlinyu Ghoorlie native title claimants (NNTT no WC2017/007) and invited survey participants / representatives. Marlinyu Ghoorlie members include Karlamaya, Karlaku and/or Kapurn people, and may also be referenced in this way throughout this document.

Copyright

This document is copyright. As such, no portion of this document may be reproduced or copied in any form, or by any means, without prior written permission from Terra Rosa Consulting except as permitted under the *Copyright Act 1968* (Cwlth). Notwithstanding this, HanRoy may use this material for the purposes of employee awareness and make enough copies for internal use.

Disclaimer

The information, opinion, ideas, and recommendations presented in this document is partly based on the experience of the authors, research, and recognised procedures, which are believed to be accurate, but not infallible. The advice contained herein is given in good faith and follows acceptable professional standards and procedures, but is not meant to encourage any activity, practice or exercise, which may have ceased, changed or have been superseded for any reason without the knowledge of the authors. The authors assume no responsibility or liability for any loss or damage caused directly or indirectly by the information presented in this document.

Version Control

Version	Date	Change Log	Author(s)
0.1	09/12/2024	Document drafted	A. Swenson
0.2	12/12/2024	Document edited	I. Omeri
0.3	17/12/2024	Document updated	A. Swenson
0.4	19/12/2024	Document reviewed	D. Monks
1.0	6/02/2025	Feedback addressed	A. Swenson

Appendix 2

Greenhouse Gas Management Plan

KWINANA SWIFT POWER STATION EXPANSION PROJECT

GREENHOUSE GAS MANAGEMENT PLAN

DOCUMENT ID: AGL-KSX-EMP-01

25 March 2025
PREPARED FOR AGL ENERGY LIMITED
BY PRESTON CONSULTING PTY LTD

Proponent contact details:

WESTERN ENERGY PTY LTD

Contact Person: Jay Halai
Email: j.halai@perthenergy.com.au
Phone: (08) 9420 0300
Street Address: 221 St Georges Terrace, Perth WA 6000

Document developed by:

PRESTON CONSULTING PTY LTD

Contact Person: Gavin Edwards
Email: gedwards@prestonconsulting.com.au
Website: www.prestonconsulting.com.au
Phone: 0488 737 273
Street Address: Level 1, 226 Adelaide Terrace, Perth WA 6000
Postal Address: PO Box 3093, East Perth, Western Australia, 6892

Disclaimer:

This Report has been prepared on behalf of and for the exclusive use of Ramboll Australia Pty Ltd and is subject to and issued in accordance with the agreement between Preston Consulting Pty Ltd and Ramboll Australia Pty Ltd.

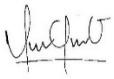
Preston Consulting Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this Report by any third party.

Copying of any part of this Report without the express permission of Preston Consulting Pty Ltd and Ramboll Australia Pty Ltd is not permitted.

ACKNOWLEDGEMENT OF COUNTRY

In the spirit of reconciliation, Western Energy Pty Ltd and Preston Consulting Pty Ltd acknowledge that this Project is proposed on the lands of the Whadjuk People of the Noongar Nation. We recognise their rich culture and their continuing connection to land and waters, and pay our respects to their Elders past, present and emerging.

DOCUMENT CONTROL

Document Title	Kwinana Swift Power Station Expansion Project - Greenhouse Gas Management Plan		
Document Number	RAM-KSX-EMP-01		
Revision Number	0		25/03/2025
Status	Final draft		
Authors	Marilyn Quintero - Preston Consulting Pty Ltd		25/03/2025
Checked	Gavin Edwards - Preston Consulting Pty Ltd		25/03/2025
Approved	Marc Barendrecht Ramboll Australia Pty Ltd		25/03/2025
Authorised	Jay Halai Western Energy Pty Ltd		25/03/2025

Confidential

1 EXECUTIVE SUMMARY

Western Energy Pty Ltd (Perth Energy), a subsidiary of AGL Energy Limited (AGL), is proposing to construct and operate the Kwinana Swift Power Station Expansion Project (Proposal). The Kwinana Swift Power Station (the existing plant) is comprised of four gas-fired turbine generator units coupled to two electrical generators, with a generation capacity of 120 Megawatts (MW). The Proposal is for the expansion of the existing plant by up to four additional gas fired turbine generator units, increasing the plant generation capacity to 370 MW.

The Proposal will provide peaking power supply for the South West Interconnected System (SWIS) to support the State Government's objectives to decarbonise the network. The Proposal will supply reliable and flexible electricity to the SWIS, necessary to satisfy demand fluctuations resulting from increasing renewable penetration in the SWIS.

Greenhouse Gas (GHG) emissions from the Proposal will be assessed by the Environmental Protection Authority (EPA), as emissions are predicted to exceed the 100,000 tonnes (t) per annum threshold for carbon dioxide equivalent (CO_2-e) outlined within the EPA's *Greenhouse Gas Emissions Factor Guideline* (GHG Guidelines) (EPA, 2024).

This GHG Management Plan (GHGMP), while not explicitly required by the EPA, has been developed to provide detailed information required for the EPA's assessment of GHG impacts from the Proposal under Part IV of the *Environmental Protection Act 1986* (WA). This approach is consistent with the EPAs GHG Guidelines (EPA, 2024). A summary of the Proposal details and the GHGMP are provided in Table ES1.

Table ES1: Summary of GHGMP

Proposal name	Kwinana Swift Power Station Expansion Project
Proponent name	Western Energy Pty Ltd
Proposal description and scope	Construct and operate an expansion to the existing Kwinana Swift Power Station, comprising up to four additional gas fired turbine units coupled to two electrical generators, which increase generation capacity from 120 MW to up to 370 MW. The Proposal is located in Kwinana, WA.
Purpose of this GHGMP	To provide the Proposal GHG emissions estimates and management and monitoring measures to demonstrate that GHG emissions will be reduced over the life of the Proposal, in accordance with the EPA's objective outlined in the GHG Emissions Environmental Factor Guideline (EPA, 2024).
Emissions estimates	**Construction Emissions** Construction activities required for the Proposal are minor and relate primarily to the movement of light vehicles and assembly of infrastructure over a relatively short period. Emissions from these activities are not expected to be material and therefore have not been included in the GHG emissions estimates. **Operational Emissions** **Scope 1:** 195,659 t CO_2-e per annum (/a) on average 5,869,763 t CO_2-e over the life of the Proposal **Scope 2:** 530 t CO_2-e/a on average 11,660 t CO_2-e total over the operation period **Scope 3:** 22,937 t CO_2-e /a on average 688,122 t CO_2-e over the life of the Proposal

Trajectory of emissions reductions	The Proposal will provide peaking power supply for the SWIS to support the state Governments objectives to decarbonise the network. The demand for electricity from the Proposal is based on a number of factors, such as consumers, environmental conditions and the rate at which coal and diesel based power generation is retired and build-out of new solar and wind generation. There is therefore uncertainty about the Proposal's operational throughput and resulting emissions trajectory. The emissions trajectory presented in this GHGMP has been calculated based on consumer demand projections and grid demand, factoring in the retirement of old technology. Demand for power from the Proposal will fluctuate but will be enduring and persist beyond 2050. The Proposal will satisfy an electricity demand that would otherwise be satisfied with less efficient technology (coal or diesel), therefore the overall reduction in emissions from the SWIS will be significant in comparison to the current operating scenario. The Proposal will present a low emissions intensity power generation option compared to current technology. If the retirement of old technology is expedited the demand for power from the Proposal could be higher than current projections. For the Proposal to support decarbonisation of the SWIS there must be flexibility in its operational capacity. On this basis, a baseline that represents operation at the expected maximum reasonable emissions trajectory has been chosen to allow flexibility in production without penalty. Perth Energy is exploring options to improve the emissions intensity of the Proposal and will continue to do so over the life of the Proposal.
Other statutory decision-making processes which require reduction in GHG emissions	The pathway to net zero emissions is regulated in Australia under the Safeguard Mechanism. The Safeguard Mechanism is designed to encourage/force emitters to net-zero emissions by 2050. The Safeguard Mechanism applies a sectoral baseline to grid-connected electricity generators. The Proposal will supply power to the SWIS which is subject to the Commonwealth of Australia's Renewable Energy Target (RET). The RET is designed to reduce emissions of GHG in the electricity sector by encouraging additional generation of electricity from sustainable and renewable sources.
Key components in the GHGMP	Perth Energy has investigated several gas turbine generator technology options to identify the best practice technology suitable for the Proposal. Parameters that were considered include: • High energy density per square metre MW/m^2; • Low nitrogen oxide (NOx) emissions; • High efficiency; • Flexible and reliable operation; • Fast-start; • Very-low minimal-generation; • Factors contributing to system stability; • Dual fuel (natural gas and diesel); • Low cost generation ($/MW); • Maintenance and operational requirements; • High availability; • Firm generation (when renewables not generating); • Proven technology in WA (for construction, operation and maintainability); • Ability to operate on hydrogen in the future; and • Ability to operate on bio-diesel fuel in the future. Additionally, the Proposal commits to consider the following parameters over the life of the Proposal: • Use of new high-efficiency aero-derivative or light-industrial gas turbine technology; • Selected world-leading original equipment manufacturer (OEM) for gas turbine supply and commissioning; • Through-life emissions/efficiency part of technology selection process; and • Performance Guarantees in construction and operation. Perth Energy is determined to utilise the best-practice technology that is suitable for the Proposal application. The choice of technology is limited by site-specific factors including climate, availability, packaging and compliance with other environmental constraints such as air quality. The chosen technology may therefore not represent

	best-practice in a global context of power generation; however, the Proposal will use the latest models of the chosen technology where possible. In the event that Perth Energy is not able to meet their GHG emission targets, and/or where carbon emissions cannot be avoided or reduced to enable Perth Energy to achieve its objectives, Perth Energy will offset the remaining GHG emissions.
GHGMP reviews and reporting	5-yearly review and as required by relevant approvals
Proposed construction date	2026 - 2029
GHGMP required pre-construction?	Yes
Proposed end of life/ decommissioning date	2058

CONTENT

LIST OF TABLES

LIST OF FIGURES

2 CONTEXT, SCOPE AND PURPOSE

2.1 PROPONENT, PROPOSAL DESCRIPTION AND SCOPE

Table 1 states the proponent, proposal description and scope of the Proposal.

Table 1: Summary of proposal

Proposal name	Kwinana Swift Power Station Expansion Project
Proponent name	Western Energy Pty Ltd
Proposal description and scope	Construct and operate an expansion to the existing Kwinana Swift Power Station, comprising up to four additional gas fired turbine units coupled to two electrical generators, which increase generation capacity from 120 MW to up to 370 MW. The Proposal is located in Kwinana, Western Australia (WA).
Purpose of this GHGMP	To provide the Proposal GHG emissions estimates and management and monitoring measures to demonstrate that GHG emissions will be reduced over the life of the Proposal, in accordance with the EPA's objective outlined in the GHG Emissions Environmental Factor Guideline (EPA, 2024).

Western Energy Pty Ltd (Perth Energy), a subsidiary of AGL Energy Limited (AGL), is proposing to construct and operate the Kwinana Swift Power Station Expansion Project (Proposal). The Kwinana Swift Power Station (the existing plant) is comprised of four gas fired turbine generator units coupled to two electrical generators, with a generation capacity of 120 Megawatts (MW). The Proposal is for the expansion of the existing plant by up to four additional gas fired turbine generator units, increasing the plant generation capacity to 370 MW.

The Proposal will provide peaking power supply for the South West Interconnected System (SWIS) to support the state Governments objectives to decarbonise the network. The Proposal will supply reliable and flexible electricity to the SWIS, necessary to satisfy demand fluctuations resulting from increasing renewable penetration in the SWIS.

The Proposal is located in Kwinana, WA. Kwinana is an industrial area approximately 40 kilometres (km) south of Perth (Figure 1). The Proposal site is classified as zoning 'Town Planning Scheme (TPS) No. 2 General Industry'. Use class is also classified as general industry and is a permitted use. The Proposal complies with TPS policies for TPS No. 2 General Industry.

The Proposal will be developed within a development envelope that consists of cleared land that has had civil works previously undertaken. The Proposal is situated immediately adjacent to the existing plant and in proximity to significant industrial infrastructure and activities of the Kwinana industrial area (Figure 2).

The Proposal includes construction and operation of up to four gas powered turbines connected to two electrical generators. These new gas-turbine units are flexible, operating on natural gas, distillate, liquefied natural gas (LNG), liquefied petroleum gas (LPG) and/or hydrogen. An indicative turbine unit is presented below (Figure 3). The scope of the Proposal is for the additional turbines only.

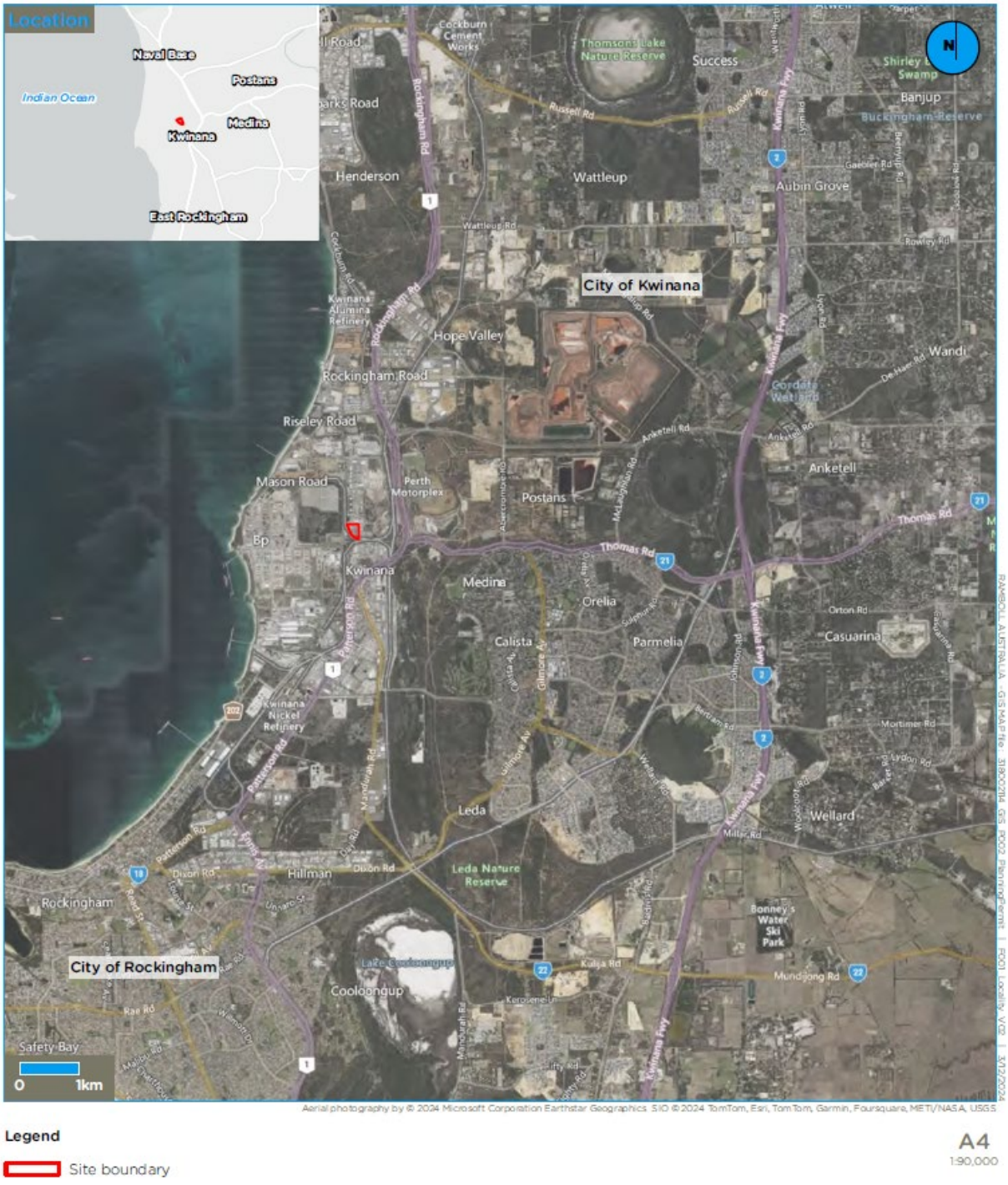


Figure 1: Regional location

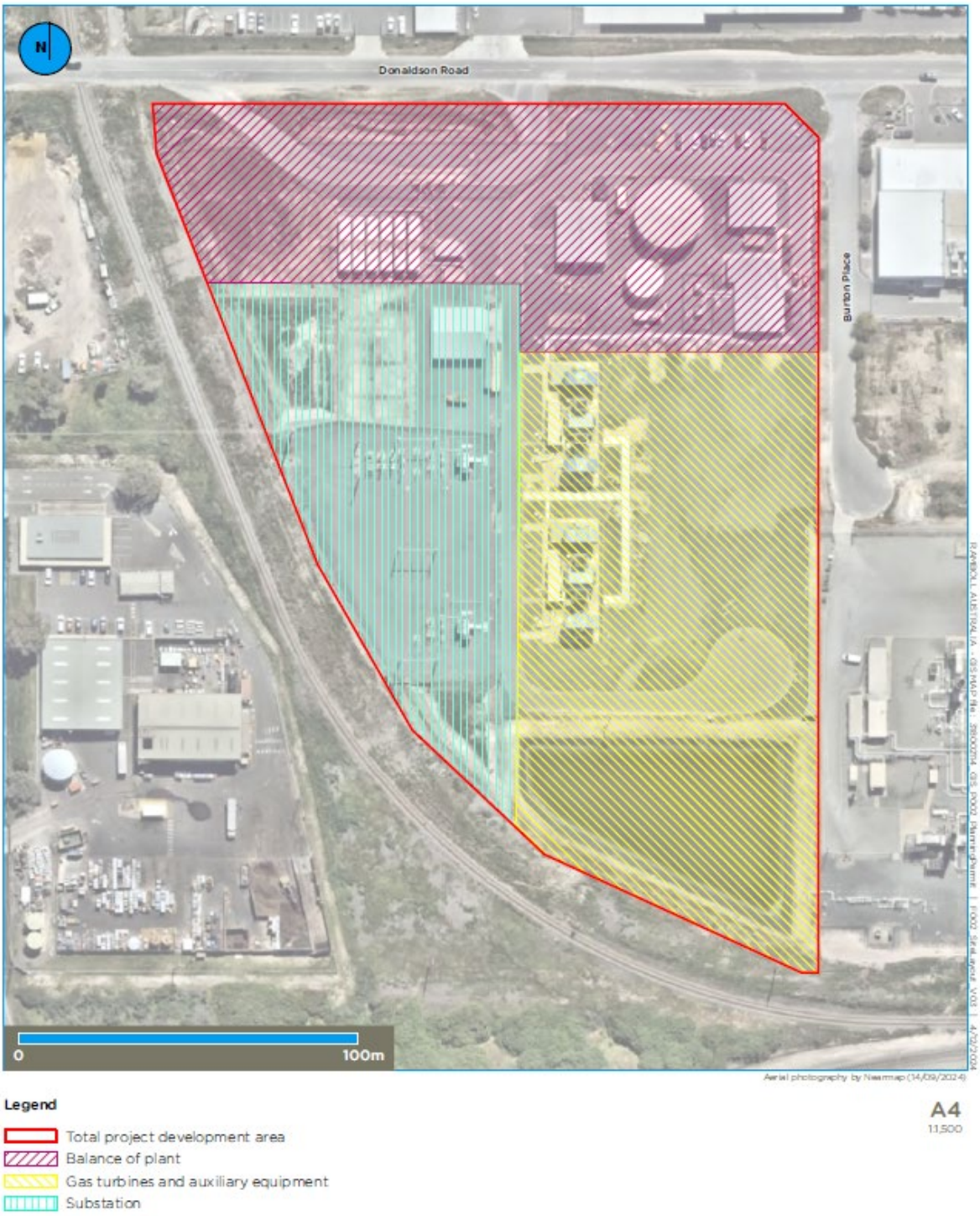


Figure 2: Proposal location (yellow area)

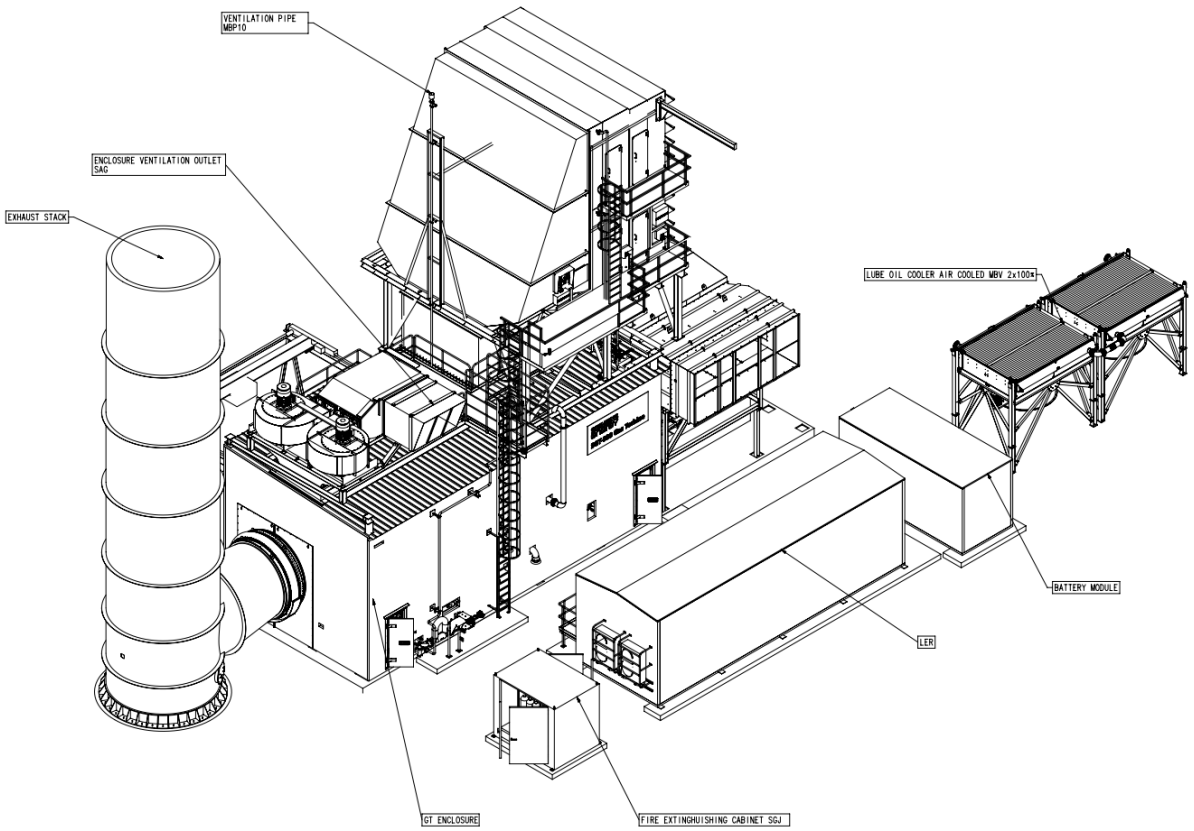


Figure 3: Indicative gas-turbine unit

2.2 PURPOSE OF THE GHGMP

Under section 15 of the *Environmental Protection Act 1986* (EP Act), the EPA has the objective to use its best endeavours to protect the environment and to prevent, control and abate pollution and environmental harm. One way in which the EPA discharges this objective is to consider proposals referred to it under Part IV of the EP Act. The reports that the EPA produces following formal assessments must set out what the EPA considers to be the key environmental factors identified in the course of the assessment, the EPA's recommendation as to whether the Proposal may be implemented, and (if the EPA recommends that implementation be allowed) the conditions and procedures that should apply to that implementation. The Minister for Environment (in consultation with other decision-making authorities) then decides whether or not the Proposal may be implemented.

The section 15 objective, combined with the established link between cumulative sources of GHG emissions and the risk of climate change, and the broad acknowledgement that the warming climate will impact the WA environment, means it is appropriate for the EPA to consider the effects of proposals that contribute to the state's GHG emissions. Outlined in the EPA's GHG Emissions Environmental Factor Guideline (GHG Guideline) (EPA, 2024), the EPA's objective for GHG emissions is to "minimise the risk of environmental harm associated with climate change by reducing GHG emissions as far as practicable".

The EPA considers that climate change should be limited to no more than 1.5 degrees Celsius (°C) above pre-industrial levels to minimise the risk of environmental harm to WA's environment. In

order to contribute to this goal, the EPA's view is that there should be deep, substantial and sustained reductions in WA's emissions this decade, and achievement of net zero emissions no later than 2050 through a straight-line trajectory (at a minimum) from 2030. The EPA emphasises reductions beyond these should also be made as far as practicable, and that WA emissions should reach net zero well before 2050.

The GHG Guideline requires proponents to provide sufficient information for the EPA to make an assessment as to whether the Proposal meets the EPA's objective. The purpose of this GHGMP is to provide the Proposal GHG emissions estimates and management, and monitoring measures to demonstrate that the Proposal can meet the EPA's objective. While not explicitly required by the EPA, this GHGMP has been developed to provide the information required for the EPA's assessment of GHG impacts and support approval under Part IV of EP Act. This approach is consistent with the EPA's GHG Guidelines which suggests proponents may still provide a GHGMP to support assessment. This GHGMP has been prepared in consideration of the GHG guidelines and associated GHGMP template. The scope of the GHGMP includes construction and operation of the Proposal.

3 GHG MANAGEMENT PLAN COMPONENTS

3.1 EMISSION ESTIMATES

Perth Energy has estimated Scope 1, 2 and 3 GHG emissions (in tonnes (t) Carbon Dioxide Equivalent (CO_2-e) that can be expected from the Proposal, based on the information available in January 2025. The methodology used to develop the estimates is provided in Section 3.1.5. The emissions estimate includes GHG emissions during the operation phase of the Proposal. The operation phase is considered to be from 2029 onwards.

At this stage Perth Energy has not undertaken detailed design or engaged a third party construction contractor for development of the Proposal, therefore the level of detail required to estimate GHG emissions during construction was not available. Construction activities are expected to be limited and include the assembly of infrastructure (turbines and generators) on cleared/prepared land and the movement of vehicles and equipment to site. Construction emissions are not expected to be material (i.e., well below the EPA's 100,000 t CO_2-e/a threshold), any estimates provided at this stage would be highly speculative. On this basis, construction GHG emissions estimates have not been calculated.

A summary of the Proposal Scope 1, 2 and 3 GHG emissions estimates for the operational phase is provided in Table 2. The Proposal emissions estimates and the background calculations used to assess the GHG emissions estimates are provided in more detail on the following sections. The major GHG emissions from the Proposal are carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4).

Table 2: Emissions estimates for the Proposal

	Emissions (t CO_2-e)			
	Construction	**Operation**	**Annual average**	**Peak Emissions (Year)**
Scope 1	Not available, refer to text above.	5,869,763	195,659	281,871 (2036)
Scope 2		11,660	530	530 (any year)
Scope 3		688,122	22,937	32,822 (2036)

3.1.1 ANNUAL EMISSIONS

Table 3 provides the Proposal annual and total GHG emissions estimates over the life of the Proposal. Annual Emissions over the life of the Proposal are shown in Figure 4.

Table 3: Annual emission estimates for the Proposal

Year	**Stage**	**Annual Emissions (t CO_2-e/a)**		
		Scope 1	**Scope 2**	**Scope 3**
2026	Construction	Not available, refer to text in Section 3.1		
2027				
2028				

Year	Stage	Annual Emissions (t CO_2-e/a)		
		Scope 1	Scope 2	Scope 3
2029	Operations	136,509	530	16,353
2030		188,622	530	22,323
2031		266,589	530	31,420
2032		214,928	530	25,361
2033		197,765	530	23,548
2034		194,215	530	22,928
2035		209,314	530	24,870
2036		281,871	530	32,822
2037		186,276	530	21,775
2038		197,085	530	23,084
2039		213,994	530	25,039
2040		261,880	530	30,215
2041		195,850	530	22,903
2042		187,637	530	22,062
2043		177,636	530	20,747
2044		254,299	530	29,354
2045		171,153	530	20,098
2046		162,058	530	19,157
2047		159,113	530	18,644
2048		176,985	530	20,574
2049		248,378	530	28,868
2050		171,761	530	20,259
2051		160,877	530	18,844
2052		158,463	530	18,471
2053		178,210	530	20,899
2054		248,986	530	29,029
2055		170,580	530	19,946
2056		160,227	530	18,671
2057		159,687	530	18,796
2058		178,817	530	21,060

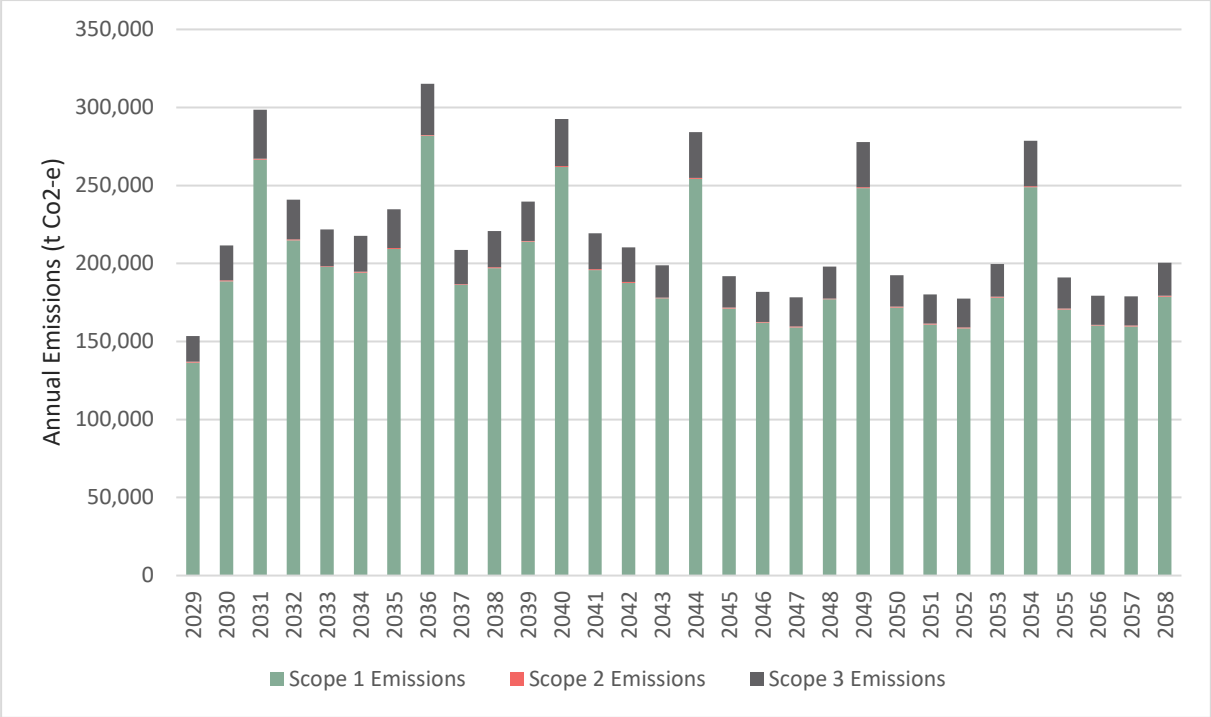


Figure 4: GHG emissions over the operational life of the Proposal

3.1.2 Proposed Emissions Baseline

The proposed emissions baseline is based on a reasonable estimate of the Proposal's maximum power generation for the installed infrastructure. The maximum installed capacity is 250 MW. Operating 8,322 hours a year (accounting for maintenance and shutdowns) at 100% load the Proposal can produce up to 2,080,500 Mega Watts per hour (MWh). The Proposal will use up to four gas turbines, the number and configuration of which is yet to be determined. Turbine selection will be based on the best available technology suitable for the Proposal's context at the time of development. Perth Energy has considered the emissions intensities and heat rates of several gas turbines currently available to the market and has chosen to use an emissions intensity of 0.507 t CO_2-e / MWh. The 0.507 t CO_2-e / MWh is representative of the turbines that are likely to be installed and operated.

Perth Energy has been approached by the State Government to investigate delivery of the peaking power generation to help facilitate the SWIS network's decarbonisation pathway to align with the State Sectoral Emissions Reduction Strategy (SERS). The demand for peaking power has not yet been clearly defined and is subject to market conditions and the timing of SWIS-connected power generation infrastructure retirement. An indicative demand profile for the Proposal has been provided by the Australian Energy Market Operator (AEMO) and has been used to estimate the emissions profile for the Proposal.

The actual demand for the Proposal will be subject to demand of grid connected customers and the timing of shutting down other, less efficient power generation technologies (coal fired, older gas generation). Ultimately demand for peaking power will be dictated by AEMO and therefore the Proposal must be factor in flexibility in its operational capacity to satisfy this demand, and any subsequent baseline and reduction targets. The Proposal will therefore generally work at a low power generation rate, with high power production during peaking periods. There is not a regular quantity of electricity to be produced by day by the Proposal.

The Proposal will satisfy an electricity demand that would otherwise be satisfied with less efficient technology (coal or diesel), therefore the overall reduction in emissions from the SWIS will be significant by comparison to current operating scenario.

The Proposal is a low emissions intensity power generation option compared to current technology. If the retirement of old technology is expedited the average demand for power from the Proposal could be higher than current projections. For the Proposal to support decarbonisation of the SWIS there must be flexibility in its operational capacity. On this basis, a baseline that represents operation at a reasonable maximum expected emissions trajectory has been chosen to allow flexibility in production without penalty. The baseline and emissions estimates are provided in Figure 5.

Perth Energy considers this to be a suitable approach as the Proposal is a necessary interim step that facilitates decarbonisation of the SWIS. As the proportion of renewable power generation and storage connected to the SWIS increases, reliance on the Proposal for power generation will reduce and so will the GHG emissions.

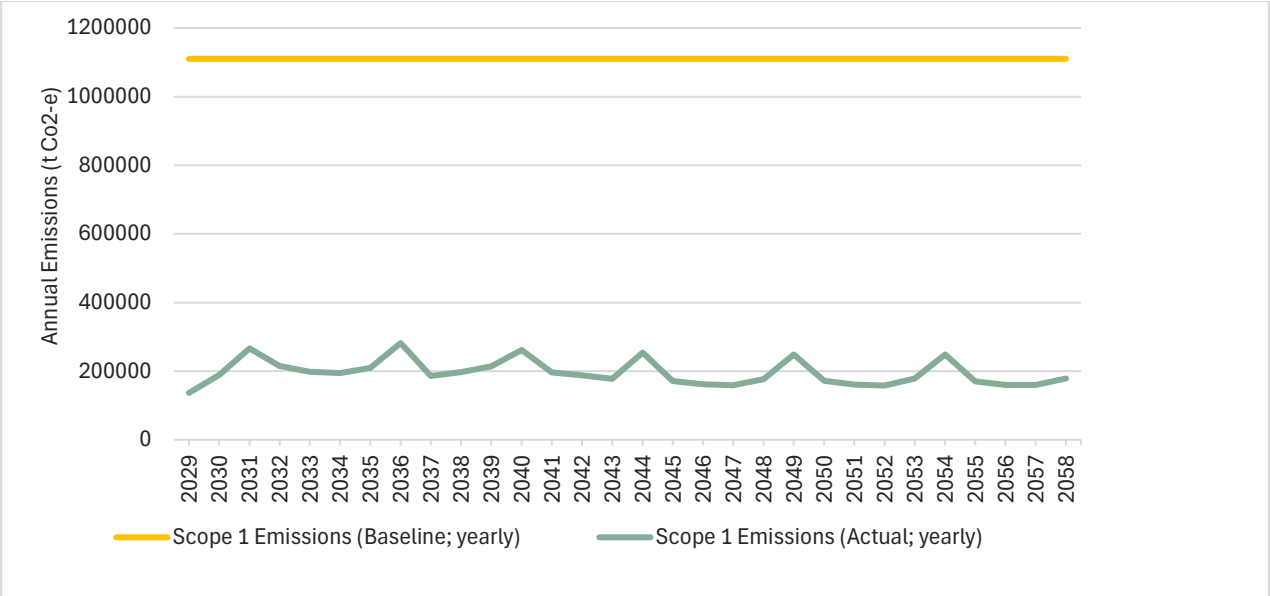


Figure 5: Baseline and predicted emissions estimates

3.1.3 Source of Emissions

A summary of the Proposal GHG emissions estimates inventory for the life of the Proposal is provided in Table 4.

Table 4: GHG Emissions estimates summary

Emissions	Average Emissions ($t CO_{2-e}/a$)	Total Emissions ($t CO_{2-e}$)
Construction		
Not available, refer to text in Section 3.1		
Operations		
Scope 1		
Process Emissions	195,659	5,869,763

Emissions	Average Emissions ($t CO_{2-e}/a$)	Total Emissions ($t CO_{2-e}$)
Total Scope 1 Emissions	**195,659**	**5,869,763**
Scope 2		
Electricity from the grid whilst not operating	530	11,660
Total Scope 2 Emissions	**530**	**11,660**
Scope 3		
Natural Gas	14,151	424,519
Diesel	1,116	33,491
Transmission	7,670	230,112
Total Scope 3 Emissions	**22,937**	**688,122**

3.1.4 Greenhouse Gas and Global Warming Potential

The GHG Emissions Environmental Factor Guideline (EPA, 2024) relates to the seven categories of GHG covered by the United Nations Framework Convention on Climate Change Reporting Guidelines on Annual Inventories and Kyoto Protocol. These gases are CO_2, CH_4, N_2O, sulphur hexafluoride, hydro fluorocarbons, perfluorocarbons and nitrogen trifluoride.

The GHG considered in this assessment and the corresponding global warming potential (GWP) for each GHG are listed in Table 5. GWP is a metric used to quantify and communicate the relative contributions of different substances to climate change over a given time horizon (100 years). GWP accounts for the radiative efficiencies of various gases and their lifetimes in the atmosphere, allowing for the impacts of individual gases on global climate change to be compared relative to those for the reference gas CO_2. The GWPs from the Intergovernmental Panel on Climate Change Fifth Assessment report were used in this assessment (Table 5).

Table 5: 100 year global warming potential of GHGs

GHG	Global Warming Potential
CO_2	1
CH_4	28
N_2O	265

3.1.5 Emission Estimate Methodology

The GHG Protocol Corporate Accounting and Reporting Standard (GHG Protocol Corporate Standard; World Resources Institute (WRI) & World Business Council for Sustainable Development (WBCSD), 2004), was first published in September 2001 and is now adopted and accepted globally by businesses, non-governmental organisations (NGOs), and governments as the guidance standard for GHG accounting and reporting.

Businesses benefit from using a common standard for GHG inventory as it improves the consistency, transparency, and understandability of reported information, making it easier to track and compare progress over time.

The GHG Protocol Corporate Standard (WRI & WBCSD, 2004) was updated in 2015 with the Scope 2 Guidance. It provides requirements and guidance for companies and other organisations, such as NGOs, government agencies, and universities that are preparing a corporate-level GHG emissions inventory. The GHG Protocol Corporate Standard has been used as the basis for this assessment, for calculating and reporting the GHG emissions estimates, assuming the Proposal will be built and operated as designed.

GHG emissions are classified as Scope 1, Scope 2 and Scope 3. The following sections provide an overview of the classification.

Scope 1 Emissions

The GHG Protocol Corporate Standard (WRI & WBCSD, 2004) defines Scope 1 GHG emissions as the emissions from sources a company owns or controls. The emissions are generally direct GHG emissions and are principally the result of the following types of activities undertaken by the company:

- Stationary Combustion – On-site generation of electricity, heat, or steam. These emissions result from combustion of fuels in stationary sources, e.g. boilers, furnaces, turbines;
- Physical or Chemical Processing – Most of these emissions result from manufacture or processing of chemicals and materials, e.g. cement, aluminium, adipic acid, ammonia manufacture, and waste processing;
- Mobile Combustion – Transportation of materials, products, waste, and employees. These emissions result from the combustion of fuels in company owned/controlled mobile combustion sources (e.g. trucks, trains, ships, airplanes, buses, and cars); and
- Fugitive Emissions – These emissions result from intentional or unintentional releases, e.g. equipment leaks from joints, seals, packing, and gaskets; CH_4 emissions from coal mines and venting; Hydrofluorocarbon emissions during the use of refrigeration and air conditioning equipment; and CH_4 leakages from gas transport.

The Proposal is only expected to have material emissions from stationary combustion.

Scope 2 Emissions

The GHG Protocol Corporate Standard (WRI & WBCSD, 2004) defines Scope 2 GHG emissions as the emissions from the generation of purchased electricity that is consumed in its owned or controlled equipment or operations. Scope 2 emissions are a special category of indirect emissions. For many companies, purchased electricity represents one of the largest sources of GHG emissions and the most significant opportunity to reduce these emissions. Accounting for Scope 2 emissions allows companies to assess the risks and opportunities associated with changing electricity and GHG emissions costs.

Scope 3 Emissions

Scope 3 GHG emissions are the result of activities from assets not owned or controlled by the reporting company, but that the organisation indirectly affects in its value chain.

The Technical Guidance for Calculating Scope 3 Emissions (WRI & WBCSD, 2013) categorises the Scope 3 emissions into 15 distinct categories. Section 3.2.2 summarises the Scope 3 emissions from the indirect upstream and down-stream activities and outlines a brief description of each category.

3.1.6 CALCULATION METHODOLOGY

GHG emissions are calculated based on the following:

$$Activity\ Data\ \times Emission\ Factor\ = GHG\ Emissions$$

Where:

- Activity data is quantity or usage data in t/a, Gigajoule (GJ)/a, etc. It can be measured (e.g. from data received from a plant in operation) or calculated (e.g. from a mass balance model or stoichiometric chemical balance) or estimated (e.g. from published specifications on a vehicle type);
- Emission Factor is a factor or ratio that has been calculated by relating GHG emissions to a measure of activity at an emissions source. Emissions factors can be determined by experimental measurement, or published, generic emissions factors can be used from reputable organisations globally or locally. Published emissions factors can vary slightly; and
- GHG Emissions are the mass of carbon dioxide and / or all equivalent GHG over a period of time, in units such as t $CO_{2\text{-}e}$/a.

Emission Factors

Vendor data has been used to calculate Scope 1 emissions from the Proposal. The type of gas-fired generators has not yet been identified however, Perth Energy has considered the emissions intensities and heat rates of several gas turbines currently available to the market and has chosen to use the emissions intensity of 0.507 t CO_2-e / MWh. The 0.507 t CO_2-e / MWh is representative of the turbines that are likely to be installed and operated.

The National Greenhouse and Energy Reporting (NGER) emissions factors for the supply of natural gas and diesel, and the transmissions of electricity via the SWIS have been used to calculate Scope 3 emissions. The emissions factors used are summarised in Table 6.

Table 6: NGER emissions factors used to calculate Scope 3 emissions

Emissions Source	Emissions Factor
Natural Gas	4.1 (kg/GJ)
Diesel	17.3 (kg/GJ)
Transmission of Electricity	0.02 (kg/kWh)

Limitations

While every attempt has been made to ensure accuracy in calculations performed in this report, the following sources of uncertainty have been identified:

- Modelling work performed as part of preparing this publication inherently requires assumptions about future behaviours and market interactions, which may result in forecasts that deviate from future conditions;
- Emissions factors have been selected based on current vendor options which may be subject to change as procurement develops resulting in higher or lower estimated emissions; and
- Emissions estimates have considered site climatic conditions, however these are expected to fluctuate and may impact the efficiency of the generators.

Assumptions

The following key assumptions have been applied to the calculation and modelling of GHG emissions for the Proposal.

General Assumptions

- The Proposal will operate below the maximum operating scenario; and
- The Proposal demand will be subject to grid requirements and will fluctuate over the life of the Proposal.

Scope 1

- No vegetation clearing is required;
- Aero-derivative or light industrial gas fired turbine units will be used;
- Turbines are installed and operated in an open cycle configuration;
- Projected power generation and emissions estimates consider site specific operating conditions, including:
    - Evaporative cooling;
    - Wet compression and fogging;
    - NO_x control and injection;
    - An average temperature of 41°C and relative humidity of 15%; and
    - Operations are at sea level.

Scope 2

- It is assumed that the Proposal will purchase 1 MWh of electricity per annum to maintain connection during maintenance and shutdowns. No other Scope 2 emissions will be generated during the operating phase.

Scope 3

- Natural gas and diesel will be sourced from a provider that complies with the required standards;
- NGER emissions factors are suitable for the calculation of scope 3 emissions from the supply of natural gas, diesel and the transmission of electrical energy via the SWIS; and
- Supply of natural gas and diesel will be direct to the Proposal site.

Exclusions

The following sources of emissions are excluded from the Proposal emissions estimate:

- Other projects that Perth Energy has planned or proposed are not considered;
- Perth Energy planned or proposed future development of the Proposal, including future stages;
- Perth Energy's other facilities outside of the Proposal (e.g. offices in Perth, etc.) are not included in this assessment;
- Specific Scope 3 emissions including:
    - Business Travel;
    - Franchises and investments; and
- Fugitive emissions – e.g. equipment leaks from joints, seals, packing, and gaskets; hydrofluorocarbon emissions during the use of refrigeration and air conditioning equipment; and CH_4 leakages from gas transport have also been excluded.

3.2 EMISSIONS TRAJECTORY AND TARGETS

Emissions reduction targets for Scope 1 and Scope 2 emissions have been developed for the Proposal to meet the EPA and WA Government's target of net-zero GHG emissions by 2050. The EPA (2024) expects proposals to demonstrate deep, substantial and sustained emissions reduction this decade and achievement of net zero emissions no later than 2050 along a linear trajectory (at a minimum) from 2030. The targets and emissions reduction trajectory are shown in Section 3.2.1.

Perth Energy is committed to reducing its operational GHG emissions for the Proposal through reasonable and practicable management measures and applying an adaptive management framework to respond to current uncertainties and future developments in government policies, markets and technology.

3.2.1 SCOPE 1 EMISSIONS TRAJECTORY AND TARGETS

An emissions target to 2050, based on the EPA's minimum expectation of a linear trajectory to net zero by 2050, from a 2030 baseline has been proposed for the Scope 1 and Scope 2 emissions baseline (Figure 6). Figure 7 presents the 5-yearly cumulative Scope 1 and Scope 2 emissions estimates and targets. A summary of Scope 1 and Scope 2 emissions estimates and targets, annually and cumulatively over 5-year intervals are provided in Table 7.

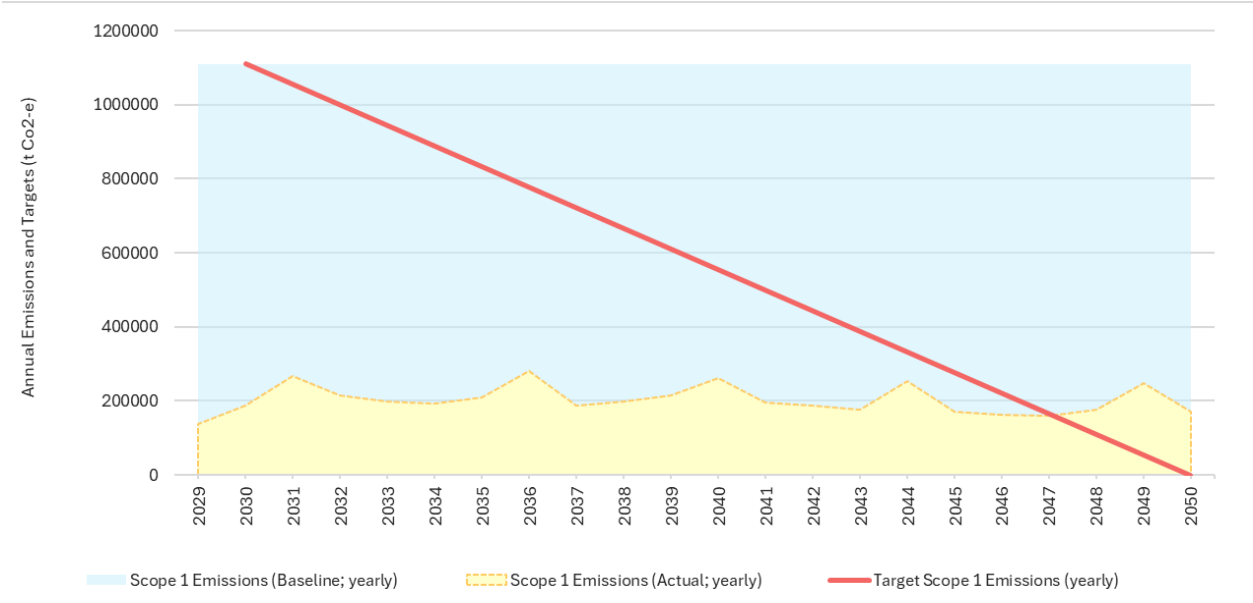


Figure 6: Emissions trajectory and targets

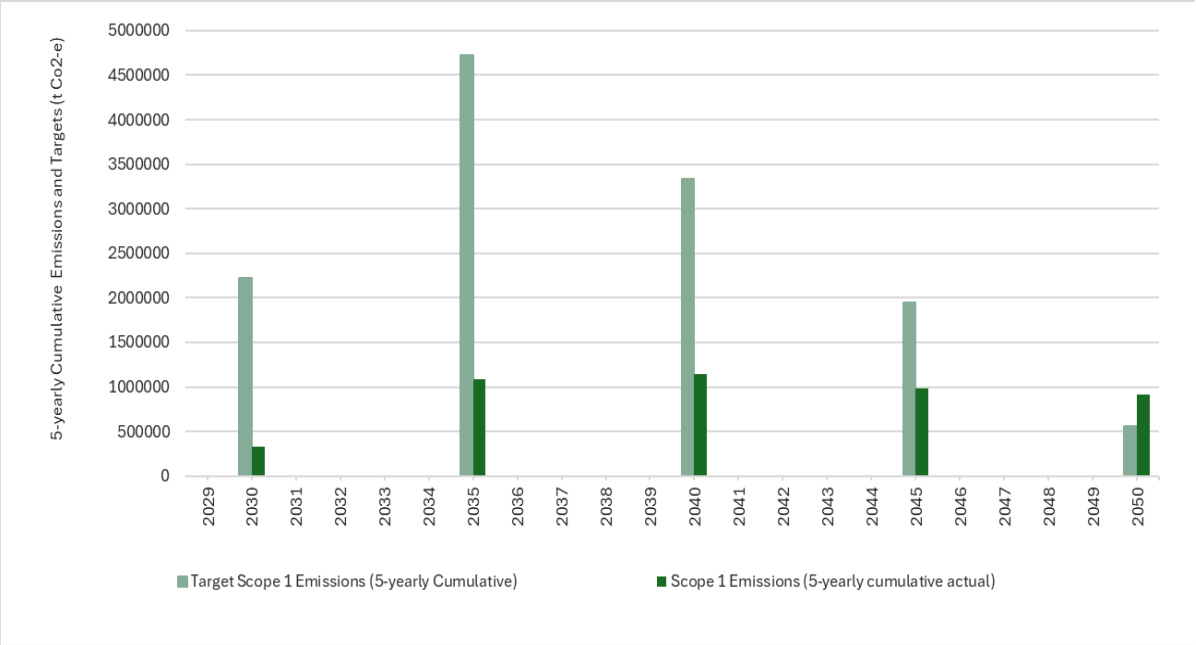


Figure 7: 5 yearly predicted cumulative emissions and targets

Assuming the targets commence from the 2030 baseline (based on maximum throughput), the predicted actual emissions are likely to comply with the emissions reduction targets until 2047. After this time the predicted actual emissions are likely to exceed the targets.

Table 7: Annual and total operational Scope 1 emissions with 5 yearly cumulative totals

Year	Actual Scope 1 Emissions (t CO_{2-e})	Target Scope 1 Emissions (t CO_{2-e})	Cumulative 5 yearly Scope 1 Emissions (t CO_{2-e})	Target Cumulative Scope 1 Emissions (t CO_{2-e})
2029	136,509	N/A	N/A	N/A
2030	188,622	1,110,330	325,130	2,220,660
2031	266,589	1,054,814		
2032	214,928	999,297		
2033	197,765	943,781		
2034	194,215	888,264		
2035	209,314	832,748	1,082,811	4,718,902.5
2036	281,871	777,231		
2037	186,276	721,715		
2038	197,085	666,198		
2039	213,994	610,682		
2040	261,880	555,165	1,141,105	3,330,990
2041	195,850	499,649		
2042	187,637	444,132		
2043	177,636	388,616		
2044	254,299	333,099		
2045	171,153	277,582	986,576	1,943,077.5
2046	162,058	222,066		
2047	159,113	166,550	918,296	555,165

Year	Actual Scope 1 Emissions (t CO_{2-e})	Target Scope 1 Emissions (t CO_{2-e})	Cumulative 5 yearly Scope 1 Emissions (t CO_{2-e})	Target Cumulative Scope 1 Emissions (t CO_{2-e})
2048	176,985	111,033		
2049	248,378	55,517		
2050	171,761	0		

3.2.2 Scope 3 Emissions Trajectory

Table 8 summarises the Scope 3 emissions from the indirect upstream and down-stream activities and outlines a brief description of each category.

Table 8: Scope 3 emission categories

No.	GHG Protocol Category	Description	Relevance to Proposal
1.	Purchased Goods and Services	Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2-8.	Not relevant, purchased goods and services are included in Category 3.
2.	Capital Goods	Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year.	Not relevant.
3.	Fuel and energy-related activities not included in Scope 1 or Scope 2	Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in Scope 1 or Scope 2, including: a) Upstream emissions of purchased fuels (extraction, production, and transportation of fuels consumed by the reporting company); b) Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling consumed by the reporting company); and c) Transmission and distribution losses (generation of electricity, steam, heating and cooling that is consumed (i.e. lost) in a transmission and distribution system) – reported by end user Generation of purchased electricity that is sold to end users (generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users) – reported by utility company or energy retailer only.	Relevant – natural gas and diesel supply. Emissions associated with extracting, processing and transporting natural gas.
4.	Upstream transportation and distribution	• Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company); and • Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g. of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company).	Not relevant as no transportation for products or services by vehicles is required.
5.	Waste generated in operations	Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company).	Not relevant as electricity production does not generate material waste volumes.

No.	GHG Protocol Category	Description	Relevance to Proposal
6.	Business Travel	Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company).	Not relevant
7.	Employee Commuting	Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company).	Not relevant, the Proposal is an expansion of the existing power station. Minimal additional workforce required to support the Proposal. Emissions are expected to be immaterial.
8.	Upstream Leased Assets	Operation of assets leased by the reporting company (lessee) in the reporting year and not included in Scope 1 and Scope 2 – reported by lessee.	Not relevant to the scope of the Proposal.
9.	Downstream Transportation and Distribution	Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company).	Included as energy supply.
10.	Processing of Sold Products	Processing of intermediate products sold in the reporting year by downstream companies (e.g. manufacturers).	Not relevant as not intermediate products will be produced.
11.	Use of Sold Products	End use of goods and services sold by the reporting company in the reporting year.	Not relevant as electricity is the final product.
12.	End-of-life Treatment of Sold Products	Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life.	Not relevant as electricity is the final product.
13.	Downstream Leased Assets	Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in Scope 1 and Scope 2 – reported by lessor.	Not relevant as it is included under Scope 1.
14.	Franchises	Operation of franchises in the reporting year, not included in Scope 1 and Scope 2 – reported by franchisor.	Not relevant as no franchises included.
15.	Investments	Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in Scope 1 or Scope 2.	Not relevant as no investments included.

Scope 3 emissions estimates were calculated using the emissions factors and methodology described in the Australian National Greenhouse Accounts Factors: 2023 (DCCEEW, 2024) and are aligned with the GHG Protocol (GHG Protocol, 2011). The emissions factors used are detailed within Table 9.

Table 9: Scope 3 emission estimates

Source	Activity	Category	NGER emissions factor	Average Emissions (t CO_{2-e})	Lifetime Emissions (t CO_{2-e})
Natural gas	Energy Generation	Purchased goods and services	4.1 kg CO_2-e/GJ	14,151	424,519
Diesel	Energy Generation	Purchased goods and services	17.3 kg CO_2-e/GJ	1,116	33,491
Transmission and distribution	Energy supply	Downstream Transportation and Distribution	0.02 kg CO_2-e/kWh	7,670	230,112
				Total	**688,122**

A Scope 3 GHG emissions trajectory for the Proposal to 2050 is shown in Figure 8. A conservative approach to Scope 3 emissions has been taken to present the 'worst-case' scenario (e.g. no decarbonisation). It is assumed that due to the wide-spread de-carbonisation efforts, Scope 3 emissions will slowly decline, however, these emissions will be challenging to avoid or reduce due to the limited influence Perth Energy has over the way the product is processed by external companies.

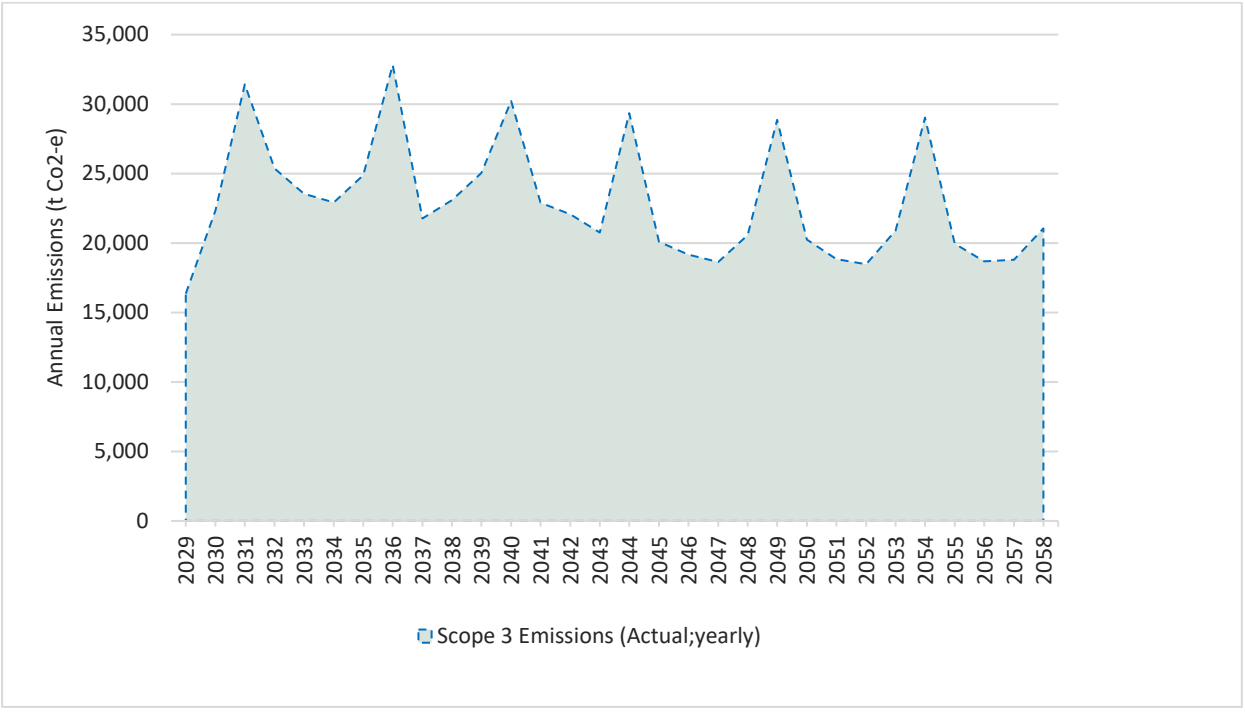


Figure 8: Scope 3 emissions trajectory

3.3 Scope 1 Mitigation Measures

The following sections detail the mitigation measures that will be implemented over the life of the Proposal to avoid, reduce or offset Scope 1 emissions.

3.3.1 Best-Practice Design

Perth Energy has investigated several gas turbine generator technology options to identify the best practice technology suitable for the Proposal. Parameters that were considered include:

- High energy density per square metre MW/m^2;
- Low nitrogen oxide (NOx) emissions;
- High efficiency;
- Flexible and reliable operation;
- Fast-start;
- Very-low minimal-generation;
- Factors contributing to system stability;
- Dual fuel (natural gas and diesel);
- Low cost generation ($/MW);
- Maintenance and operational requirements;
- High availability;
- Firm generation (when renewables not generating);
- Proven technology in WA (for construction, operation and maintainability);
- Ability to operate on hydrogen in the future; and
- Ability to operate on bio-diesel fuel in the future.

Additionally, the Proposal commits to consider the following parameters over the life of the Proposal:

- Use of new high-efficiency aero-derivative or light industrial gas turbine technology;
- Selected world-leading original equipment manufacturer (OEM) for gas turbine supply and commissioning;
- Through-life emissions/efficiency part of technology selection process; and
- Performance Guarantees in construction and operation.

Perth Energy is determined to utilise the best-practice technology that is suitable for the Proposal application. The choice of technology is limited by site-specific factors including climate, availability, packaging and compliance with other environmental constraints such as air quality. The chosen technology may therefore not represent best-practice in a global context of power generation; however, the Proposal will use the latest models of the chosen technology where possible which is expected to be competitive with other power generation technology and is considered best-practice in the context of the Proposal.

Although gas-fired power generation in combined cycle configuration (CCGT) is the most efficient from an emissions intensity perspective, it is not necessarily considered best practice design for this application. The primary objective of the Proposal is to provide intermittent firming power to support the increased penetration of renewable generation in WA. In this context, the Proposal must be able to be deployed rapidly and provide reliable, flexible power supply to the SWIS. Gas turbines in an open-cycle (OCGT) configuration are better suited to this purpose as they have a quicker start-up procedure and are able to ramp their power output up and down. OCGT are less complex meaning a smaller footprint, greater reliability and reduced maintenance. Furthermore, the OCGTs can be deployed rapidly, which is particularly urgent due to the announced retirement of the majority of baseload coal-fired power stations in the State by 2030.

Additionally, the transition from dominant coal generation to renewables is initially constrained by the transmission network. Utilising gas turbines in open cycle configuration maximises the installed capacity on the existing site, and has the advantage of utilisation of existing network capacity while avoiding any additional land disturbances for the power station or new

transmission lines. This approach also aligns with the State's coal retirement trajectory, including the scheduled closure of the Collie Power Station in 2027.

3.3.2 Site Selection

Perth Energy has decided to co-locate the Proposal with the existing power station. This approach has several emissions avoidance benefits including:

- Avoiding the need to clear native vegetation;
- Maximising the use of limited existing network transmission capacity;
- Efficiencies in commuting and supply of equipment for maintenance that is required for both plants; and
- Avoiding the need to develop and clear vegetation for additional supply and transmission infrastructure.

3.3.3 Low Carbon Fuel Alternatives

Perth Energy has determined, based on a combination of site and intended use as firming support for its renewables portfolio, that the ideal technology type for the Proposal would be additional aeroderivative multi fuel turbines in an open cycle configuration. At the time of this submission, Perth Energy is in the process of tendering for the supply of these turbines and has not yet identified the specific turbines to be installed at the Proposal. A decarbonisation opportunity exists to utilise low carbon fuel such as biodiesel or hydrogen in place of natural gas. However, a reliable cost competitive source of either has not yet been identified. Even though there are several proposed production facilities for such fuels in the Kwinana area.

Despite the above, the ability to utilise biodiesel and or hydrogen for power generation is a key consideration in the selection of turbine technology. Perth Energy will continue to explore the opportunity to use low carbon fuel sources over the life of the Proposal.

3.3.4 Review Process

Perth Energy has investigated available alternative energy generation sources and assessed their applicability to this Proposal using criteria such as decarbonisation potential, site infrastructure, power demand, reliability and maintenance requirements. At this time, the use of natural gas fuelled power generation is determined to be the most appropriate technology for the Proposal.

Perth Energy is committed to investigating the implementation of alternative technologies and strategies to lower the emissions intensity of the Proposal, such as the use of hydrogen or biofuels. As technologies and developments continue to grow and new GHG abatement technologies become available, Perth Energy will investigate their potential to be integrated into the Proposal.

3.4 Scope 2 Mitigation Measures

The Proposal will generate minor Scope 2 emissions during operations.

A minor amount (estimated to be up to 1 MWh/a) of electricity will be purchased form the SWIS to maintain connection to the grid while the plant is not operating during maintenance and

shutdowns. The electricity purchased will cover the Proposal auxiliary loads such as lighting, air-conditioning, pumps, compressors, fans, among others whilst the power station is not operating.

Perth Energy will investigate electricity supply options and factor in the carbon footprint of supply. Preference will be given to those suppliers with a lower carbon intensity product and clear commitments and pathways to decarbonisation.

3.5 Scope 3 Mitigation Measures

Scope 3 emissions for the Proposal include those associated with the purchased goods and services (natural gas and diesel), and downstream distribution of electricity. Perth Energy has limited control over the emissions associated with these sources however it is, is committed to exploring opportunities for decarbonisation. Perth Energy will consider options to reduce the quantity and Scope 3 emissions relating to the delivery of natural gas and diesel by using:

- New high-efficiency aero-derivative or light industrial gas turbine technology;
- Selected world-leading OEM for gas turbine supply and commissioning;
- Through-life emissions/efficiency part of technology selection process; and
- Performance Guarantees in construction and operation.

Perth Energy will also investigate third party supply options for gas and diesel supply and factor in the carbon footprint of supply. Preference will be given to those suppliers with a lower carbon intensity product and clear commitments and pathways to decarbonisation.

3.6 Other Statutory Decision-Making Processes which Require Reduction in GHG Emissions

3.6.1 Western Australia State Greenhouse Gas Policy

In October 2024, the WA State Government released an updated GHG emissions policy to help guide Government decision making for major projects that are assessed by the EPA. The updated policy considered the Commonwealth Government reforms to the Safeguard Mechanism released in March 2023. The policy change is focused on removing duplication of GHG emissions regulation at a state and federal level stating:

"Where the greenhouse gas emissions of a major proposal assessed under Part IV of the Environmental Protection Act 1986 (WA) will be subjected to alternative regulatory measures, the State will no longer apply conditions to reduce net greenhouse gas emissions".

The pathway to net zero emissions will be regulated in Australia under the Safeguard Mechanism. The Safeguard Mechanism is designed to encourage/force emitters to a net-zero situation by 2050.

The Safeguard Mechanism applies a sectoral baseline to grid-connected electricity generators.

The GHG Guideline (EPA, 2024) was revised in November 2024, which includes a summary of the information required by the EPA to undertake environmental impact assessment related to this GHGMP. It provides that for grid connected facilities additional information is usually required to

support the EPA's assessment and generally relates to benchmarking and best practice. This GHGMP has been prepared in consideration of the latest GHG Guideline (EPA, 2024).

3.6.2 Renewable Energy Target

The Renewable Energy Target (RET) is an Australian Government scheme that aims to reduce GHG emissions in the electricity sector and increase renewable electricity generation. The RET sets a target to deliver an extra 33,000 gigawatt-hours of electricity from renewable sources every year from 2020 to 2030. The RET differs to the proposed EPA reduction trajectory due to it being an incentive to add renewable electricity generation (currently legislated to 2030) rather than reduce emissions. However, the intent is by increasing renewables, electricity generated from fossil fuels should reduce along with emissions.

The Proposal will provide services to the SWIS, including provision of security and reliability on the SWIS transition process of decarbonisation. In a long term, the Proposal emissions will reduce when less electricity is required by the SWIS as other electricity providers connect to the grid.

3.7 Consistency with other GHG Reduction Instruments

3.7.1 Corporate Emission Reduction Targets

AGL has been supplying energy in Australia for over 185 years and was Australia's first gas company. As a major investor in renewable energy, AGL is committed to playing a role in the transition to a low carbon economy.

AGL is committed to taking a leading role in Australia's transition to a low carbon economy. AGL has created a Climate Transition Action Plan (AGL, 2022):

- The closure of Loy Tang A Power Station by the end of 2035. This closure is up to a decade earlier than previously announced and would prevent 200 Mt CO_2-e of GHG being emitted;
- Reduce their annual GHG emissions by at least 52% by 2035 following the closure of the Bayswater Power Station by 2033;
- Aim to be Net Zero for operated Scope 1 and 2 GHG emissions following the closure of all AGL's coal-fired power stations; and
- Develop a decarbonisation pathway to become Net Zero for Scope 3 emissions by 2050.

3.7.2 Sectoral Emissions Reduction Strategies

The State Government released the SERS for WA in December 2023 (DWER, 2023) which outlines the key priorities, benchmarks and milestones for WA's transition to net zero emissions while supporting the decarbonisation of our region. By 2050, 96% of energy consumed is projected to come from renewable generation, compared with 34% currently in the SWIS.

The SERS notes that under the pathway for industry, significant reduction of industry emissions can be achieved through low-emission electricity generation. This transition to renewable generation will include the need for additional back-up supply from plants such as this Proposal. This will ensure the SWIS receives reliable power supply and the reliance on coal and diesel power

will be reduced. The Proposal is centred around providing the aforementioned stepping stone to emissions reduction until renewables have been fully integrated and therefore aligns with the SERS.

3.8 BENCHMARKING REVIEW

Perth Energy has benchmarked the estimated emissions from the operations phase of the Proposal against other Australian gas-fired electricity generators. Reporting data sourced from NGERs has been used to compare Scope 1 emissions per unit of energy generation. Data used in benchmarking includes OCGT, CCGT and reciprocating engine power generation facilities. Facilities use a combination of fuel sources including natural gas, LNG, diesel and in some cases are blended. Benchmarking data is presented in Appendix 1. It was determined that the most relevant metric for comparison of GHG emission performance is GHG emissions per megawatt hour (t CO_2-e / MWh).

Benchmarking comparisons presented in Appendix 1 are not necessarily comparing like-for-like, due to the assumptions and projections applied to the emissions estimates for the Proposal. Emissions for other projects assessed in the benchmarking exercise are reported 'actual' emissions under the NGERs. The accuracy and reliability of the benchmarking data is based upon the transparency and consistency of reporting among the suppliers included in the analysis. Discrepancies in methodologies, data availability, and reporting practices may impact the comparability of emission intensity metrics. Furthermore, this benchmarking analysis may not encompass the entirety of the environmental impacts linked to electricity generation, such as water consumption, land use change, and waste management.

Despite the limitations discussed above, benchmarking shows the Proposal compares favourably against other gas-powered power stations and would place within the best 25% of gas-powered electricity stations in Australia (Figure 9). The emissions intensity of the Proposal is the lowest of all OCGT facilities and also compares favourably to many of the CCGT facilities.

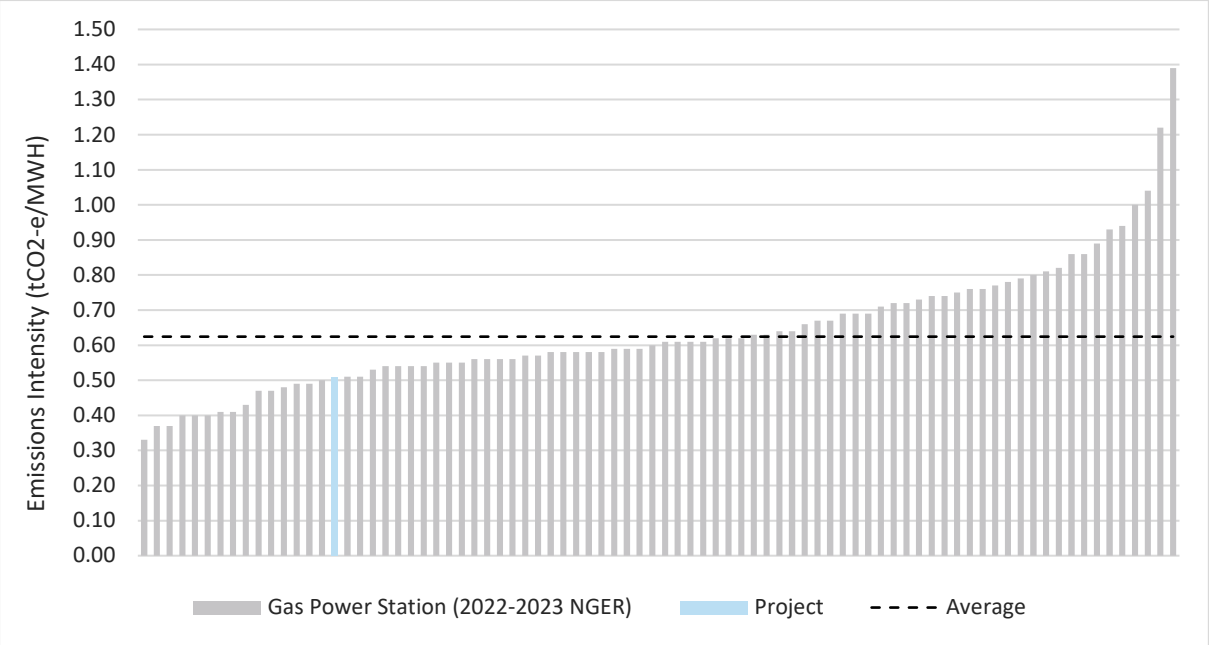


Figure 9: GHG emissions benchmarking

3.9 OFFSETS

Perth Energy has committed to reach net zero emissions by 2050 for this Proposal, with the intent of only using offsets (i.e., carbon credits) as a temporary solution while the technology or innovation required to completely decarbonise is developed.

Based on the targets and emissions estimates presented in Section 3.2.1, the Proposal will need to offset emissions in 2048 and the years beyond. A total of 430,574 t CO_2-e emissions will need to be offset to 2050 and then an average of 176,401 t CO_2-e / a will need to be offset thereafter (based on current projections).

Perth Energy will offset GHG emissions above the target with tangible offsets. Potential tangible offset options include but are not limited to undertaking additional re-vegetation activities on land held by Perth Energy to generate carbon credits, investing in carbon offset projects and purchasing, and surrendering carbon credits that meet the Australian Government's Climate Active Carbon Neutral Standard's offsets integrity principles (Commonwealth of Australia, 2020).

Preference will be given to ACCUs and other Nature-Based Solutions carbon credits that aim to protect and enhance natural ecosystems, benefit local communities and improve biodiversity. The exact proportion of ACCUs and other Nature-Based Solution carbon credits within the overall offsets portfolio will be determined each period based on forecast residual emissions and monitoring of offset markets. Offsets will be certified, accredited and registered under Standards within the International Carbon Reduction and Offsetting Accreditation (ICROA) Code of Best Practice (ICROA, 2024).

3.10 PROJECTS OPERATING BEYOND 2050

The EPA's view is that there should be a deep, substantial and sustained reduction in WA's emissions this decade, and achievement of net zero emissions no later than 2050 through a straight-line trajectory (at a minimum) from 2030. The EPA emphasises reductions beyond these

should also be made as far as practicable, and that WA emissions should reach net zero well before 2050.

Given that the expected life of the Proposal is likely to exceed 2050, the Proposal will need to reach net zero emissions during its operating life. Perth Energy's objective for the Proposal is to reach net zero GHG emissions by 2050, and therefore the Proposal's expected operations beyond 2050 and subsequent decommissioning and rehabilitation of the site will be net zero. At this stage, net zero after 2050 will be achieved using offsets however as technology and the availability of alternative fuels progresses, Perth Energy may be able to meet these targets without reliance on offsets.

4 ADAPTIVE MANAGEMENT, CONTINUOUS IMPROVEMENT AND REVIEW OF THE GHGMP

4.1 MONITORING AND CONTINUOUS IMPROVEMENT

GHG emissions and the production energy arising from the operation of the Proposal will be monitored to enable estimation of GHG emissions and reporting as per the NGER requirements. In addition to the measurement and collection of NGER data, Perth Energy will adhere to the record keeping requirements of the NGER Scheme.

The following data would require annual monitoring, in order to estimate GHG emissions and energy consumption:

- Natural gas use;
- Electricity produced;
- Diesel consumption in equipment; and
- Minor fuel consumption such as oils and greases, LPG and acetylene, if above reporting thresholds.

4.2 REVIEW OF THE GHGMP

Perth Energy will undertake an annual review of this GHGMP to ensure it:

- Is accurate;
- Captures all up to date information and site practices;
- Integrates any updated plans and forecasts for site operations; and
- Is in alignment with all current legislation and regulatory requirements.

Perth Energy will also review the GHGMP as required by any future conditions in the Ministerial Statement (if required and approved).

4.3 ADAPTIVE MANAGEMENT

This GHGMP has been developed to avoid and minimise the GHG emissions of the Proposal. Perth Energy aims to achieve this by implementing the mitigation and management measures outlined in this GHGMP. The success of the GHGMP will be measured against Condition requirements, EPA objectives for GHG emissions and Perth Energy's GHG emission aspirations.

Perth Energy has designed this GHGMP to incorporate an adaptive management and review strategy. This strategy includes ongoing evaluation of monitoring data to determine if the environmental objectives are being met. In the event that the GHGMP is failing to achieve the objectives defined in Section 3.2, Perth Energy will initiate a review of the GHGMP. If the GHGMP is revised as a result of this review a copy of the GHGMP and a summary of the GHGMP will be submitted to the Department of Water and Environmental Regulation (DWER) for approval.

In addition to the above, significant changes to the Proposal or updated information gathered through further investigations (e.g., updates to process flowsheet design and/or further optimisation studies) will also trigger review of the GHGMP. Perth Energy will also continue to

periodically review current best practice technologies for consideration for implementation in the Proposal.

In order to facilitate an adaptive management approach, Perth Energy will revise the GHGMP every five years. Each revision will draw on information learned in the preceding years and will typically include a review of following:

- Assumptions and uncertainties;
- The performance of the GHGMP;
- Re-evaluation of the risk assessment;
- External changes during the life of the Proposal; and
- Management actions, considering:
    - If new abatement technology is proposed to achieve interim and long-term targets in Section 3.2 not already considered;
    - If a new process or activity is proposed to be introduced that has the potential to significantly change the emissions from the Proposal, and that was not already considered (and that is not in accordance with this GHGMP);
    - Comments from the EPA, DWER and other decision-making authorities during the EP Act assessment processes;
    - Applicable changes in State or Commonwealth climate change legislation or policy; and
    - Material changes in risk (opportunities, processes and procedures) related to climate change identified by Perth Energy.

In addition to the above, Perth Energy will consider committing to the following conditions in the next five-year revision of the GHGMP (2030):

- Outlining other relevant potential GHG emission abatement measures that were considered but not proposed to be implemented;
- Provide a rationale as to why the abovementioned abatement measures were not implemented; and
- Provide a brief discussion on the feasibility and availability of offsets.

5 REPORTING

5.1 NATIONAL GREENHOUSE AND ENERGY REPORTING

Under the NGER scheme, corporations that exceed the corporate and facility thresholds for emissions, energy production or energy consumption need to report annually to the Clean Energy Regulator (Clean Energy Regulator, 2024). This Proposal will meet the NGER threshold and Perth Energy is required to register as a controlling corporation under the NGER Scheme and report annually.

5.1.1 PUBLIC REPORTING

Perth Energy will make the latest confirmed GHGMP publicly available on their website, along with a summary of the latest confirmed GHGMP.

Reports on the progress against the commitments and interim targets identified in emissions reductions trajectories in this GHGMP will be provided annually, along with consolidated reporting aligned with the 5-year milestones set out in the Paris Agreement (e.g. 2030, 2035 etc.).

Each time the GHGMP is revised and submitted to DWER for approval, Perth Energy will prepare and submit a separate summary of the GHGMP to the CEO for public disclosure. The summary will outline key information from the GHGMP (and reports to that time) in an accessible form which can be easily reviewed by third parties for transparency.

6 GLOSSARY

Term	Meaning
/a	Per annum
ACCUs	Australian Carbon Credit Units
AEMO	Australian Energy Market Operator
AGL	AGL Energy Limited
°C	Degrees Celsius
CH_4	Methane
CO_2	Carbon dioxide
$CO_{2\text{-}e}$	Carbon Dioxide Equivalent
CCGT	Combined-cycle Gas Turbine
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority
GHG	Greenhouse Gas
GHG Protocol Corporate Standard	GHG Protocol Corporate Accounting and Reporting Standard
GHGMP	Greenhouse Gas Management Plan
GJ	Gigajoule
GWP	Global Warming Potential
ha	Hectare
ICROA	International Carbon Reduction and Offsetting Accreditation
km	Kilometres
LPG	Liquid Petroleum Gas
m	metres
Mt	Million tonnes
MW	Mega Watt
MWh	Mega Watt hour
N_2O	Nitrous oxide
NGER	National Greenhouse and Energy Reporting
NGO	Non-governmental Organisations
NOx	Oxides of Nitrogen
OCGT	Open-cycle Gas Turbine
OEM	Original equipment manufacturer
Perth Energy	Western Energy Pty Ltd
Proposal	Kwinana Swift Power Station Expansion Project
RET	Renewable Energy Target
SERS	Sectoral emissions reduction strategy for Western Australia
SWIS	South West Interconnected System
t	Tonnes

Term	Meaning
TPS	Town Planning Scheme
WA	Western Australia

7 REFERENCES

AGL Energy Limited (2022). *Climate Transition Action Plan September 2022*. Available online from: https://www.agl.com.au/content/dam/digital/agl/documents/about-agl/sustainability/240603-climate-transition-action-plan.pdf?srsltid=AfmBOooRtkdxbFBFJEAFoZI7U8x38WK23wQ5tg7LK62GWmhB6gOXiYDk.

Australian Energy Market Operator (2023). *2023 Western Australia Gas Statement of Opportunities*. December 2023. Available online from: https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/wa_gsoo/2023/2023-wa-gas-statement-of-opportunities-wa-gsoo.pdf?la=en&hash=71B9040F2097FF4552429FF8F61C62A4.

Clean Energy Regulator (2024). *Assess your obligations – NGER thresholds.* Australian Government. Retrieved from: https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme/assess-your-obligations.

Commonwealth of Australia (2020). *Climate Active Carbon Neutral Standard for Organisations*. Australian Government. Retrieved from: https://www.climateactive.org.au/sites/default/files/2022-07/climate-active-carbon-neutral-standard-organisations.pdf.

Department of Climate Change, Energy, the Environment and Water (2024). *Australian National Greenhouse Accounts Factors.* August 2024. Available online from: https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2024.pdf.

Department of Water and Environmental Regulation (2023). *Sectoral emissions reduction strategy for Western Australia. Pathways and priority actions for the state's transition to net zero emissions.* December 2023. Available online from: https://www.wa.gov.au/system/files/2024-07/sers-final-report-20240702.pdf.

Environmental Protection Authority (2024). *Environmental Factor Guideline – Greenhouse Gas Emissions.* Government of Western Australia. Retrieved from: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Guideline%20%E2%80%93%20GHG%20Emissions%20-%20November%202024.pdf.

Greenhouse Gas Protocol (2011). *Corporate Value Chain (Scope 3) Accounting and Reporting Standard. Supplement to the GHG Protocol Corporate Accounting and Reporting Standard.* Available online from: https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf.

International Carbon Reduction and Offsetting Accreditation (2024). *ICROA Code of Best Practice.* Version 2.5. February 2024. Available online from: https://icroa.org/wp-content/uploads/2024/02/ICROA_Code_Best_Practice_v2.5.pdf.

World Resources Institute and World Business Council for Sustainable Development (2004). A Corporate Accounting and Reporting Standard. Available online from: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

8 APPENDICES

APPENDIX 1: BENCHMARKING REVIEW DATA

Table 10: Benchmarking data

Facility Name	State	Electricity Production (MWh)	Total Emissions	Emissions intensity (t $CO_{2\text{-}e}$/MWh)	Grid Connected	Grid	Primary fuel	Facility type/technology
Mica Creek Power Station	QLD	149,476	49,174	0.33	On	Mt Isa	Natural Gas	Combined Cycle; Siemens SGT-800 Gas Turbines
Cockburn Power Station	WA	1,306,506	487,712	0.37	On	SWIS	Natural Gas	Combined Cycle; Alstom GT13E2 Gas Turbine
Tallawarra Power Station	NSW	1,216,119	457,982	0.37	On	NEM	Natural Gas	Combined Cycle; Alstom GT26 Gas Turbine
Swanbank E Power Station	QLD	839,557	340,491	0.40	On	NEM	Natural Gas/Coal Seam Gas	Combined Cycle; Siemens V94.2 (SGT5-2000E) Gas Turbine
Pelican Point Power Station	SA	1,710,400	689,892	0.40	On	NEM	Natural Gas	Combined Cycle; Mitsubishi M701F Gas Turbines
Kwinana Gas Fired Power Station	WA	1,458,348	584,031	0.40	On	SWIS	Natural Gas	Combined Cycle; Siemens V94.2 (SGT5-2000E) Gas Turbines
Diamantina Power Station	QLD	1,882,190	780,957	0.41	On	Mt Isa	Natural Gas	Combined Cycle; Siemens SGT-800 Gas Turbines
Osborne facility	SA	440,638	185,019	0.41	On	NEM	Natural Gas	Combined Cycle; Siemens V94.2 (SGT5-2000E) Gas Turbine
Yarnima Power Station	WA	782,093	336,179	0.43	Off	Off-grid	Natural Gas	Combined Cycle; GE LM6000 Gas Turbines
Pine Creek A Power Station	NT	196,221	91,717	0.47	On	DKIS	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 20V34SG Engines; Open Cycle
Newman Power Station	WA	798,399	379,196	0.47	Off	Off-grid	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 50DF Engines; Open Cycle
McArthur River Power Station	NT	293,703	141,369	0.48	Off	Off-grid	Natural Gas	Reciprocating Engines; Caterpillar 3616 Engines; Open Cycle

Facility Name	State	Electricity Production (MWh)	Total Emissions	Emissions intensity (t CO_{2-e}/MWh)	Grid Connected	Grid	Primary fuel	Facility type/technology
Onslow Power Station & Onslow Distribution Network	WA	19,595	9,533	0.49	Off	Off-grid	Natural Gas/Diesel	Reciprocating Engines; Cummins QSK60 Engines; Open Cycle
South Hedland Power Station	WA	554,563	270,158	0.49	On	NWIS	Natural Gas	Combined Cycle; GE Frame 9E Gas Turbines
Paraburdoo Power Station	WA	541,351	270,649	0.50	On	NWIS	Natural Gas/Diesel	Reciprocating Engines; Caterpillar 3616 Engines; Open Cycle
Kwinana Swift Power Station Project Expansion*	WA	389,498	195,659	0.51	On	SWIS	Natural Gas	Open Cycle; Turbines to be confirmed
Kwinana Power Station	WA	1,070,204	543,135	0.51	On	SWIS	Natural Gas	Combined Cycle; Siemens V94.2 (SGT5-2000E) Gas Turbines
Ladbroke Grove Power Station	SA	63,771	32,618	0.51	On	NEM	Natural Gas	Open Cycle; Siemens SGT-600 Gas Turbines
West Angelas Power Station	WA	400,678	211,291	0.53	On	NWIS	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 34SG Engines; Open Cycle
Newport Power Station	VIC	432,895	257,558	0.54	On	NEM	Natural Gas	Open Cycle; Siemens V94.2 (SGT5-2000E) Gas Turbine
Bairnsdale Power Station	VIC	64,227	35,153	0.54	On	NEM	Natural Gas	Open Cycle; GE LM6000 Gas Turbines
Owen Springs Power Station	NT	132,669	71,828	0.54	Off	Off-grid	Natural Gas/Diesel	Reciprocating Engines; Caterpillar G3520C Engines; Open Cycle
Nova Power Station	VIC	9,743	5,260	0.54	On	NEM	Natural Gas	Open Cycle; GE 9E Gas Turbines
Mortlake Power Station	VIC	441,440	248,174	0.55	On	NEM	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 20V34SG Engines; Open Cycle
HEZ Power Station	NSW	727	984	0.55	On	NEM	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 34SG Engines; Open Cycle
Leinster Power Station	WA	246,261	135,634	0.55	Off	Off-grid	Natural Gas	Open Cycle; Siemens SGT5-2000E Gas Turbines
Uranquinty Power Station	NSW	153,013	90,649	0.56	On	NEM	Natural Gas	Open Cycle; GE LM6000 Gas Turbines

Facility Name	State	Electricity Production (MWh)	Total Emissions	Emissions intensity (t CO_{2-e}/MWh)	Grid Connected	Grid	Primary fuel	Facility type/technology
Weddell Power Station	NT	447,740	251,486	0.56	On	DKIS	Natural Gas	Open Cycle; GE Frame 6B Gas Turbines
Kalgoorlie Power Station	WA	245,295	137,865	0.56	On	SWIS	Natural Gas/Diesel	Reciprocating Engines; Caterpillar G3616 Engines; Open Cycle
Kambalda Power Station	WA	262,980	146,527	0.56	On	SWIS	LNG/Diesel	Reciprocating Engines; Cummins QSK60 Engines; Open Cycle
Broome LNG Power Station	WA	132,226	75,473	0.57	Off	Off-grid	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 34SG Engines; Open Cycle
Mt Keith Power Station	WA	289,042	165,136	0.57	Off	Off-grid	Natural Gas	Open Cycle; Pratt & Whitney FT8 Gas Turbines
Kwinana Swift Power Station	WA	106,642	62,227	0.58	On	SWIS	Natural Gas	Open Cycle; AGL GT13E2 Gas Turbines
Torrens Island Power Station	SA	766,715	447,635	0.58	On	NEM	LNG/Diesel	Reciprocating Engines; Caterpillar 3516B Engines; Open Cycle
Fitzroy Crossing LNG Power Station	WA	13,036	7,535	0.58	Off	Off-grid	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 34SG Engines; Open Cycle
Parkeston Power Station	WA	75,554	43,918	0.58	On	SWIS	Natural Gas	Open Cycle; GE Frame 6 Gas Turbines
Wagerup Power Station	WA	167,155	101,367	0.58	On	SWIS	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 34DF Engines; Open Cycle
Barker Inlet Power Station	SA	293,867	175,310	0.59	On	NEM	Natural Gas/Diesel	Reciprocating Engines; Caterpillar G3516 Engines; Open Cycle
Carnarvon Power Station & Distribution network	WA	39,595	23,385	0.59	Off	Off-grid	Natural Gas/Diesel	Open Cycle; GE Frame 6B Gas Turbines
Yurralyi Maya Power Station	WA	661,895	388,022	0.59	On	NWIS	Natural Gas	Open Cycle; GE LM6000 Gas Turbines
Exhibition Street	VIC	5	3	0.60	On	NEM	LNG/Diesel	Reciprocating Engines; Cummins QSK60 Engines; Open Cycle
Derby LNG Power Station	WA	31,405	19,128	0.61	Off	Off-grid	Natural Gas	Combined Cycle; Siemens SGT-800 Gas Turbines

Facility Name	State	Electricity Production (MWh)	Total Emissions	Emissions intensity (t CO_{2-e}/MWh)	Grid Connected	Grid	Primary fuel	Facility type/technology
Power Station - Tamar Valley	TAS	81,038	51,253	0.61	On	NEM	Natural Gas/Diesel	Open Cycle; Siemens SGT5-2000E Gas Turbines
Channel Island Power Station	NT	768,011	471,504	0.61	On	DKIS	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 34SG Engines; Open Cycle
Cape Lambert Power Station	WA	233,360	141,935	0.61	On	NWIS	Natural Gas/Diesel	Reciprocating Engines; Wärtsilä 34SG Engines; Open Cycle
Solomon Power Station	WA	331,917	206,715	0.62	Off	Off-grid	Natural Gas/Diesel	Reciprocating Engines; Caterpillar 3516B Engines; Open Cycle
Mt Magnet Town Power Station	WA	4,162	2,560	0.62	Off	Off-grid	Natural Gas	Open Cycle; Siemens SGT5-2000E Gas Turbine
Colongra Power Station	NSW	212,154	136,103	0.62	On	NEM	Natural Gas	Open Cycle; GE LM6000 Gas Turbine
Mount	NSW	35	23	0.63	On	NEM	Natural Gas	Open Cycle; Siemens SGT-600 Gas Turbines
Quarantine Power Station	SA	197,794	126,055	0.63	On	NEM	LNG/Diesel	Reciprocating Engines; Caterpillar 3516B Engines; Open Cycle
Halls Creek LNG Power Station	WA	11,753	7,494	0.64	Off	Off-grid	Natural Gas/Diesel	Open Cycle; GE Frame 6B Gas Turbines
Oakey Power Station	QLD	113,377	74,133	0.64	On	NEM	Natural Gas	Open Cycle; GE LM6000 Gas Turbines
Laverton North Power Station	VIC	106,312	73,026	0.66	On	NEM	Natural Gas	Reciprocating Engines; Caterpillar G3516 Engines; Open Cycle
Wadeye (Port Keats)	NT	9,507	6,377	0.67	Off	Off-grid	Natural Gas	Open Cycle; Alstom GT13E2 Gas Turbines
Kemerton Power Station	WA	694,109	464,382	0.67	On	SWIS	Natural Gas/Diesel	Reciprocating Engines; Caterpillar G3516 Engines; Open Cycle
Exmouth Power Station Pty Ltd	WA	25,443	17,643	0.69	Off	Off-grid	Natural Gas	Reciprocating Engines; Caterpillar G3516 Engines; Open Cycle
Tennant Creek Power Station	NT	29,546	20,485	0.69	Off	Off-grid	Natural Gas	Combined Cycle; GE Frame 9E Gas Turbines
Newgen Neerabup Power Station	WA	338,730	235,222	0.69	On	SWIS	Natural Gas/Diesel	Reciprocating Engines; Caterpillar G3516 Engines; Open Cycle

Facility Name	State	Electricity Production (MWh)	Total Emissions	Emissions intensity (t CO_{2-e}/MWh)	Grid Connected	Grid	Primary fuel	Facility type/technology
Elliot Generation	NT	3,116	2,218	0.71	Off	Off-grid	Natural Gas	Open Cycle; GE Frame 6 Gas Turbines
Smithfield Gas Turbine	NSW	32,085	24,060	0.72	On	NEM	Natural Gas/Diesel	Reciprocating Engines; Caterpillar G3516 Engines; Open Cycle
YPF UTILITIES PRODUCTION AND SUPPLY	WA	22,122	15,999	0.72	Off	Off-grid	Natural Gas	Open Cycle; Siemens SGT-600 Gas Turbines
Hallett Power Station	SA	70,602	52,045	0.73	On	NEM	Natural Gas	Open Cycle; GE LM6000 Gas Turbines
Somerton Power Station	VIC	80,692	61,027	0.74	On	NEM	Natural Gas	Reciprocating Engines; Caterpillar G3520C Engines; Open Cycle
Katherine Power Station	NT	25,984	19,337	0.74	On	DKIS	Natural Gas	Open Cycle; GE Frame 6 Gas Turbines
Karratha Power Station	WA	102,091	76,555	0.75	On	NWIS	Natural Gas	Open Cycle; GE Frame 6 Gas Turbines
Port Hedland Power Station	WA	461,349	352,397	0.76	On	NWIS	Natural Gas/Diesel	Reciprocating Engines; Caterpillar G3516 Engines; Open Cycle
Yulara Power Station	NT	17,784	13,560	0.76	Off	Off-grid	Natural Gas	Open Cycle; Caterpillar G3516 Engines
Roma Power Station	QLD	21,838	17,546	0.77	On	NEM	Natural Gas	Open Cycle; Wärtsilä 34SG Engines
Ron Goodin Power Station	NT	51,868	40,570	0.78	Off	Off-grid	Natural Gas	Combined Cycle; Siemens SGT-800 Gas Turbines
Alinta Pinjarra Generation Facility	WA	1,636,746	1,299,946	0.79	On	SWIS	Natural Gas	Open Cycle; Caterpillar G3520C Engines
Bolivar Power Station	SA	12,358	9,940	0.80	On	NEM	Natural Gas	Open Cycle; GE LM6000 Gas Turbines
Jeeralang Power Station	VIC	51,904	46,745	0.81	On	NEM	Natural Gas/Diesel	Reciprocating Engines; Caterpillar 3616 Engines; Open Cycle
Leonora Facility	WA	7,666	6,316	0.82	Off	Off-grid	Natural Gas	Open Cycle; Siemens SGT-800 Gas Turbines
Dry Creek Power Station	SA	32,641	28,272	0.86	On	NEM	Natural Gas	Open Cycle; Siemens SGT-800 Gas Turbines

Facility Name	State	Electricity Production (MWh)	Total Emissions	Emissions intensity (t $CO_{2\text{-}e}$/MWh)	Grid Connected	Grid	Primary fuel	Facility type/technology
Mintaro Power Station	SA	50,144	43,099	0.86	On	NEM	Natural Gas	Open Cycle; GE Frame 6 Gas Turbines
Mungarra Gas Turbine Station	WA	5,255	4,687	0.89	On	SWIS	Natural Gas	Open Cycle; GE Frame 6 Gas Turbines
Pinjar Gas Turbine Station	WA	718,062	669,979	0.93	On	SWIS	Natural Gas	Open Cycle; Siemens SGT-600 Gas Turbines
Valley Power	VIC	29,621	30,001	0.94	On	NEM	Natural Gas	Open Cycle; Siemens SGT-600 Gas Turbines
La Trobe	VIC	1	1	1.00	On	NEM	Natural Gas	Open Cycle; GE Frame 6 Gas Turbines
Kalgoorlie Gas Turbine Station	WA	4,465	4,655	1.04	On	SWIS	Natural Gas	Open Cycle; Caterpillar 3616 Engines
Barcaldine Power Station Facility	QLD	5,486	7,032	1.22	On	NEM	Natural Gas	Open Cycle; Caterpillar G3520C Engines
Karratha Temporary Generation Power Station	WA	432	601	1.39	On	NWIS	Natural Gas	Combined Cycle; Siemens SGT-800 Gas Turbines

**Note: Emissions estimates for the Proposal are from 2029 to 2050*

Appendix 3

Environmental Acoustic Assessment

HERRING STORER ACOUSTICS

RAMBOLL AUSTRALIA

KWINANA POWER STATION 2 PROJECT
LOT 13 BURTON PLACE
KWINANA

ENVIRONMENTAL ACOUSTIC ASSESSMENT

NOVEMBER 2024

OUR REFERENCE: 33801-3-24360

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
P.O. Box 219, Como, W.A. 6952
(08) 9367 6200
hsa@hsacoustics.com.au

DOCUMENT CONTROL PAGE

ENVIRONMENTAL ACOUSTIC ASSESSMENT
KWINANA POWER STATION 2 PROJECT

Job No: 24360

Document Reference: 33801-3-24360

FOR

RAMBOLL AUSTRALIA

DOCUMENT INFORMATION			
Author:	Tim Reynolds	**Checked By:**	Paul Daly
Date of Issue:	28 November 2024		

REVISION HISTORY

Revision	Description	Date	Author	Checked
1	Minor correction	02/12/2024	TR	N/A
2	Client Comments	09/12/2024	TR	N/A

DOCUMENT DISTRIBUTION

Copy No.	Version No.	Destination	Hard Copy	Electronic Copy
1	3	RAMBOLL AUSTRALIA Attn: Jeff Barham Email: jbarham@ramboll.com		✓

CONTENTS

APPENDICES

EXECUTIVE SUMMARY

Herring Storer Acoustics was commissioned to undertake a noise assessment of noise emissions associated with the proposed Kwinana Power Starion 2 Project, located at Lot 13 Burton Place, Kwinana.

The assessment was undertaken for the expected final capacity of 350MW.

Based on the conservative assessment, noise received at a limited number of residences could exceed the Regulatory requirements (ie to be considered as NOT “significantly contributing”) by 2 dB(A).

However, we understand that during the night period, there would be a reduction in noise emissions, not only due to demand on the power station, but the lower ambient temperature resulting in less air required for cooling.

As part of the design process noise mitigation options will be assessed and incorporated as required to ensure compliance with the Regulatory requirements are achieved.

1. INTRODUCTION

Herring Storer Acoustics were commissioned to undertake an acoustic assessment of noise emissions associated with the proposed Kwinana Power Starion 2 Project, located at Lot 13 Burton Place, Kwinana.

It is understood that the power station is a peak load power station, using gas turbines to generate up to 350MW during peak load conditions. Thus, the power station rarely operates at full capacity. The proposed layout is shown on Figure 1.1.

FIGURE 1.1 – INDICATIVE POWER STATION LAYOUT

The objectives of the study were to model and assess noise emissions from the final overall capacity of the power station for compliance with the requirements of the Environmental Protection (Noise) regulations 1997.

2. CRITERIA

The allowable noise level at the surrounding locales is prescribed by the *Environmental Protection (Noise) Regulations 1997*. Regulations 7 & 8 stipulate maximum allowable external noise levels. For the neighbouring residences this is determined by the calculation of an influencing factor, which is then added to the base levels. The influencing factor is calculated for the usage of land within two circles, having radii of 100m and 450m from the premises of concern.

The base noise levels for the times of day being considered as part of this application are shown below in Table 2.1.

TABLE 2.1 – ASSIGNED OUTDOOR NOISE LEVELS

Type of premises receiving noise	Time of day	Assigned level (dB)		
		$L_{A\,10}$	$L_{A\,1}$	$L_{A\,max}$
Noise sensitive premises: highly sensitive area (i.e within 15m of a dwelling)	0700 to 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 to 1900 hours Sunday and public holidays	40 + IF	50 + IF	65 + IF
	1900 to 2200 hours all days	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + IF	45 + IF	55 + IF
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90
Industrial and utility premises in the Kwinana Industrial Area	All hours	75	85	90

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
The L_{A1} noise level is the noise that is exceeded for 1% of the time.
The L_{Amax} noise level is the maximum noise level recorded.
IF = Influencing Factor

It is a requirement that received noise be free of annoying characteristics (tonality, modulation and impulsiveness), defined below as per Regulation 9.

"impulsiveness" means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax(Slow)}$ is more than 15 dB when determined for a single representative event;

"modulation" means a variation in the emission of noise that –

(a) is more than 3 dB L_{AFast} or is more than 3 dB L_{AFast} in any one-third octave band;

(b) is present for more at least 10% of the representative assessment period; and

(c) is regular, cyclic and audible;

"tonality" means the presence in the noise emission of tonal characteristics where the difference between –

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as L_{ASlow} levels.

Where the noise emission is not music, if the above characteristics exist and cannot be practicably removed, then any measured level is adjusted according to Table 2.2 below.

TABLE 2.2 - ADJUSTMENTS TO MEASURED LEVELS

Where **tonality** is present	Where **modulation** is present	Where **impulsiveness** is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB.

For this development, the closest residential premises are located, as shown on Figure 2.1 below.

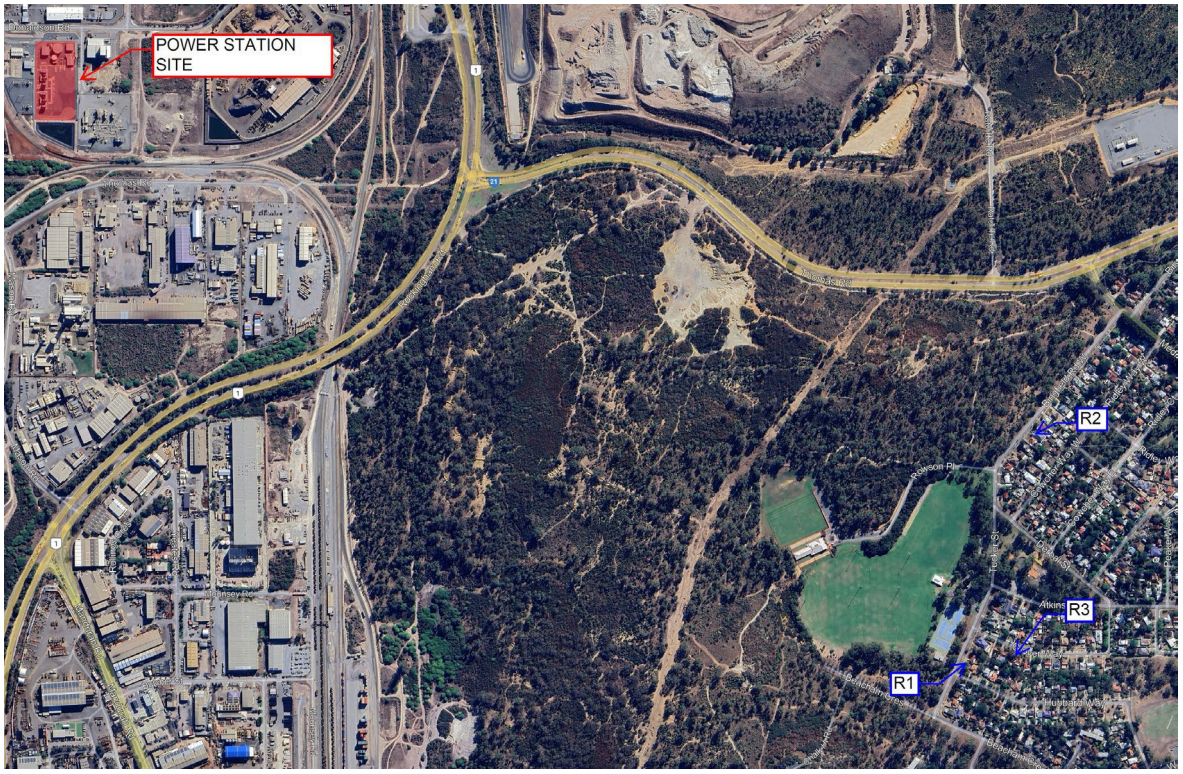


FIGURE 2.1 – RECEIVER POINTS

It is noted that Residence R1 is within 100 metres of the Kwinana United Soccer Club. Thus for these residences within 100 metres of the lot / land on which the club is located, the Influencing Factor would be increased by an addition to the influencing Factor of +2 dB.

Given the location of the Kwinana Policy Area, those residences within approximately 220 metres of the boundary of Area B, the Influence Factor for this land being considered as commercial would be +1 dB. Outside that distance the Influencing Factor would be rounded down to 0 dB.

A plan of the Kwinana Policy Air Buffer Zone is attached in Appendix B. Based on the above,

the Influencing Factors would be :

R1 - +3 dB(A).

R2 - +1 dB(A).

R3 - 0 dB(A).

Based on the above, the assigned noise levels for the periods of concern relating to this report would as listed in Tables 2.3 to 2.6.

TABLE 2.3 - ASSIGNED OUTDOOR NOISE LEVEL
RESIDENTIAL LOCATION R1

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises : Highly sensitive area	0700 - 1900 hours Monday to Saturday	48	58	68
	0900 - 1900 hours Sunday and Public Holidays	43	53	68
	1900 - 2200 hours all days	43	53	58
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	38	48	58

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

TABLE 2.4 - ASSIGNED OUTDOOR NOISE LEVEL
RESIDENTIAL LOCATION R2

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises : Highly sensitive area	0700 - 1900 hours Monday to Saturday	46	56	66
	0900 - 1900 hours Sunday and Public Holidays	41	51	66
	1900 - 2200 hours all days	41	51	56
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	36	46	56

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

TABLE 2.5 - ASSIGNED OUTDOOR NOISE LEVEL
RESIDENTIAL LOCATION R3

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises : Highly sensitive area	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

Finally, the Regulations also stipulate that noise emitted from a site must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at any premises.

The noise emissions from the site are considered not to significantly contribute to the overall noise level at the nearest noise sensitive premises provided noise received at the premiese are 5dB(A) less than the Assigned Noise Levels. The proposed power station will be one of many noise sources in the “Kwinana Strip” and could contribute to exceedances. As such, 5 dB(A) should be deducted from the determined assigned levels.

3. PROPOSAL

This report assesses noise received at the neighbouring residences for the proposed expansion of the power station, with the assessment being undertaken for the final expected overall capacity (350MW) of the power station.

The indicative preliminary layout of the proposed turbines are shown below in Figure 3.1.

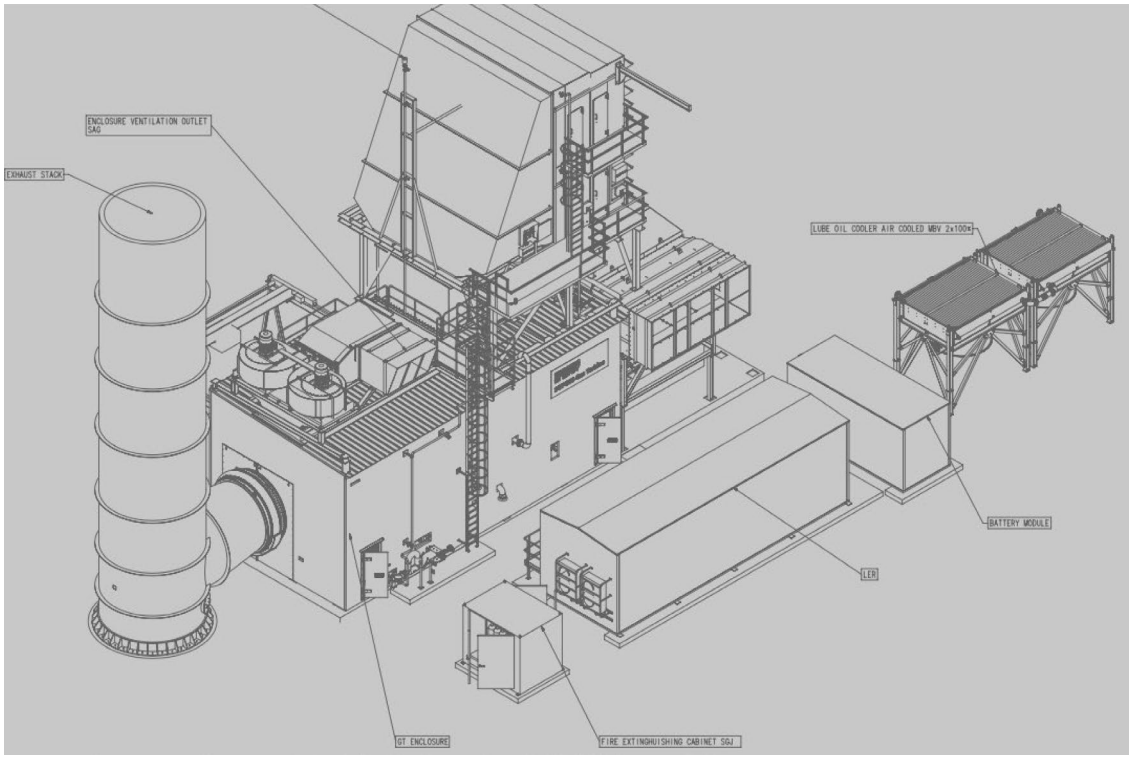


FIGURE 3.1 – TYPICAL GAS TURBINE

To achieve the overall capacity of the power station, 4 units, as shown above would be installed.

4. MEASUREMENTS

To determine the noise emission from the existing power station, noise level measurements of the existing turbines was undertaken on 13th November 2024, when the power station was operating at 100% capacity.

The measurements are summarised below in Figure 4.1.

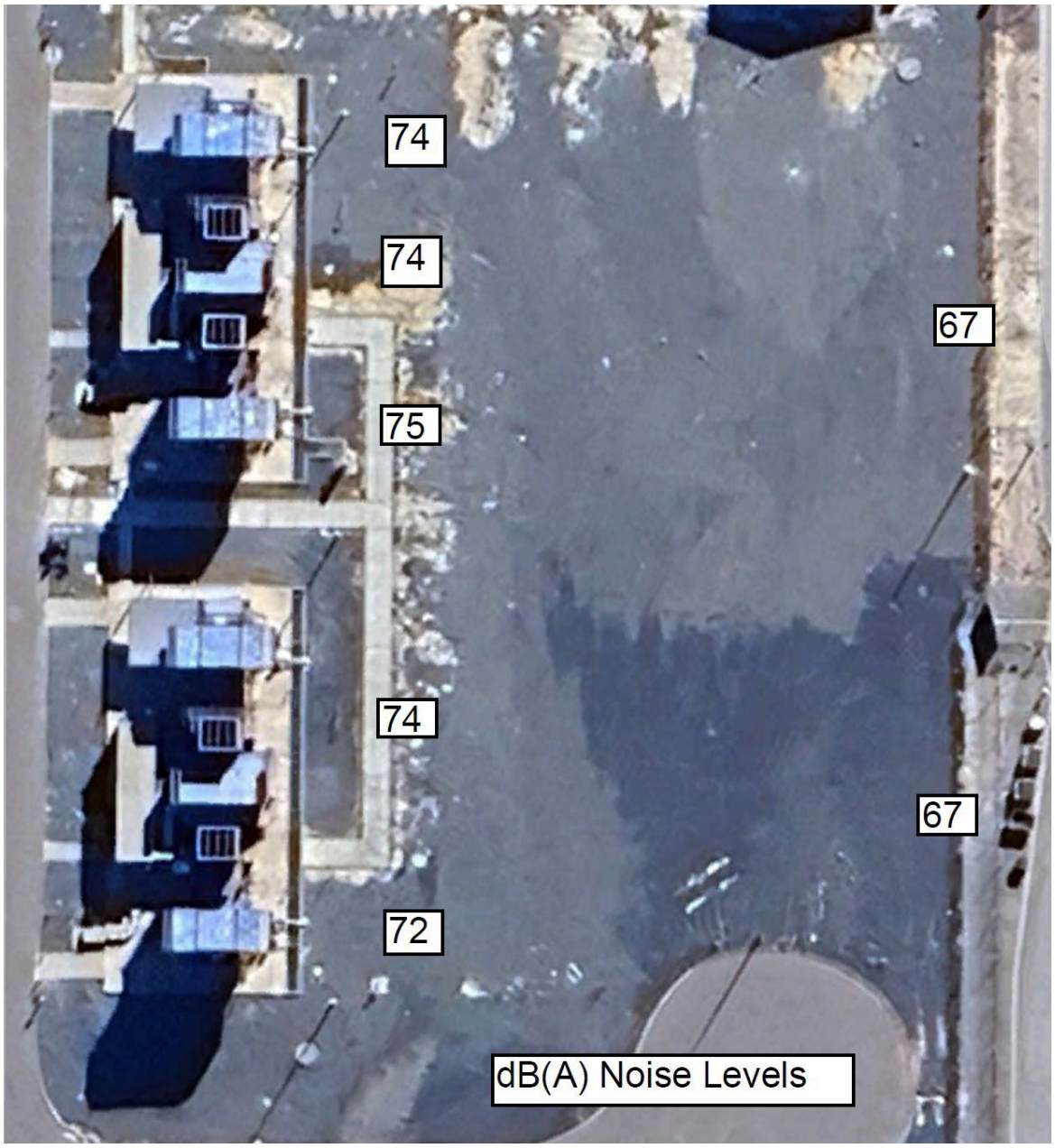


FIGURE 4.1 – EXISTING POWER STATION NOISE LEVELS

For information, the 1/3rd octave band noise levels recorded at the eastern boundary are shown in Figure 4.2.

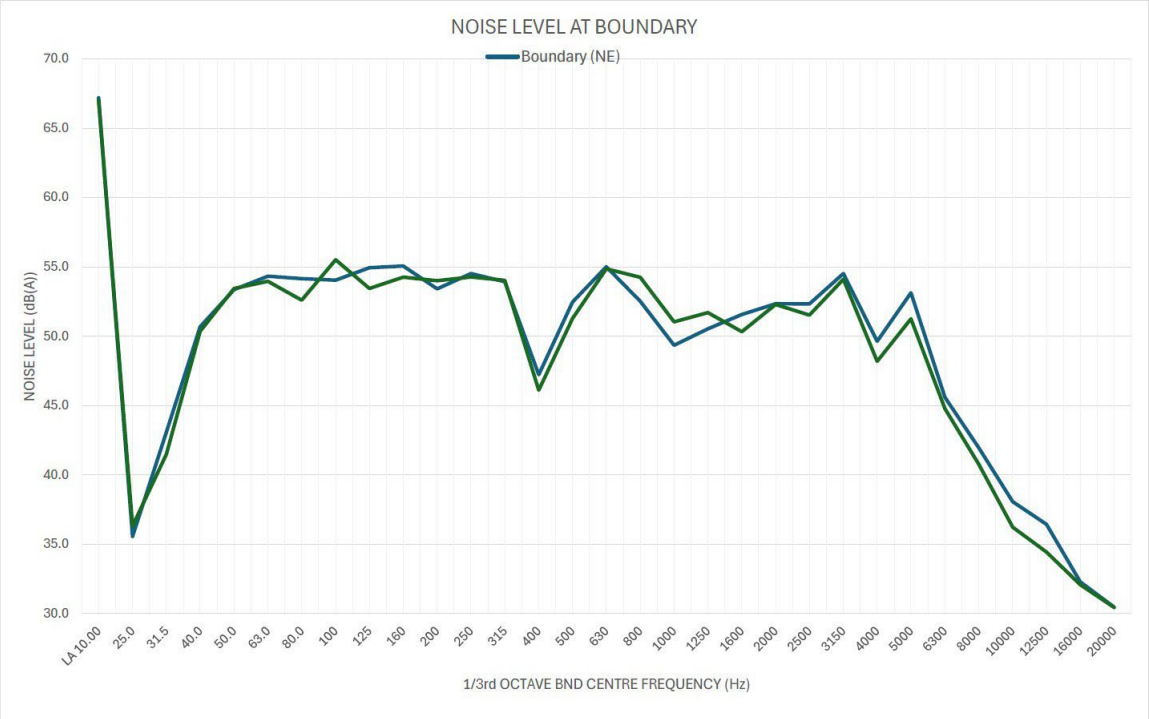


FIGURE 4.2 – BOUNDARY NOISE LEVELS

5. MODELLING

To assess the noise received at the neighbouring premises, noise modelling was undertaken using the noise modelling program SoundPlan.

Calculations were carried out using the Department of Water and Environmental Regulation's standard weather conditions for the night period, which relate to worst case noise propagation, as stated in Table 4 of the Department of Environment Regulation Draft Guidance for the "Assessment of Environmental Noise Emissions". These conditions include winds blowing from sources to the receiver(s). For information, the weather conditions, as stated in Table 4, are shown in the following Table 5.1.

TABLE 5.1 – WEATHER CONDITIONS

Condition	Night	Day
Temperature	15°C	20°C
Relative humidity	50%	50%
Pasquill Stability Class	F	E
Wind speed	3 m/s*	4 m/s*

* From sources, towards receivers.

From data supplied by the client and the above measurements the sound power levels used in the noise model were as outlined in Table 5.2.

TABLE 5.2 – SOUND POWER LEVEL - NOISE SOURCES dB(A)

Noise Sources	Sound Power Level dB(A)
EXISTING TURBINES	
Turbine	108
Enclosure Outlet	102
FUTURE TURBINES	
Turbine Enclosure	103
Generator Cooling Inlet	105
Gas Turbine Inlet	93
Gas Turbine Outlet	106
Stack	102
Lube Air Cooler	93

6. RESULTS

A summary of the calculated noise levels for scenarios are shown in Table 6.1.

TABLE 6.1 – CALCULATED NOISE LEVELS, L_{A10} dB(A)

Receiver Name	Calculated Noise Level (dB(A))
R1	30
R2	20
R3	32
Eastern Boundary of Premises	76

The noise contour plot is attached in Appendix A.

7. ASSESSMENT

As outline above in Section 2 – Criteria, under the Regulations, noise received at the noise sensitive premises must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at any premises.

The noise emissions from the site are considered not to significantly contribute to the overall noise level at the nearest noise sensitive premises provided noise received at the premises are 5dB(A) less than the Assigned Noise Levels. The proposed power station will be one of many noise sources in the "Kwinana Strip" and could to contribute to exceedances. As such, 5 dB(A) should be deducted from the determined assigned levels.

As the noise received from the power station would occur for more than 10% of the time, noise received at residential premises would need to comply with the assigned L_{A10} noise level. Table 7.1 lists the adjusted noise level (ie adjusting 5 dB(A) for the "significantly contributing" provision of the Regulations), for which noise received at the residences would be deemed compliant.

TABLE 7.1 - ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Location / Adjusted L_{A10} Level (dB)		
		R1	R2	R3
Noise sensitive premises : Highly sensitive area	0700 - 1900 hours Monday to Saturday	42	41	40
	0900 - 1900 hours Sunday and Public Holidays	38	36	35
	1900 - 2200 hours all days	38	36	35
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	33	31	30

Note: L_{A10} is the noise level exceeded for 10% of the time.

Table 7.2 compares the noise level received at the residences with the adjusted noise level for which compliance would be achieved.

TABLE 7.2 – ASSESSMENT OF NOISE LEVELS

Receiver	Assessable Noise Level, dB(A)	Applicable Times of Day	L_{A10} Compliance Noise Level (dB)	Exceedance to Assigned Noise Level L_{A01} (dB)
R1	31	0700 - 1900 hours Monday to Saturday	42	Complies
		0900 - 1900 hours Sunday and Public Holidays	38	Complies
		1900 - 2200 hours all days	38	Complies
		2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	33	Complies
R2	20	0700 - 1900 hours Monday to Saturday	41	Complies
		0900 - 1900 hours Sunday and Public Holidays	36	Complies
		1900 - 2200 hours all days	36	Complies
		2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	31	Complies
R3	32	0700 - 1900 hours Monday to Saturday	40	Complies
		0900 - 1900 hours Sunday and Public Holidays	35	Complies
		1900 - 2200 hours all days	35	Complies
		2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	30	+2
Western Boundary	76	All hours	75	76

8. CONCLUSION

A noise assessment has been undertaken with regards noise received at the residential premises from the proposed final expected capacity 350MW capacity of the power station located at Lot 13 Burton Place, Kwinana.

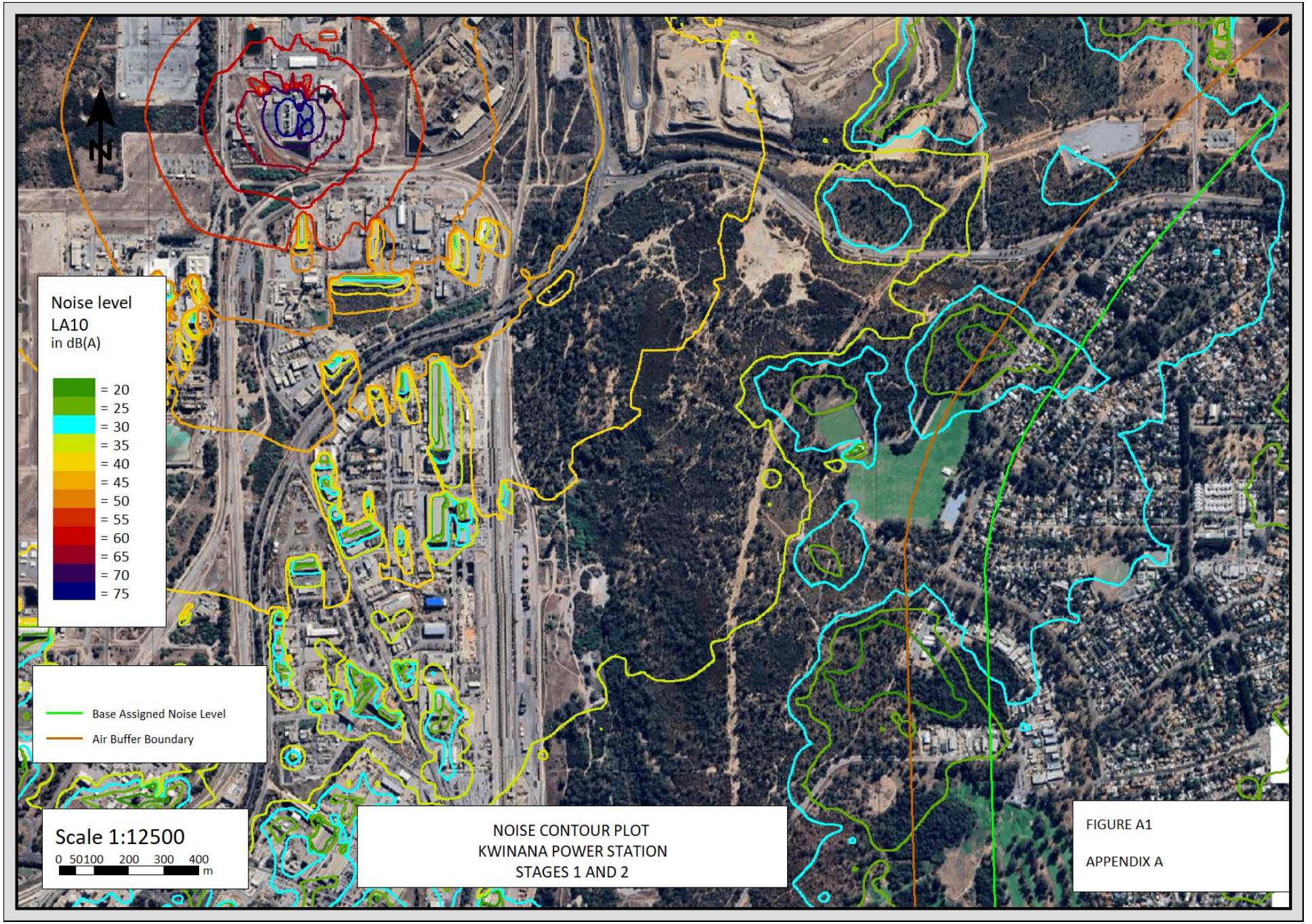
We note that the assessment has been based on the power station operating at full capacity. Under this scenario, noise received at the residences could comply with the Regulatory requirements during the day and evening periods, but could exceed these requirements during the night period by +2 dB(A). However, we understand that during the night period, there would be a reduction in noise emissions, not only due to demand on the power station, but the lower ambient temperature resulting in less air required for cooling.

Noise received at the boundary of the premises, could exceed the assigned noise level by 1 dB(A).

As part of the design process noise mitigation options will be assessed and incorporated as required to ensure compliance at the Regulator requirements are achieved.

APPENDIX A

NOISE CONTOUR PLOT


Noise level
LA10
in dB(A)
= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70
= 75
Base Assigned Noise Level
Air Buffer Boundary
Scale 1:12500
0 50100 200 300 400
m
NOISE CONTOUR PLOT
KWINANA POWER STATION
STAGES 1 AND 2
FIGURE A1
APPENDIX A

APPENDIX B

KWINANA AIR BUFFER ZONE

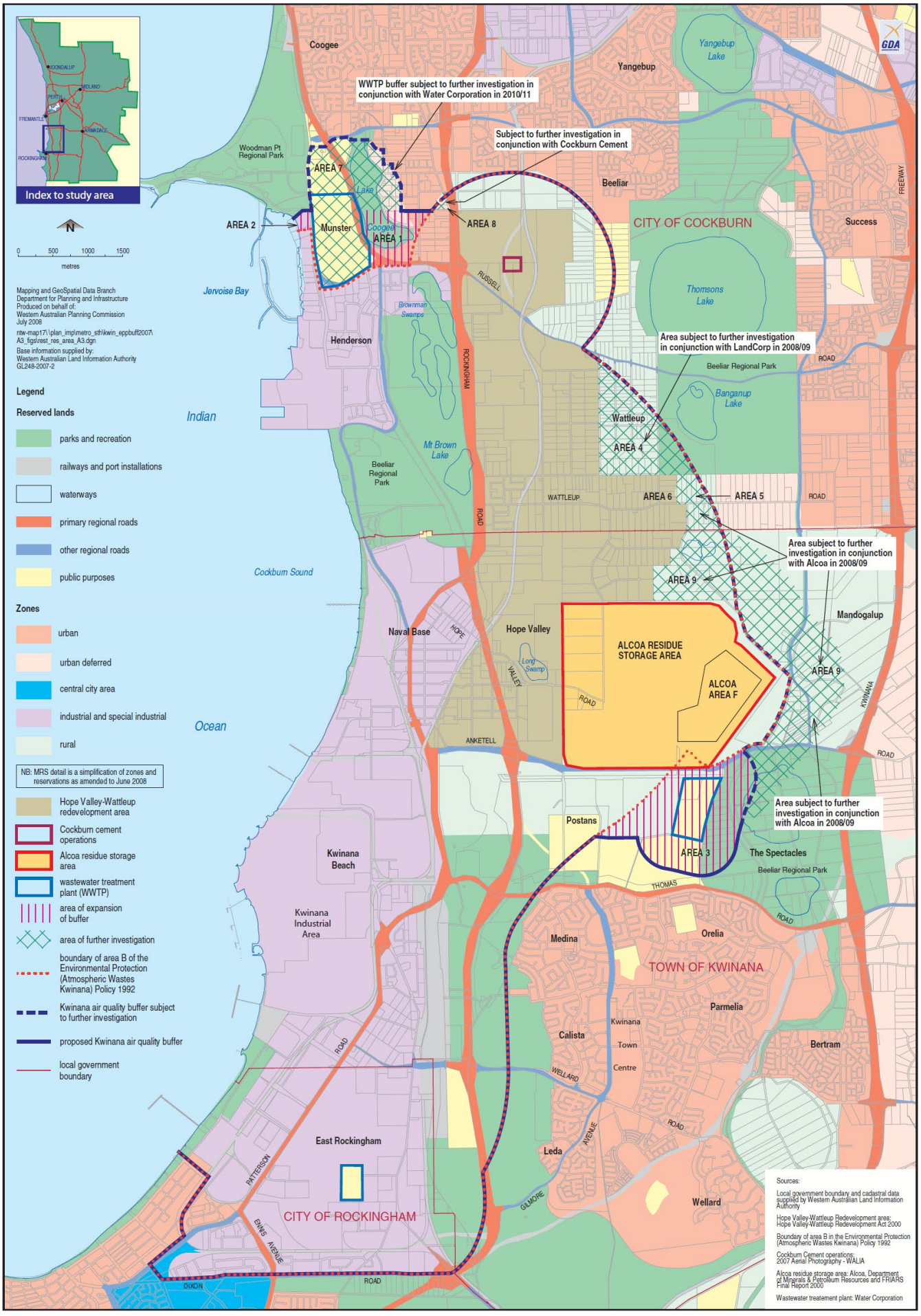


Figure 1: Areas comprising the *Review of the Kwinana Air Quality Buffer* and recommended Kwinana air quality buffer for 2008 – 2009

Appendix 4
Air Quality Assessment

Intended for
AGL Energy Limited

Document type.
Draft

Date
February 2025

KWINANA SWIFT POWER STATION EXPANSION – AIR QUALITY ASSESSMENT

RAMBOLL Bright ideas. Sustainable change.

Confidential

KWINANA SWIFT POWER STATION EXPANSION – – AIR QUALITY ASSESSMENT

Project name	**Kwinana Swift Power Station Expansion – Air Quality Assessment**
Project no.	**318002114**
Recipient	**AGL Energy Limited**
Document type	**Draft Report**
Version	**Final**
Date	**18/2/2024**
Prepared by	**Martin Parsons**
Checked by	**Jeff Barham & Marc Barendrecht**
Approved by	**John Miragliotta**

Ramboll
Level 7
41 St Georges Terrace
Perth
WA 6000
Australia

T +61 8 9225 5199
https://ramboll.com

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

Confidential

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1 Background

In the 2024 Wholesale Energy Market (WEM) Electricity Statement of Opportunities (ESOO), published on 18 June 2024, the Australian Energy Market Operator (AEMO) has signalled a capacity investment shortfall starting from the 2027-28 capacity year, largely driven by planned retirement of most of the existing coal fired generation fleet.

The proposed KSPS expansion (the K2 Project) will contribute additional electricity supply to address forecast electricity capacity deficits resulting from increased demand and the retirement of thermal coal fire generation of State-owned Collie, Muja C and Muja D power stations. The K2 Project would provide critical flexible firming capacity to the WEM. In addition, the K2 Project will be designed to meet AEMO's new Flexible Capacity criteria, which is designed to play a crucial role in flexible fast response generation to complement batteries and intermittent renewable generation.
The KSPS is located 40 km South of Perth in the Kwinana Industrial Area (KIA) at 1 Burton Place, Kwinana Beach (Lot 13 DP39572) in the city of Kwinana. The KSPS is a dual-fuel 120 MW peaking power station. The site is licensed as a prescribed premises for Electric power generation (L8471/2010/2) under the Environmental Protection Regulations. The premises have been operating under this licence without incident, since 2010.

The KSPS features four 30MW gas turbines connected to two common generators. The expansion would involve installing additional gas turbines within the existing site to provide a total additional capacity of up to 250MW. It is proposed that the turbines would be open cycle units that could operate on gas, distillate, LNG, LPG and/or hydrogen.

The existing plant is primarily operational during times of peak energy usage in Perth and the surrounding region, and the expansion of the plant will not change these operations. The power station by nature, will not operate continuously. AGL intends to obtain all necessary environment and planning approvals for up to four types of gas turbines which will correspond to four different plant configurations. The gas turbine will be selected after the environment and planning approval is obtained.

AGL requested Ramboll undertake an air quality assessment as part of their approvals support for the expansion of the KSPS. The assessment included modelling potential air quality impacts arising from emissions of concern which in this instance is oxides of nitrogen (NOx) (expressed as nitrogen dioxide (NO_2)). Emissions of carbon monoxide and particulates are also expected to be emitted from the turbines; however, the concentrations of these pollutants are negligible in the context of ambient air quality guidelines and have not been assessed further as part of this assessment.

1.2 Purpose of this Report

This report presents the assessment of the potential air quality impacts arising from emissions of NOx. The approach, methodology and results of the air dispersion modelling are detailed as well as the predicted impacts.

Confidential

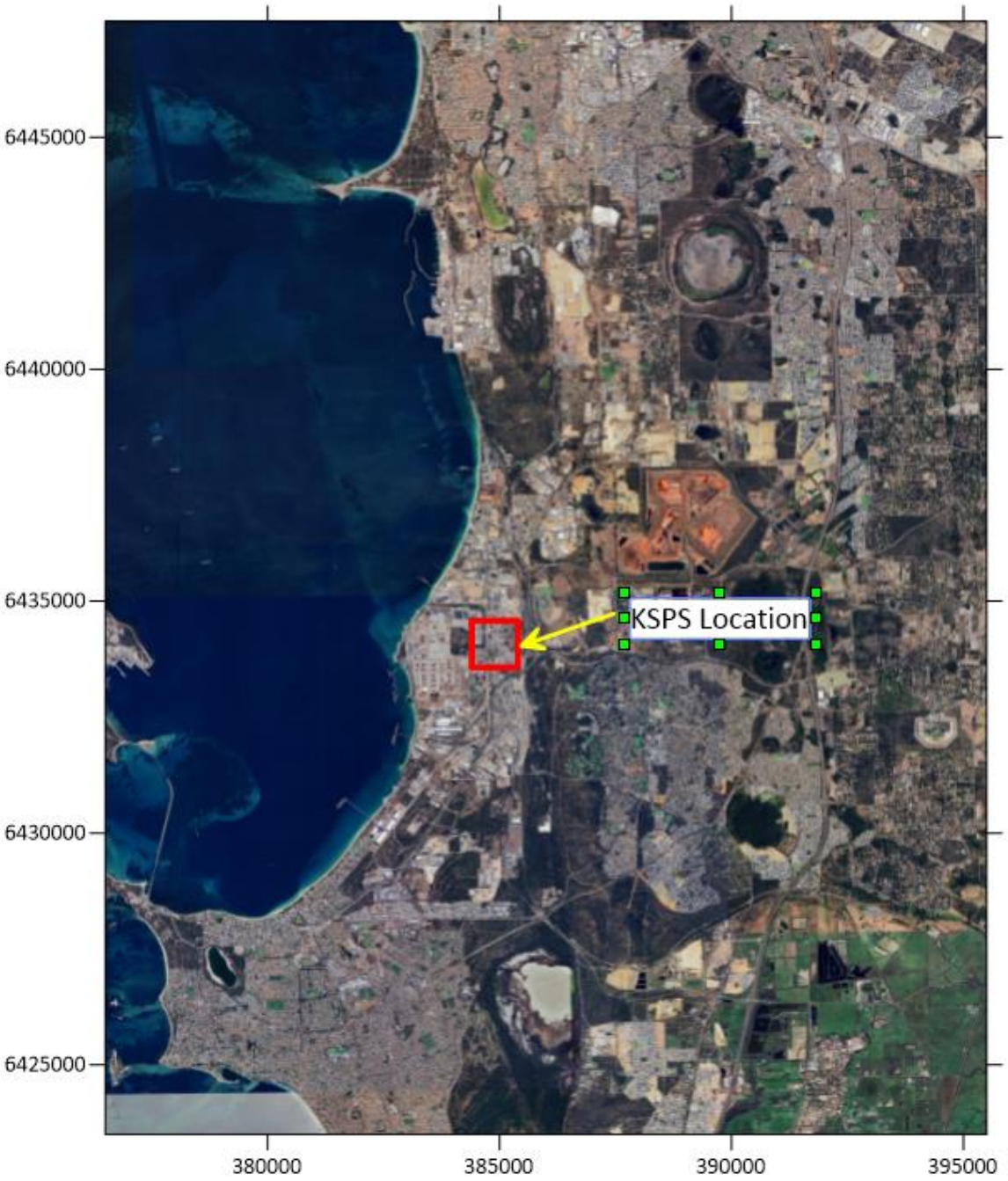


Figure 1: KSPS Locations

Confidential

Figure 2: Indicative Layout of the proposed Facility

Confidential

2. AIR QUALITY CRITERIA

2.1 Ambient Air Quality Criteria

The Department of Water and Environmental Regulation (DWER) published the Guidance Statement for Risk Assessments in February 2017 (DWER, 2017) and the draft Guideline: Air Emissions in October 2019 (DWER, 2019), which refers to air quality criteria that may be considered in determining public health and environment impacts. The publication containing air quality criteria relevant to this assessment is the National Environment Protection (Ambient Air Quality) Measure (NEPM) (NEPC, 2015 & 2021).

A summary of the current applicable air quality criteria for NO_2 is presented in Table 1, and a summary of the previously applied criteria is presented in Table 2.

Table 1: Ambient Air Quality Criteria

Compound	Averaging Period	Concentration (µg/m^3)[1]	Reference
NO_2	1-hr	151	NEPC (2021)
	Annual	28	

Notes
1. Referenced to 25ºC, and 101.3 kPa.

Confidential

3. AMBIENT MONITORING

3.1 Ambient Air Quality

The DWER conduct ongoing ambient air quality monitoring within the Kwinana region for NO_2. The closest air quality monitoring station (AQMS) to the KIA is at the North Rockingham AQMS (See Figure 3). Data from the North Rockingham station was obtained for the modelled period (1st July 2023 and 30th June 2024). A summary of the monitored data is presented in Table 2 below. The results show that the monitored concentrations at this station were well below the ambient air quality guideline values as presented in Table 1.

Table 2: Monitored Concentrations at North Rockingham AQMS (1st July 2023 and 30th June 2024)

Data Availability	Concentration µg/m³						
	Max 1-hour[2]	99th percentile 1- hour	98th percentile 1-hour	95th percentile 1-hour	90th percentile 1-hour	70th percentile 1-hour	Annual Average[3]
95.8%	59.8	40.2	35.4	28.1	20.3	8.3	8.1

Notes
1. Referenced to 25ºC, and 101.3 kPa.
2. 1-hour average NO_2 criteria – 151 µg/m³
3. Annual average NO_2 criteria – 28 µg/m³

Background concentrations of NO_2 are required to assess potential cumulative impacts for the purposes of this study. Whilst other major sources of NOx emissions in the KIA have been included in the modelling assessments, this does not account for other sources of NOx in the region such as vehicles or other minor sources. No specific guidance for selection of an appropriate background level is provided or endorsed by the DWER in Western Australia. Accordingly, in Victoria, the State Environment Protection Policy (Ambient Air Quality) (SEPP (AQM)) (Gov. of Vic., 2001) states that the 70th percentile concentration (concentration which is exceeded by 30% of concentrations for that averaging period) could be adopted as the background level for shorter term averaging periods.

The DWER reports annually the 75th percentile for NO_2 1-hour average concentration at its monitoring stations in Western Australia. Previous correspondence with the DWER has indicated that due to the prevailing winds of the region, the 70th percentile concentrations recorded at the North Rockingham AQMS might not be adequately considered conservative for use in an air quality assessment of sources in the KIA.

Hence, in absence of reported 70th percentile values, the more conservative 75th percentile for 1-hour averages and the annual average concentrations of NO_2 measured at another nearby DWER monitoring station (South Lake AQMS) were assessed. Concentrations over several years were analysed and concentrations for the year 2019, were considered to be the most conservative. The concentrations monitored in 2019 at the South Lake AQMS have been utilised in this assessment to conservatively represent background sources of NOx other than those that were not explicitly modelled.

Confidential

Table 3: 2019 Monitored Concentrations – South Lake Monitoring AQMS

Compound	Averaging Period	Concentration (µg/m³)
NO_2	75th percentile 1-hour	39.5
	Annual	13.2

Notes
1. Referenced to 25ºC, and 101.3 kPa.

It should be noted that the values used as indicative of background concentrations are likely conservative as they would contain contributions from the industrial sources that have been explicitly modelled. In addition, the South Lake monitor whilst in the direction of the prevailing winds of the region, is located some distance from the KIA near the Kwinana Freeway and would be impacted by traffic emissions, however it provides a conservative basis on which to assess the potential risk associated with the project.

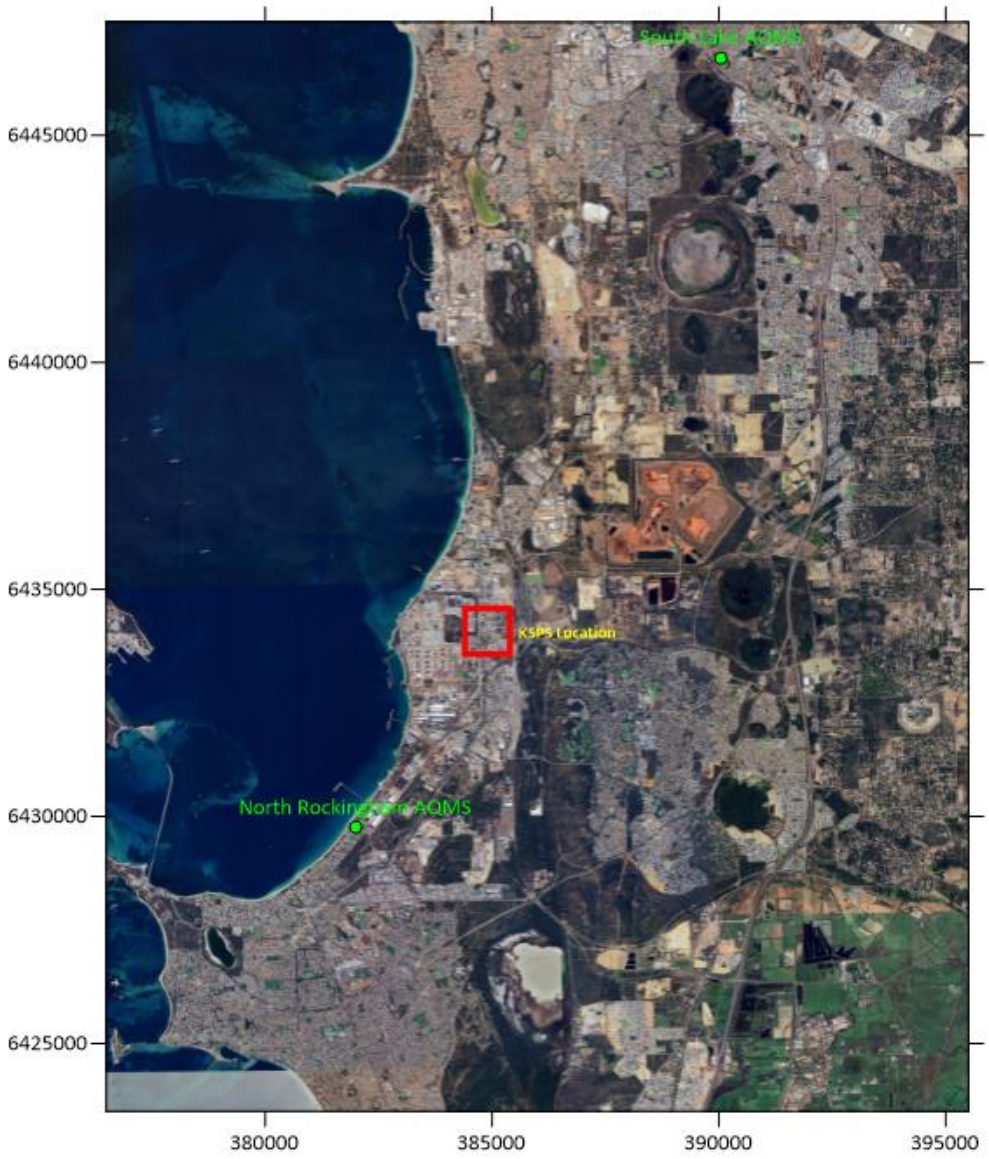


Figure 3: Background Air Quality Monitoring Study Ambient NO_2 Monitoring Sites

Confidential

4. AIR DISPERSION MODELLING AND METHODOLOGY

4.1 Air Dispersion Model

The CALPUFF modelling system was utilised to undertake air dispersion modelling. CALPUFF is a multi-layer, multi-species, non-steady-state puff dispersion model. It utilises three-dimensional wind fields to simulate the effects of the temporal and spatial meteorological conditions on pollutant transport, transformation, and removal. CALPUFF also allows for three-dimensional characterisation of land use and surface characteristics such as height and density of vegetation. CALPUFF is often used in a regulatory environment in situations where other regulatory models such as AERMOD may not be suitable due to complex terrain or proximity to the coast.

The following model set-up options within CALPUFF were used:

- Meteorological grid of 29 km by 39 km encompassing the KIA, Rockingham, and South Lakes
- Meteorological grid spacings of 1 km;
- Sampling grid of 20 km by 25 km and 200 m spacing; and
- No chemical transformation.

In addition to the gridded receptors for CALPUFF, discrete receptors were positioned throughout the modelled domain to represent residential dwellings and recreational locations to provide a quantitative assessment of NO_2 concentrations in sensitive areas of interest. These discrete receptors are summarised in Table 4 and are also highlighted in Figure 4.

Table 4: Discrete Receptor Locations

Receptor	Easting (MGA94) (m)	Northing (MGA94) (m)
Wells Park	383,090	6,431,590
Golf Course	386,587	6,431,618
Thomas Oval	386,468	6,432,951
Oval	385,925	6,434,681
Residence	386,723	6,432,276
North Rockingham AQMS	382,112	6,429,858
Residence	387,347	6,430,608
Hope Valley	386,300	6,436,000
Calista Primary School	387,961	6,431,708
Wombat Wallow Childcare Centre	387,344	6,433,024
South Lake AQMS	390,061	6,446,712

Confidential

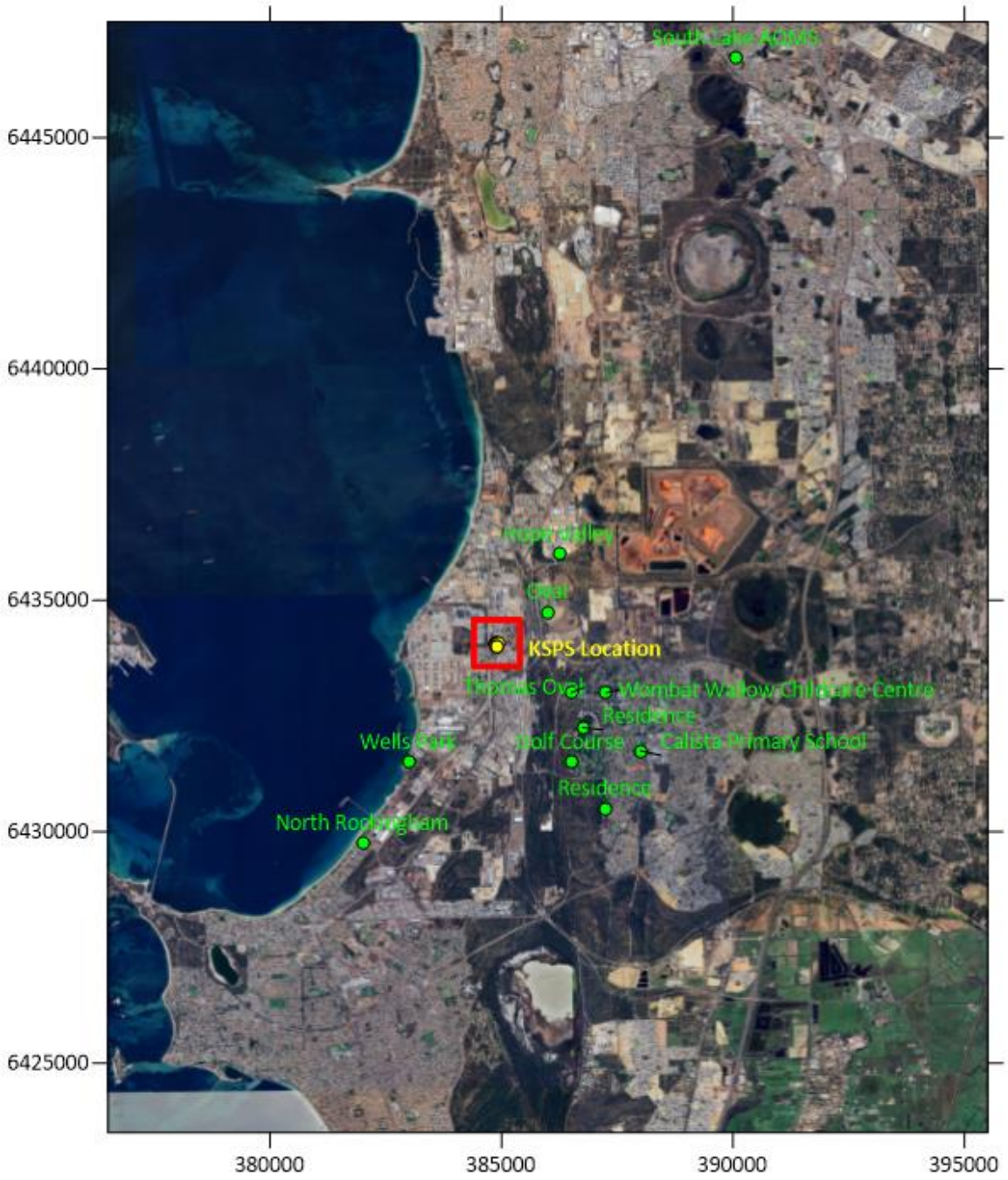


Figure 4: Receptor locations in relation to the proposed operations

Confidential

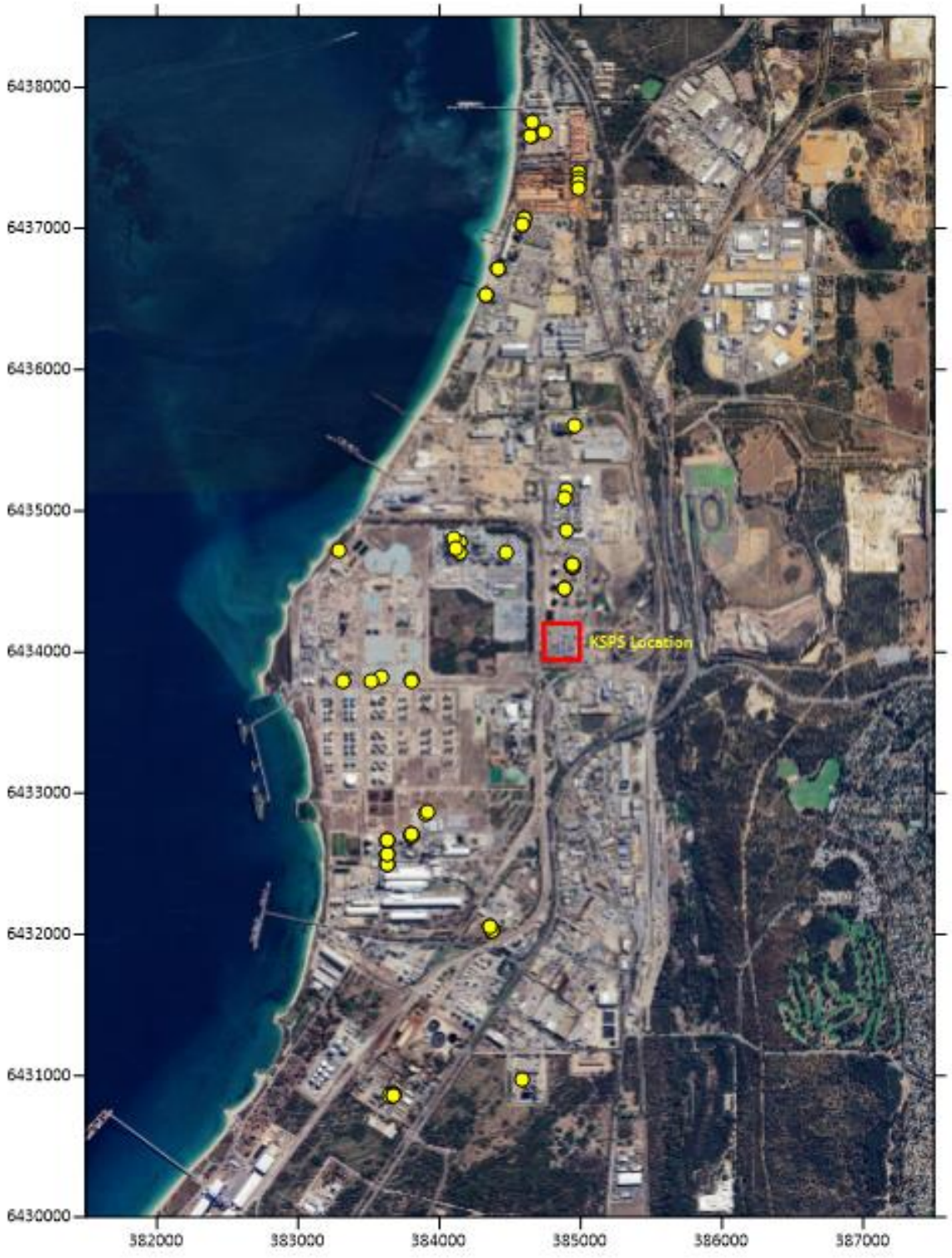


Figure 5: Significant Current and Future Sources of NOx emissions within the KIA that were included in the Background and Future Scenarios as represented by the Yellow Dots

4.2 Meteorological Data

The meteorology of the required site was simulated using the Weather Research and Forecasting Model (Michalakes et al. 2001), subsequently referred to as "WRF". This is a state-of-the-artnumerical model, which uses the basic laws of physics and thermodynamics to calculate the

evolution of a region's meteorology in time and space. While originally released in 2001, it has been continuously updated since that date. The version used in this work was numbered 4.2.

It represents the interactions of many variables, including wind velocity, air pressure, temperature and humidity, cloud, rain, plus surface characteristics like soil moisture, land use type, vegetation structure, ground roughness and water surface temperature. These are represented on a set of three-dimensional grids, covering the full depth of the atmosphere and a horizontal region that may be only a few kilometres wide, or cover the whole globe. Normally it is used in "nested" mode, in which the broader scales surrounding a region of particular interest are represented at coarse resolution, while those centred on that region are represented on a fine scale.

The model was considered appropriate in this instance for use with the CALPUFF model as it takes into consideration the complex meteorology of a coastal environment and incorporates the impacts of the thermally induced boundary layer that impacts emissions from sources in the KIA.

4.2.1 Metrological Model Configuration

The model was run using four nests, with south-north resolution 27000, 9000, 3000 and 1000 metres, and west-east resolution 85% of these values.

The centre of the modelling region was set at -32.175°S, 115.75°E. All four nested grids were of size 37 by 46 cells, using a polar grid, each centred within the next largest (Figure 6). The extent of the outermost grid was chosen to ensure that a large width of ocean was represented to the west and south of Western Australia, experience showing that this was needed to ensure adequate model accuracy.

The run simulated the period 1 July 2023 to 30 June 2024. This period was preceded by a three-day "run up", provided to permit model parameters to stabilise. Experience has shown that since the model was initialised using high-resolution measured data, a good match between modelled and measured values developed within a few hours.

Input boundary and initial conditions for the model were obtained using the ERA5 reanalyses (Herzbach et al. 2023). The data used comprised a subset of the global data set, at 1° horizontal resolution with 16 levels from the surface to 50 hPa, covering the region from 90° to 165°E and 65° to 0°S.

Confidential

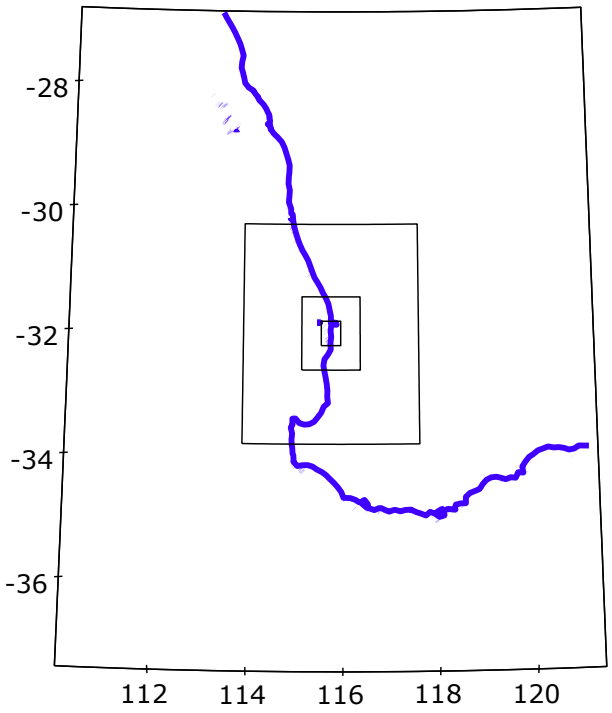


Figure 6: Boundaries of the four nested grids used for modelling, with an outline of the Western Australian coastline for reference.

Other configurations comprised:

- providing for time-varying sea surface temperatures, based on global data records;
- output of model results at hourly intervals for the innermost grid, three-hourly intervals for the next three and six-hourly for the outermost;
- lateral boundary conditions for the outermost nest provided by global measured data, with two-way transfer of boundary data at the edges of inner nests;
- adaptive time steps;
- 28 model layers, with interfaces between near-surface layers at heights of about 20, 50, 90, 160, 250, 360, 550 and 760 m;
- Microphysics using the WRF Single-Moment 6-class scheme (option 6), cumulus physics using the Kain-Fritsch scheme (option 1), longwave radiation using the Rapid Radiative Transfer Model (option 1), shortwave radiation using the Dudhia scheme (option 1), surface layer using the revised MM5 surface layer scheme (option 1). These were found not to be crucial options, all reasonable choices giving similar results;
- Surface physics using the Noah Land Surface Model;
- 4 soil layers;
- Boundary layer physics using the YSU scheme. This choice has been found to give reliable results, and also permits the use of the topographic wind adjustment scheme (which had negligible effect in this case);
- Non-hydrostatic modelling for all nests; and
- Nested boundary relaxation width of 4 cells.

Land use classes employed in the model were based on the MODIFIED_IGBP_MODIS_NOAH data set, with the exceptions:

- For the region of Jandakot Airport, index 17 corresponding to bare ground was used.

- Land use classes in the section of the innermost grid west of 115.85° and south of -32.05° were altered based on satellite imagery of the area, on a grid of 9 arc seconds.

WRF was run using only the standard initial and boundary condition inputs:

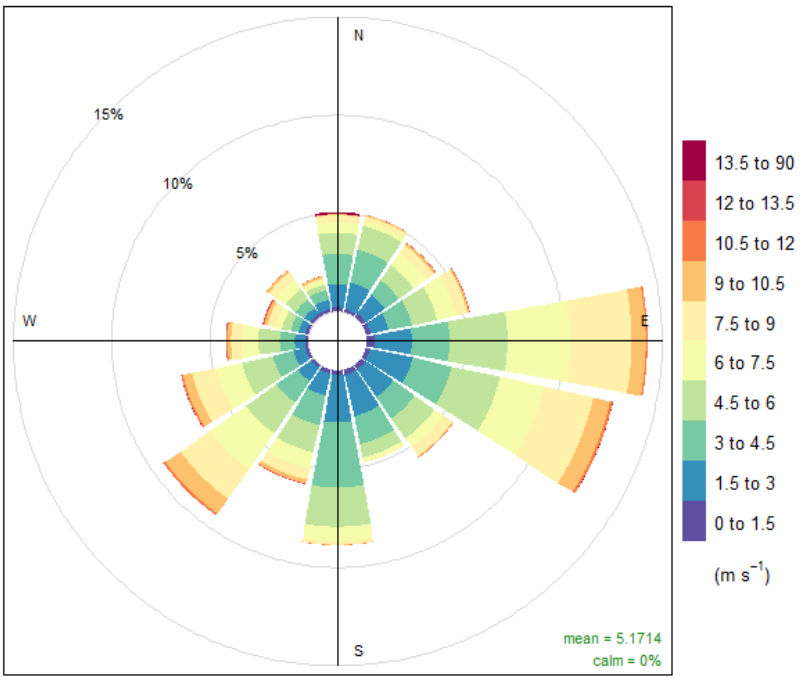
- Site measurements were not included, because it was desired to be able to compare model estimates with measurements. Should data from measurement sites have been incorporated in the model run, this would not have been feasible, since the validation process would have involved comparison of measurements with a derivative of those measurements; and
- Nudging of model calculations towards the ongoing values in the ERA5 analyses (using the "grid nudging" approach) was evaluated, but the results of an analysis run showed little effect on model estimates.

The CALMET meteorology files were generated for the period 28 June 2023 to 30 June 2024 (noting that the initial three days were a run-up period for WRF) with a grid size of 29 points west-east and 39 points south-north, and 12 levels corresponding to the lowest 12 levels used by WRF. The southwest grid origin was located at UTM zone 50, 367000 m east and 6419000 m north, using grid intervals of 1000 m. This grid was located within innermost WRF modelling grid, with about 4 cells clear on all sides to exclude the region of transition of meteorological fields from the next larger modelling grid.

4.2.2 Analysis of Meteorological Model Results

Model estimates were compared against measurements made at the nearest locations of publicly available meteorological data, the Bureau of Meteorology site at Jandakot Airport, and three on Garden Island (Garden Island HSF, Colpoy's Point and Armament Jetty). The Jandakot site is within an open airfield area, so tends to experience increased wind speeds. Figure 7 compares the wind roses for the measured and modelled winds at Jandakot. The two wind roses show general similarity, except for more frequent and generally stronger measured winds from the east. As shown in Figure 7, despite the use of the "barren land" land use class for the aerodrome, there was little enhancement of mean wind speeds. The lower modelled wind speeds compared to measurement are shown as a quantile-quantile plot in Figure 9, as a drop in the curve about 6 m/s. It appears that to achieve improved validation at Jandakot, modelling at higher resolution would be required.

Confidential



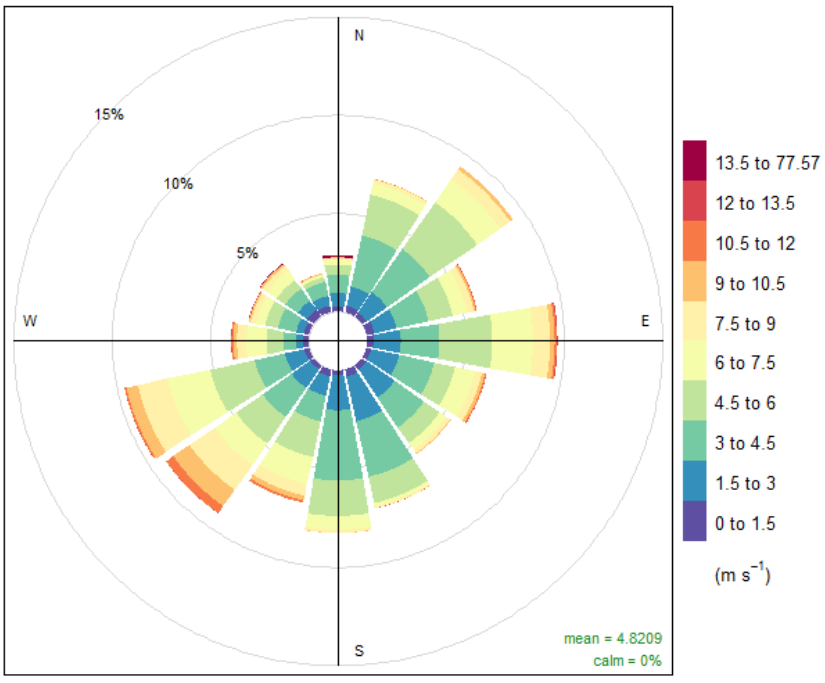


Figure 7: Comparison of measured (above) and modelled (below) wind roses for Jandakot

Confidential

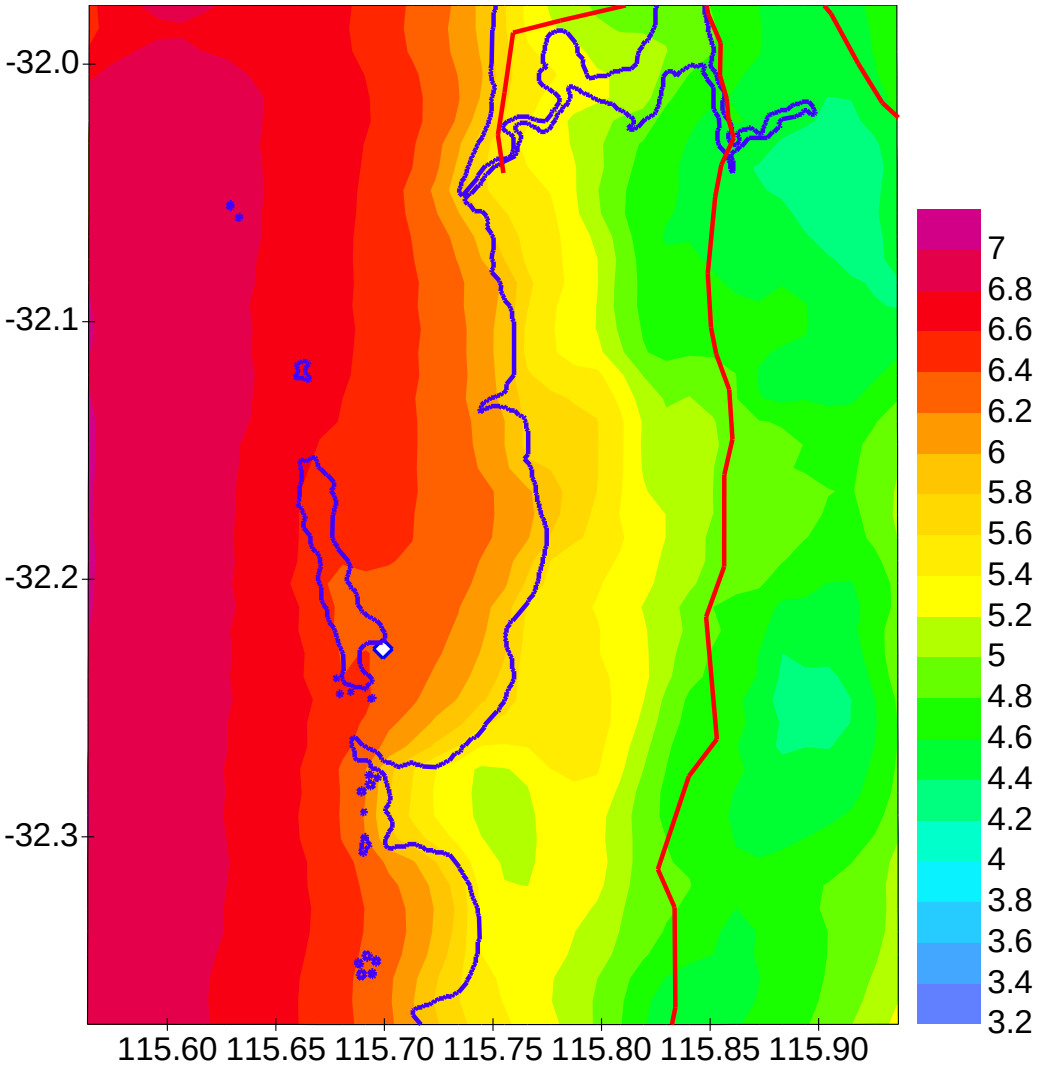


Figure 8. Mean wind speeds for the innermost grid. The location of the Colpoy's Point meteorological site is shown by the small diamond.

Confidential

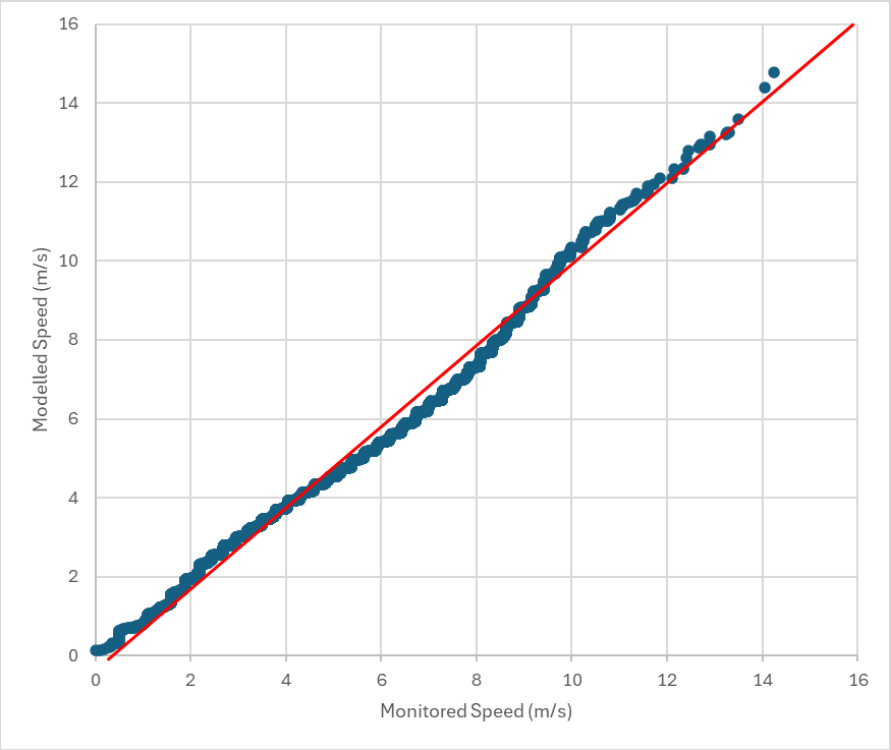
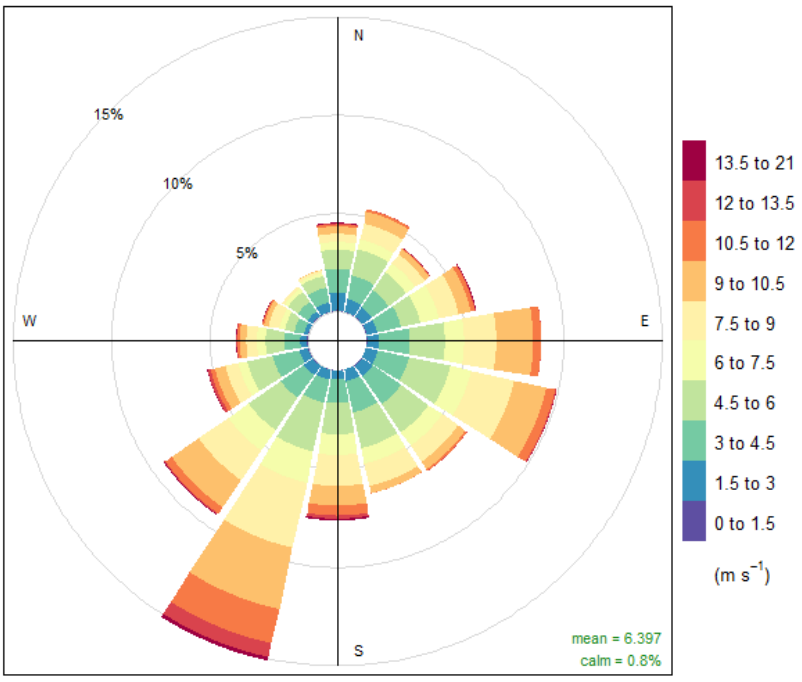


Figure 9: Quantile-quantile plot of modelled and measured wind speeds at Jandakot.

Modelling of winds in the vicinity of Garden Island might be expected to be problematic, due to the poor resolution of the island on a 1 km grid. However, the comparison of modelled and measured values at all sites showed reasonable agreement.

For example, Figure 10 shows wind roses for the Colpoys Point site, which is located on the horn-shaped point in the northern section of the naval base. There is an appearance of broad similarity, which is confirmed by the quantile-quantile plot comparing the two wind speed distributions (Figure 11). Comparisons for the Garden Island HSF and Armament Jetty sites were closely similar.

Confidential



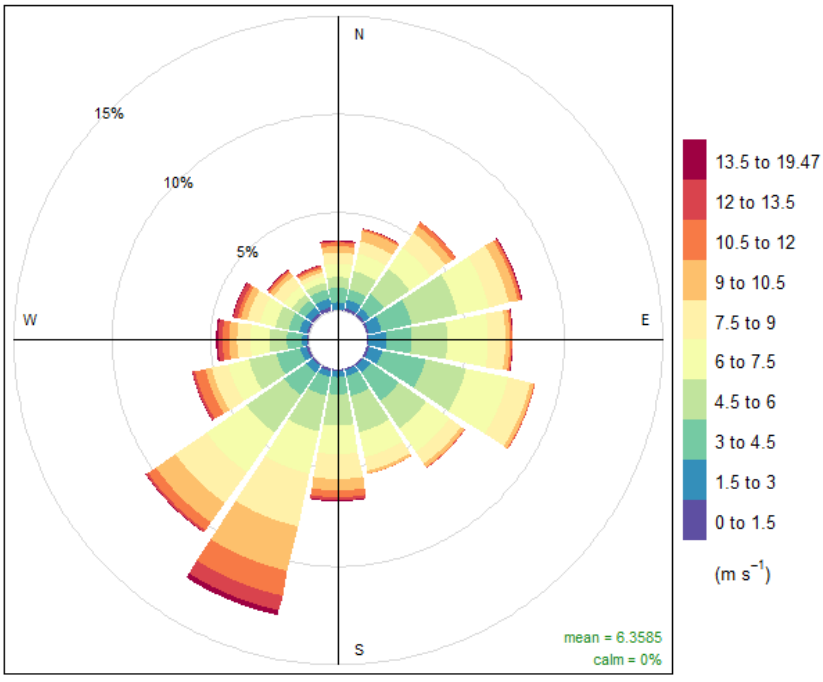


Figure 10 Comparison of measured (above) and modelled (below) wind roses at Colpoy's Point.

Confidential

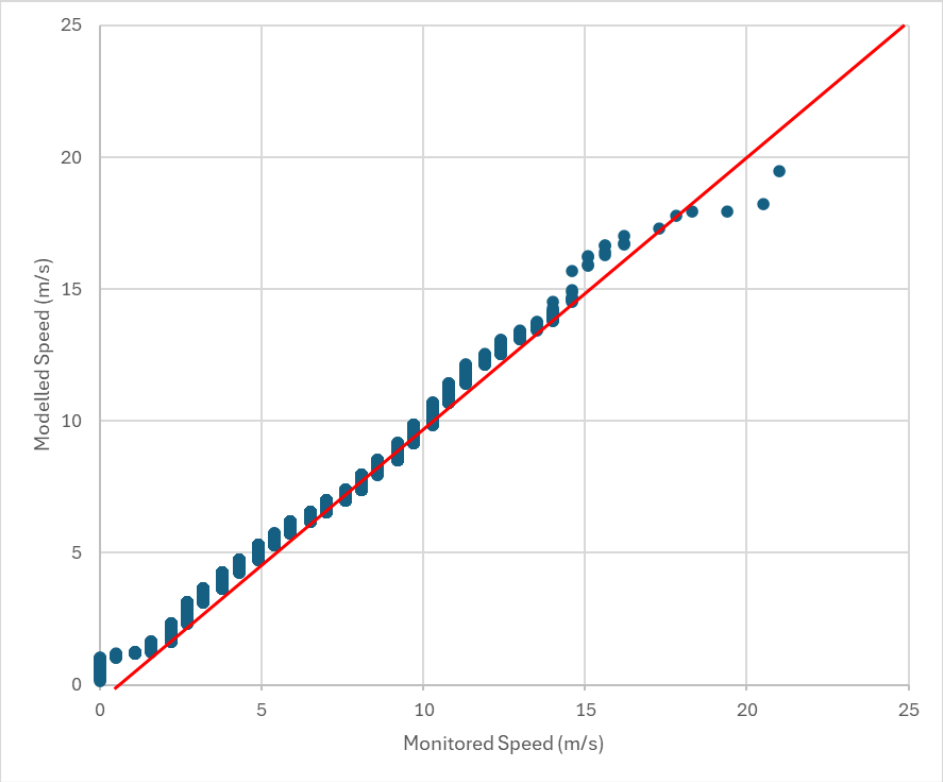


Figure 11: Quantile-quantile plot of modelled and measured wind speeds at Colpoys Point

Figure 12 shows a comparison of modelled and measured temperatures at the Jandakot site. This corresponds to a scatter plot, in which modelled and measured values matched in time are plotted against each other, but instead of a mass of dots, the data are presented as a frequency distribution. The standard deviation of the relationship was 1.9°C, with a slope of 0.96, both considered to be reasonable results.

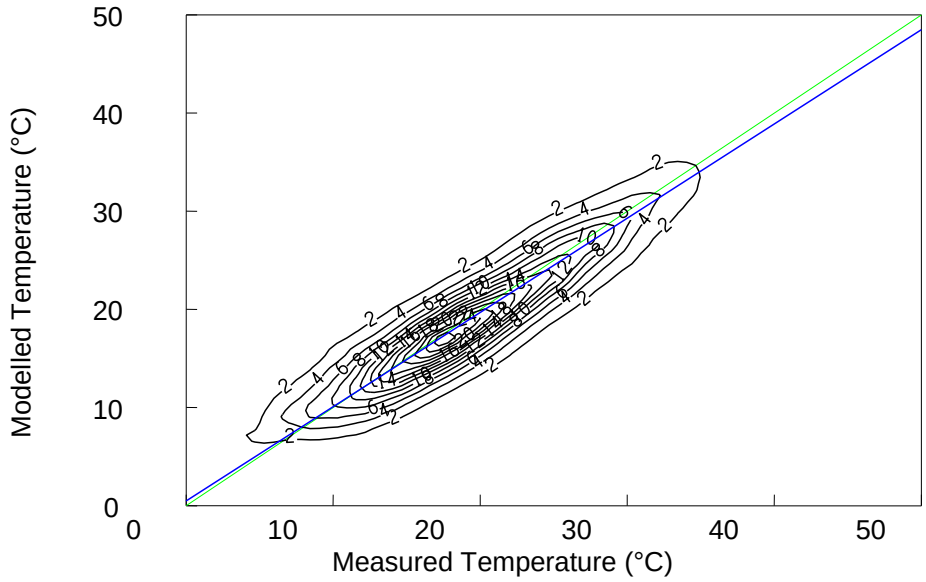


Figure 12: Frequency plot for the distribution of modelled against measured temperatures at Jandakot.

Confidential

4.2.3 Meteorological Validation

To validate the use of the WRF gridded meteorological dataset for the current modelling assessment, three statistical measures comparing wind speed and wind direction from WRF-predicted and BOM-observed data for the modelled dataset were evaluated. The statistical measures for evaluation include:

- Wind Speed – Root Mean Square Error (RMSE): This is an acceptable average measure of the difference or error between predicted and observed values. Low RMSE values in a model indicate that the model is explaining most of the variation in the observations. The benchmark for wind speed RMSE of <2 m/s has been extracted from Emery et al., 2001.
- Wind Speed – Index of Agreement (IOA): IOA reflects the ratio of the total RMSE to the sum of two differences – between each prediction and the observed mean, and each observation and the observed mean. Emery et al., 2001 suggests that an IOA of 60% or greater represents a good correlation. An IOA of 1 means a perfect correlation between predicted and observed.
- Wind Direction – Gross Error (E): calculated as the mean absolute difference in prediction-observation pairings with valid data within a given analysis region and for a given time period (hourly or daily). The benchmark for wind speed RMSE of ≤30 degrees has been extracted from Emery et al., 2001.

The benchmarks, derived from Emery et al., 2001, were based upon the evaluation of the Pennsylvania State University/ National Centre for Atmospheric Research (PSU/NCAR) Fifth generation Mesoscale Model (MM5) and the Regional Atmospheric Modelling System (RAMS) application. They provide context, when comparing predicted results to observed results, for the reviewer. A result which does not meet the benchmark does not necessarily determine the strength of the predicted values and critical evaluation is therefore imperative when understanding the results.

A summary of the WRF performance evaluation results at Colpoy's point and Jandakot Airport is presented in Table 5.

Table 5: Performance Evaluation Summary – Wind Speed and Wind Direction

Pollutant	Units	Performance Evaluation Criteria	Colpoy's Point	Jandakot Airport
Wind Speed total RMSE	m/s	<2	1.87	1.67
Wind Speed IOA	%	>60%	84%	80
Wind Direction Gross Error	degrees	≤30	26.0	30.9

The results indicate that the wind direction gross error was marginally over the performance benchmark for wind direction, however the other performance benchmarks were met at Jandakot and all benchmarks at Colpoy's Point closer to the sources of interest were met indicating that the modelled meteorological data is considered suitable for use in the KIA area.

4.3 Modelled Scenarios

A summary of the scenarios considered in this air quality assessment are provided below:

Confidential

4.3.1 Scenario 1 – Existing

Scenario 1 included all known significant existing operations in the KIA excluding current and proposed AGL sources that were operating during the modelled period between 1st July 2023 and 30th June 2024.

The sources that were included in the existing scenario included the following sources:

- AGR's sodium cyanide plant;
- CSBP's nitric acid plant;
- CSBP's ammonia plant;
- Synergy's HEGT facility;
- Alcoa's refinery including the powerhouse, calciner and liquor burner;
- Newgen power station;
- Cockburn 2 power station;
- The Kleenheat gas processing facility; and
- Nickel West's refinery.

Emissions information and source parameters were obtained from a number of publicly available information including studies undertaken by the DWER, approvals documentation and values reported to the NPI as well as emissions information supplied by some operators in the region.

In addition to these sources, an assumed background concentration for predicted concentrations as discussed in Section 3.1 was included at all modelled locations.

A validation assessment was undertaken using existing sources where the results of the modelling were compared against monitored data at the North Rockingham AQMS for the modelling period. The results of this validation are discussed further in Section 5.1.

4.3.2 Scenario 2 – Future Sources:

Scenario 2 included the emissions and background concentrations as outlined in Scenario 1 but with the addition of future approved (yet to operate) and expected operational sources in the KIA. This included the addition of the following sources:

- CSBP's ammonia plant expansion;
- The Kwinana waste to energy facility;
- The East Rockingham waste to energy facility;
- The Covalent lithium plant;
- The Tianqui lithium plant; and
- The BP renewable energy project.

4.3.3 Scenario 3a – Normal Operations in Isolation:

The normal operations in isolation scenario included emissions estimates and stack parameters from the proposed KSPS power station expansion turbines in isolation. Emissions of NOx from four proposed turbines operating on natural gas/diesel were included under the normal operations scenario. Manufacturers specifications guarantee NOx emissions of 42ppm of NOx, referenced to an oxygen content of 15%. AGL indicated that due to emissions controls that are expected to be implemented, most of the time the turbines will be operating below 25 ppm of NOx when combusting natural gas. However, the more conservative limit of 42 ppm was used in this assessment.

Confidential

The KSPS power station is expected to continue operating as peaking power station with estimates indicating that in the future it would expect to operate on average approximately 25% of the year. Whilst up to four additional turbines will be installed, it is expected that only three of these turbines will generally operate at the one time with one turbine kept in reserve. This assessment has however conservatively assumed that operations from both the existing and future KSPS would occur continuously all year and that the four proposed turbines would be operational at the same time.

4.3.4 Scenario 3b – Normal Operations - Cumulative:

The proposed normal operations scenario included emissions from all emissions sources and background concentrations as outlined in Scenario 2. It included emissions estimates and stack parameters from the existing KSPS power station that were based on conservative results from stack testing data undertaken at the facility as well as the continuous operation of the KSPS power station expansion turbines. Emissions of NOx from four proposed turbines were as described in Scenario 3a.

4.3.5 Scenario 4 – Start Up Operations:

Emissions from the proposed turbines under a startup scenario were assessed using the emissions provided by the manufacturers. Like the normal operations scenario (Scenario 3b), emissions under this scenario were considered cumulatively with emissions and background concentrations as described in Scenario 2 as well as with emissions from the existing AGL plant operating in a normal mode. Startup emissions are expected to occur over a 10-minute period. It was conservatively assumed that normal operations were occurring for the other 50 minutes in an hour.

4.3.6 Scenario 5 – Shut Down Operations:

Emissions from the proposed turbines under a shutdown scenario were assessed using the emissions information provided by the manufacturers with other sources as described in Scenario 4. Like the startup emissions, shutdown emissions are expected to occur over a 10-minute period. It was conservatively assumed that normal operations were occurring for the other 50 minutes in an hour.

4.4 Emission Estimates and Stack Parameters

A summary of the stack parameters and emissions data for the existing and proposed KSPS sources that were used in the assessment is provided in Table 6 and Table 7.

Table 6: AGL Stack Parameters and Emission Rates for Normal Operations

Source	X [m]	Y [m]	Height [m]	Diam [m]	Exit_Vel [m/s]	Exit_Temp [K]	NOX g/s
Existing KSPS Sources							
GTG 100A	384868	6434075	9	3.18	46.0	672	9.34
GTG 100B	384868	6434085	9	3.18	46.0	672	9.00
GTG 200A	384868	6434029	9	3.18	46.0	672	8.47
GTG 200B	384868	6434039	9	3.18	46.0	672	7.60
Proposed KSPS Sources							
Proposed Stack 1	384899	6434086	18	3	63.9	733	13.69
Proposed Stack 2	384925	6434087	18	3	63.9	733	13.69
Proposed Stack 3	384891	6433998	18	3	63.9	733	13.69
Proposed Stack 4	384920	6433999	18	3	63.9	733	13.69

Confidential

Table 7: AGL Stack Parameters and Emission Rates for Startup and Shutdown Operations

Source	X [m]	Y [m]	Height [m]	Diam [m]	Exit_Vel [m/s]	Exit_Temp [K]	NOX g/s
Proposed KSPS Turbines Under Startup Conditions							
Proposed Stack 1	384899	6434086	18	3	63.9	733.15	16.93
Proposed Stack 2	384925	6434087	18	3	63.9	733.15	16.93
Proposed Stack 3	384891	6433998	18	3	63.9	733.15	16.93
Proposed Stack 4	384920	6433999	18	3	63.9	733.15	16.93
Proposed KSPS Turbines Under Shutdown Conditions							
Proposed Stack 1	384899	6434086	18	3	63.9	733.15	16.22
Proposed Stack 2	384925	6434087	18	3	63.9	733.15	16.22
Proposed Stack 3	384891	6433998	18	3	63.9	733.15	16.22
Proposed Stack 4	384920	6433999	18	3	63.9	733.15	16.22

4.5 Treatment of Oxides of Nitrogen

Ramboll has applied the Ozone Limiting Method (OLM) to predict ground level concentrations of NO_2 as specified by the USEPA (see Cole and Summerhays 1979; Tikvart 1996) and NSW Environment Protection Authority (NSW EPA, 2016). This method assumes that all the available ozone in the atmosphere will react with nitrogen oxide (NO) in the plume until either all the available ozone or all the NO is used up. This approach is conservative in that it assumes that the atmospheric reaction is instant when the reaction often takes place over a number of hours.

Measured hourly average ozone concentrations were obtained from the North Rockingham AQMS between 1st July 2023 and 30th June 2024. A summary of the ozone concentrations in the assessment.

Table 8: Monitored Concentrations at North Rockingham AQMS (1st July 2023 and 30th June 2024)

Data Availability	Max 1-hour[2]	Max 8-hour[2]	70th percentile 1-hour	Annual Average
99.9%	64.2	48.9	29.5	24.4

Notes
1. Referenced to 25ºC, and 101.3 kPa.
2. 8-hour average O_3 criteria – 65 ppb

The CALNO2 module from CALPUFF was used to apply the OLM in this assessment.

Confidential

5. MODELLING RESULTS

5.1 Model Validation

To assess the potential performance of the model, predicted concentrations were compared against monitored data at the North Rockingham AQMS as shown in Figure 13. The quantile-quantile plot shows that predicted concentrations using an assumed background concentration of 30 µg/m^3 showed the model was performing reasonably at this location when the winds were coming from the direction of the KIA. The plot shows that the highest modelled concentrations were overpredicting when compared to the monitored values by approximately 5-7 µg/m^3. Despite the slight over prediction, the model is considered to be performing reasonably and is suitable to assess potential impacts from the proposed turbines at the KSPS. Use of a more conservative background concentration (39.5 µg/m^3) as outlined in Table 3 will further add to the conservativity of the assessment outcomes.

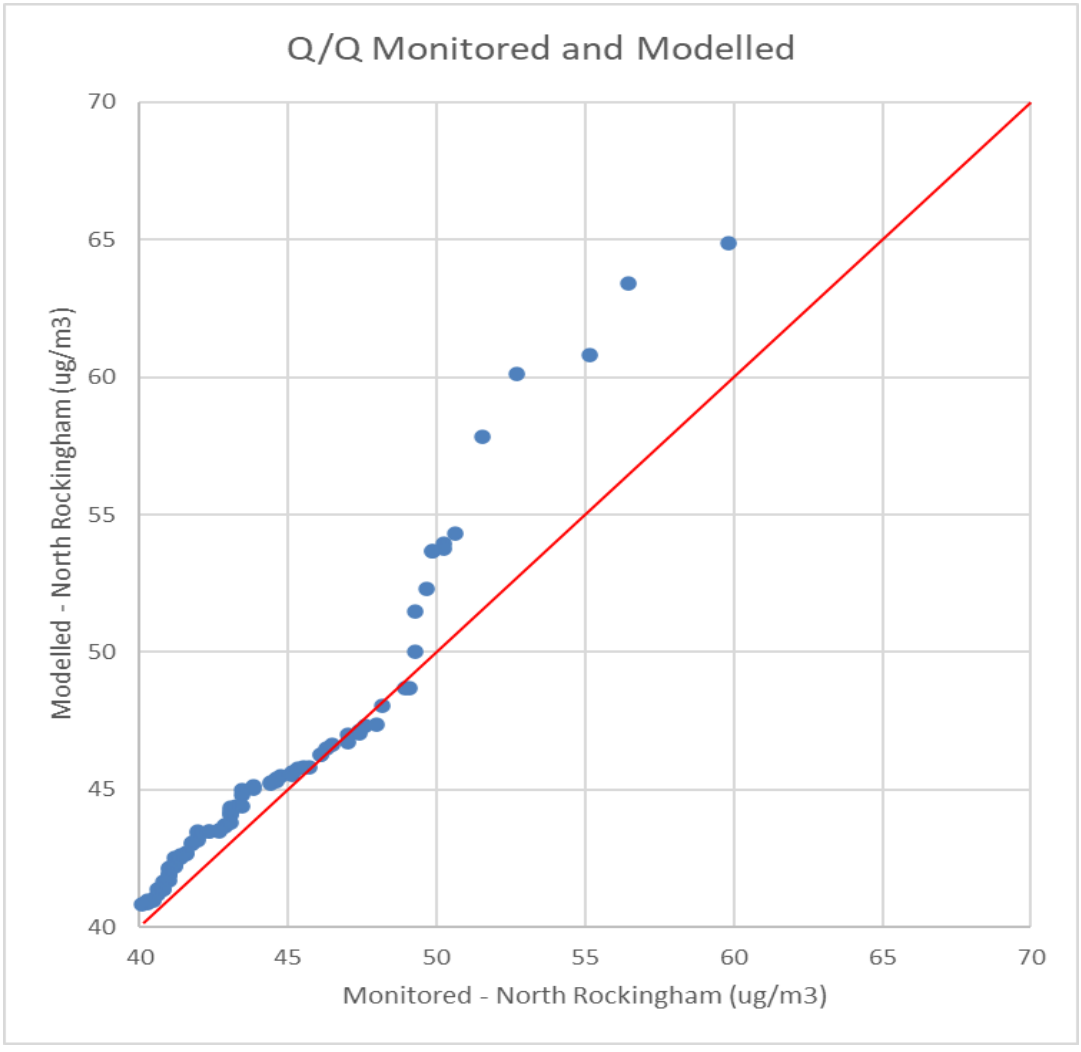


Figure 13: Quantile-Quantile Plot of Predicted and Monitored 1-hour Average Concentrations at the North Rockingham AQMS

Confidential

5.2 Modelling Results

Predicted maximum 1-hour average and annual average concentrations at the nominated receptor locations (as outlined in Table 4) are presented in Table 9 below. The results presented at the nominated receptor locations are all below the relevant NO_2 criteria. Contour plots of the predicted ground level concentrations (GLCs) for each of the scenarios and relevant averaging periods are presented from Figure 14 to Figure 37.

The contour plots show that in general all the predicted concentrations are below the relevant criteria except for some isolated exceedances of the 1-hour average NO_2 criteria predicted to occur in close vicinity to various sources including the KSPS. No exceedances were predicted of the annual average NO_2 criteria at any location in the modelled domain.

An exceedance of the 1-hour average NO_2 criteria was predicted for the normal operations, shutdown, and startup scenarios to the east of the KSPS facility at approximately 3km although the exceedance was predicted to occur in an industrial area and not over sensitive receptor locations. The maximum predicted cumulative 1-hour average concentrations at this location for normal operations, shutdown operations and startup operations were 158 $\mu g/m^3$, 164 $\mu g/m^3$ and 168 $\mu g/m^3$ respectively. Analysis of the number of exceedances predicted at this location indicated that only a single hour of exceedance was predicted at this location.

Confidential

Table 9: Summary of Predicted Cumulative Maximum 1-hour Average and Annual Average Predicted GLCs at Sensitive Receptor Locations

Maximum 1-hour Average Ground Level Concentrations												
Receptor	Criteria	Sc 1 - Existing		Sc 2 - Future Approved		Sc 3a - Normal Ops Isolation		Sc 3b - Normal Ops Cumulative		Sc 4 - Shutdown		Sc 5 - Startup	
		µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria
Wells Park	151	83	55%	83	55%	21	14%	84	55%	84	56%	84	56%
Golf Course		70	47%	78	52%	83	55%	131	86%	132	88%	133	88%
Thomas Oval		83	55%	88	58%	52	34%	109	72%	110	73%	110	73%
Oval		99	66%	99	66%	65	43%	128	85%	130	86%	130	86%
Residence		81	54%	85	57%	49	32%	107	71%	114	75%	115	76%
North Rockingham AQMS		75	49%	70	47%	26	18%	72	47%	72	48%	72	48%
Residence		69	46%	69	46%	55	36%	110	73%	120	80%	123	82%
Hope Valley		96	64%	94	63%	47	31%	101	67%	102	68%	102	68%
Calista Primary School		78	52%	80	53%	25	17%	101	67%	101	67%	101	67%
Wombat Wallow Childcare Centre		95	63%	95	63%	43	28%	100	66%	100	66%	100	66%
South Lake AQMS		61	41%	55	37%	6	4%	61	41%	62	41%	62	41%
Annual Average Ground Level Concentrations													
Receptor	Criteria	Sc 1 - Existing		Sc 2 - Future Approved		Sc 3a - Normal Ops Isolation		Sc 3b - Normal Ops Cumulative		Sc 4 - Shutdown		Sc 5 - Startup	
		µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria	µg/m^3	% Criteria
Wells Park	28	14.6	52%	14.7	52%	0.2	1%	15.0	54%	15.1	54%	15.1	54%
Golf Course		14.0	50%	14.2	51%	0.2	1%	14.6	52%	14.6	52%	14.6	52%
Thomas Oval		14.2	51%	14.6	52%	0.3	1%	15.2	54%	15.2	54%	15.2	54%
Oval		15.0	54%	15.6	56%	1.1	4%	17.3	62%	17.5	62%	17.5	62%
Residence		14.0	50%	14.3	51%	0.2	1%	14.7	53%	14.7	53%	14.8	53%
North Rockingham AQMS		13.9	50%	14.1	50%	0.2	1%	14.3	51%	14.3	51%	14.4	51%
Residence		13.7	49%	13.9	50%	0.2	1%	14.2	51%	14.2	51%	14.2	51%
Hope Valley		15.0	54%	15.5	55%	0.6	2%	16.6	59%	16.7	60%	16.7	60%
Calista Primary School		13.8	49%	13.9	50%	0.2	1%	14.3	51%	14.3	51%	14.3	51%
Wombat Wallow Childcare Centre		14.1	50%	14.3	51%	0.3	1%	14.7	53%	14.8	53%	14.8	53%
South Lake AQMS		13.8	49%	13.7	49%	0.1	0%	13.9	50%	13.9	50%	14.0	50%

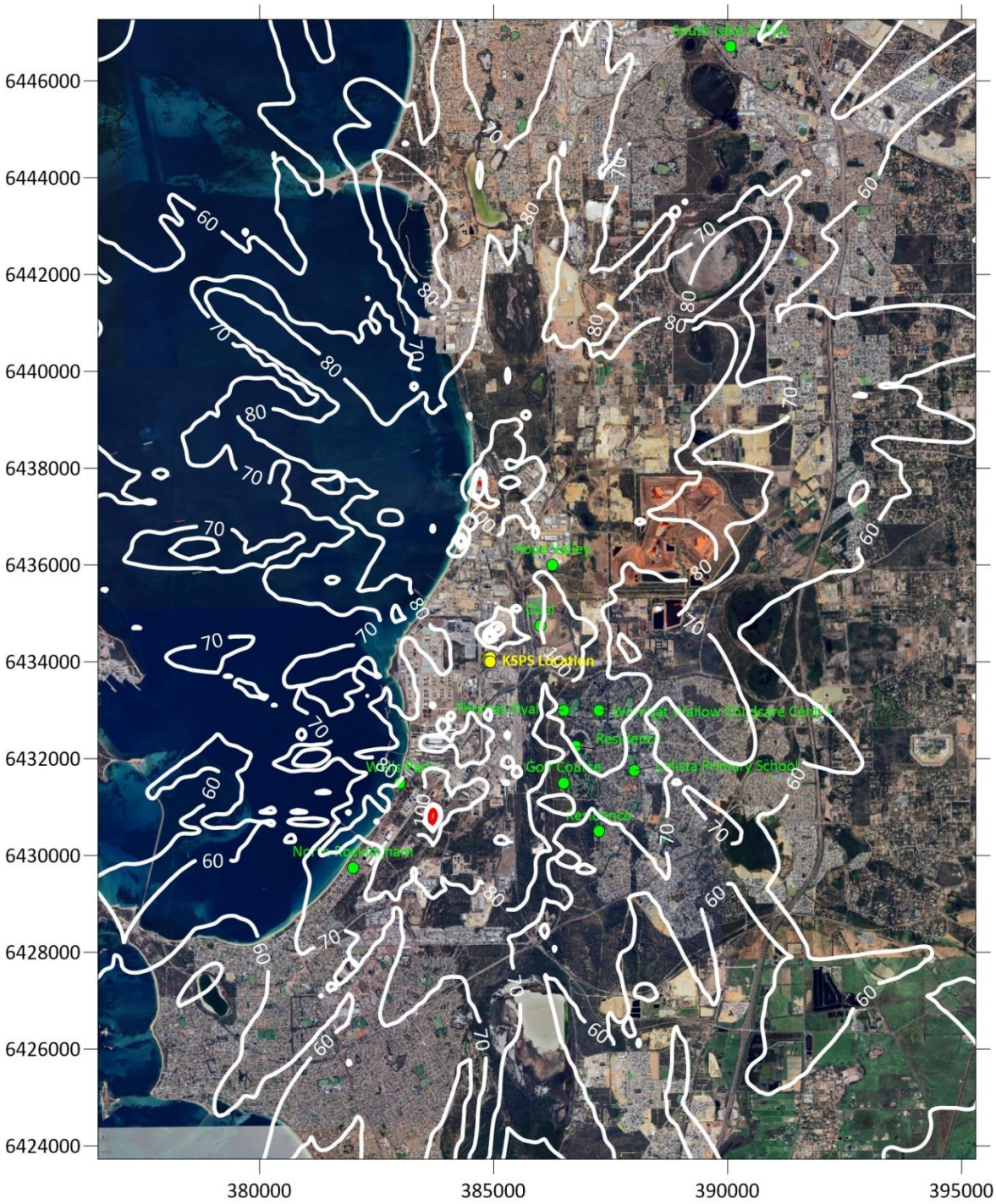


Figure 14: Predicted Maximum 1-hour Average GLCs of NO_2 (Across Modelled Domain) – Scenario 1: Existing Sources

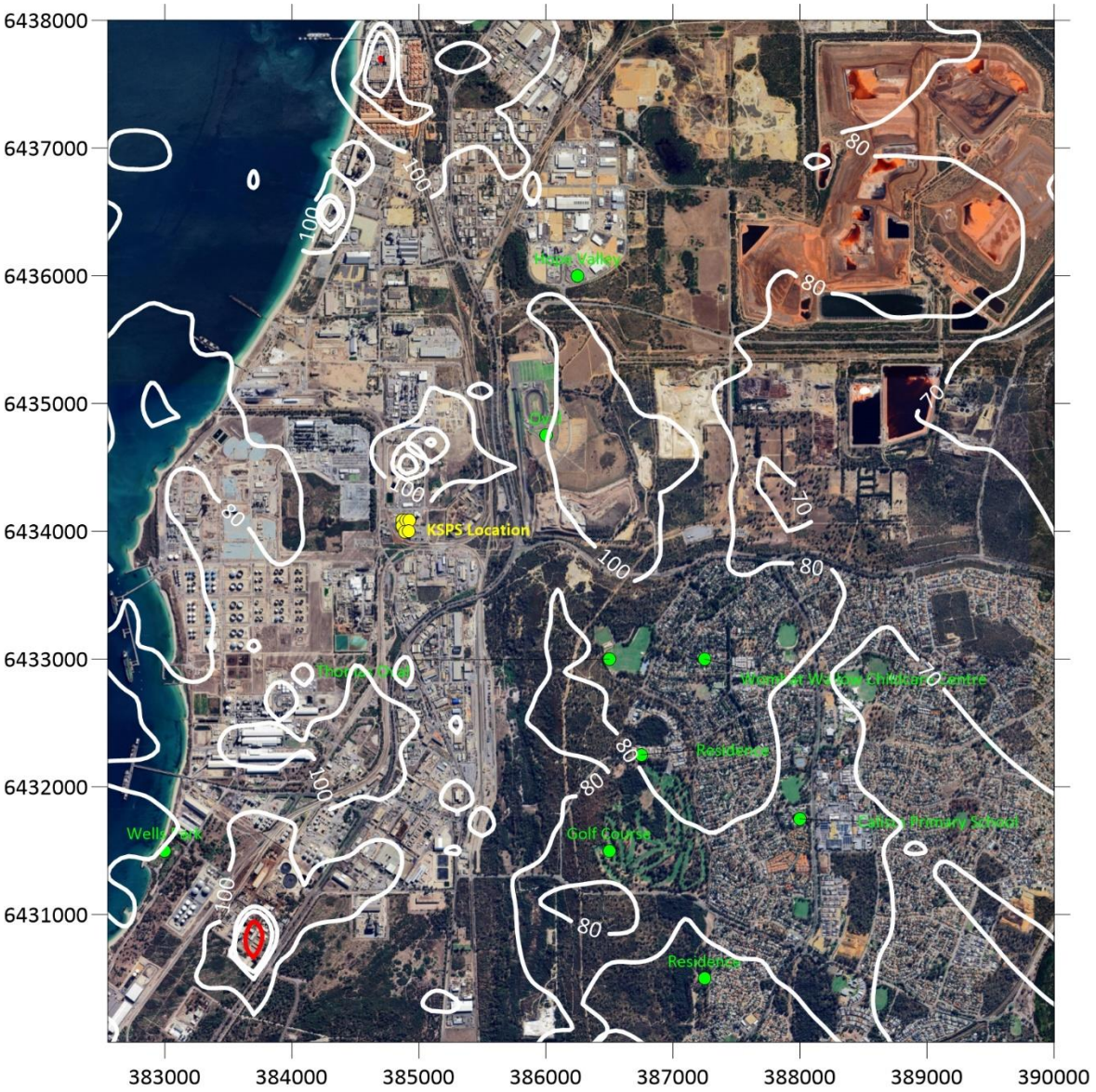


Figure 15: Predicted Maximum 1-hour Average GLCs of NO_2 (Zoomed In) – Scenario 1: Existing Sources

Confidential

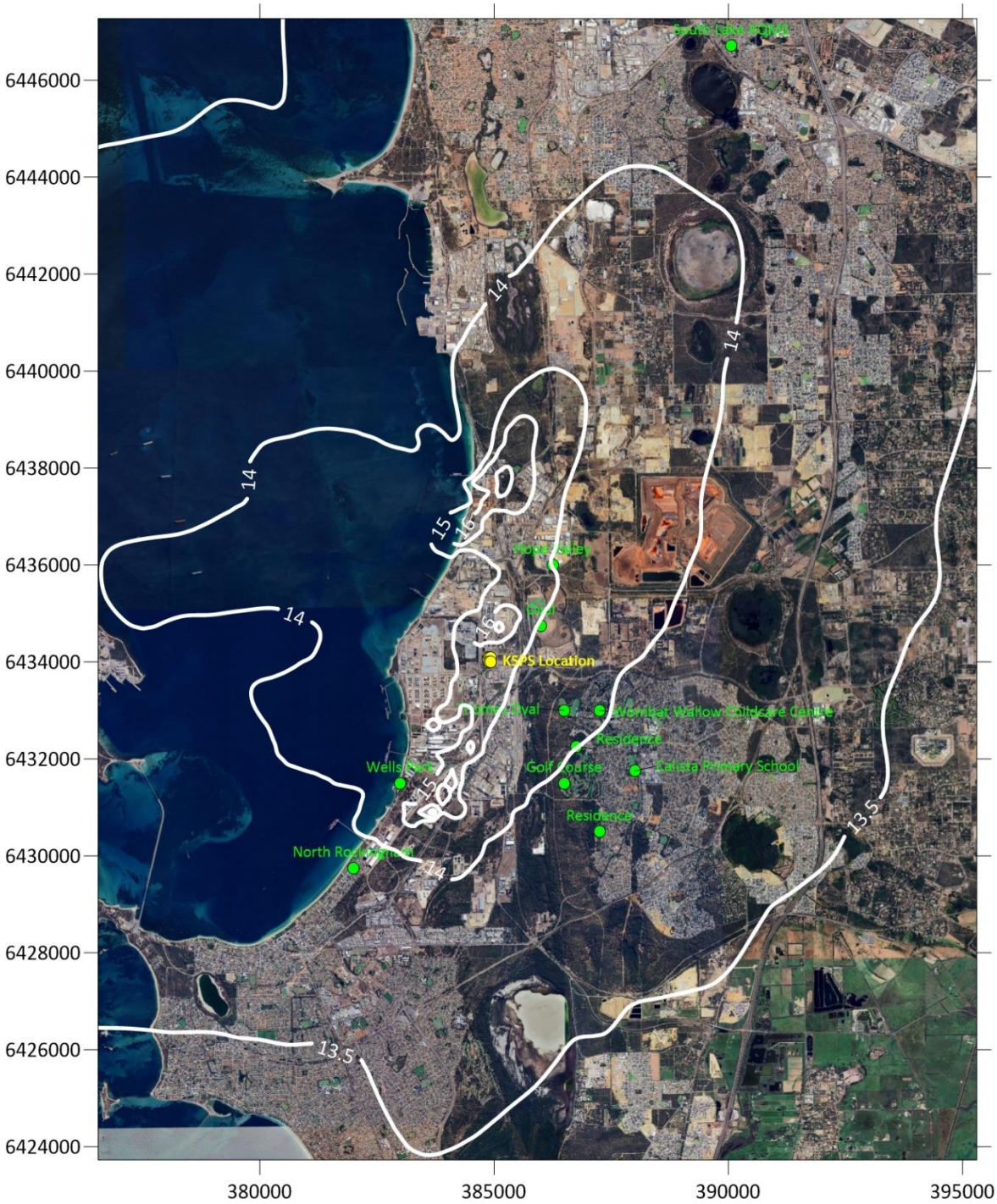


Figure 16: Predicted Annual Average GLCs of NO_2 (Across Modelled Domain) – Scenario 1: Existing Sources

Confidential

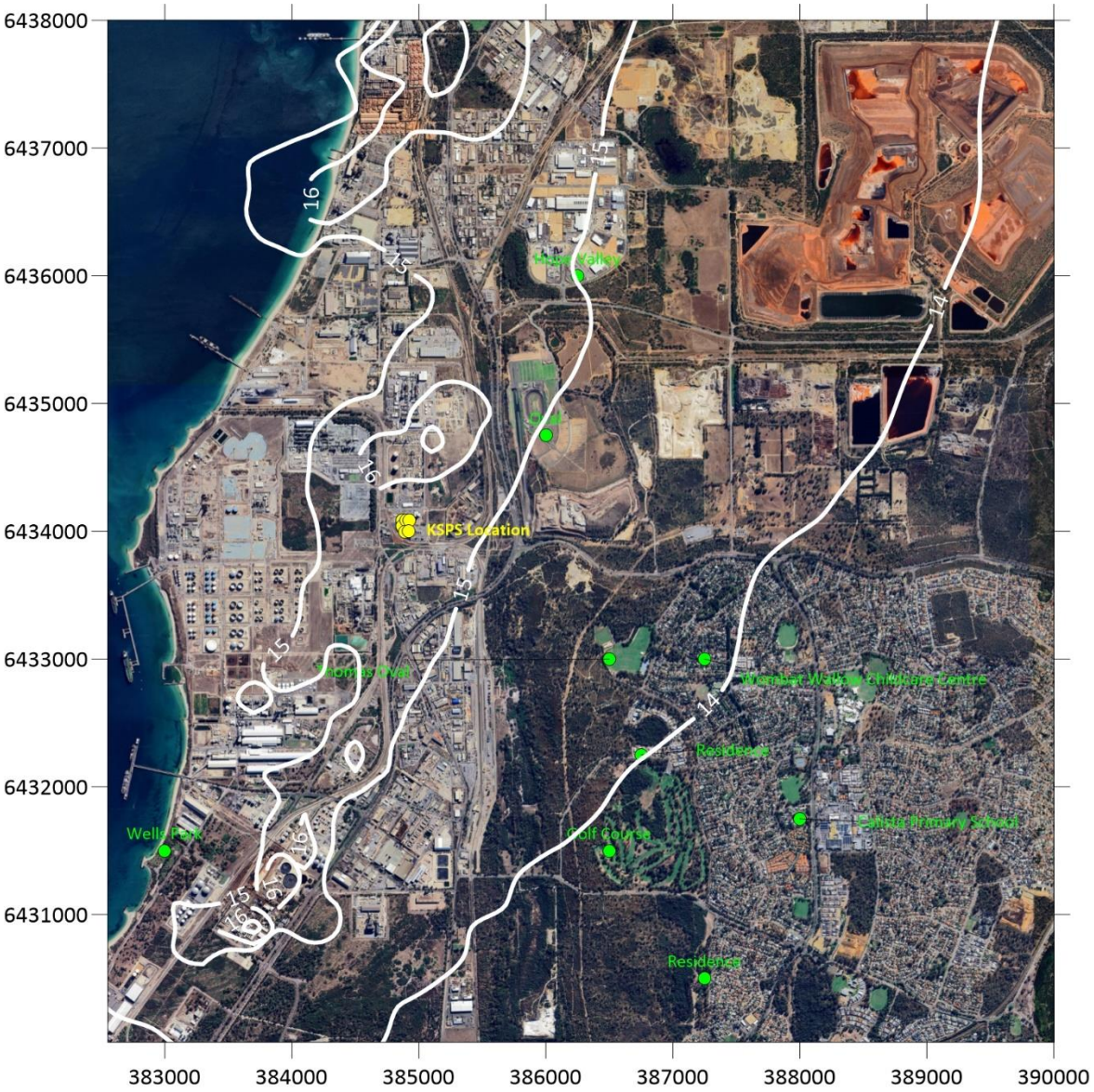


Figure 17: Predicted Annual Average GLCs of NO_2 (Zoomed In) – Scenario 1: Existing Sources

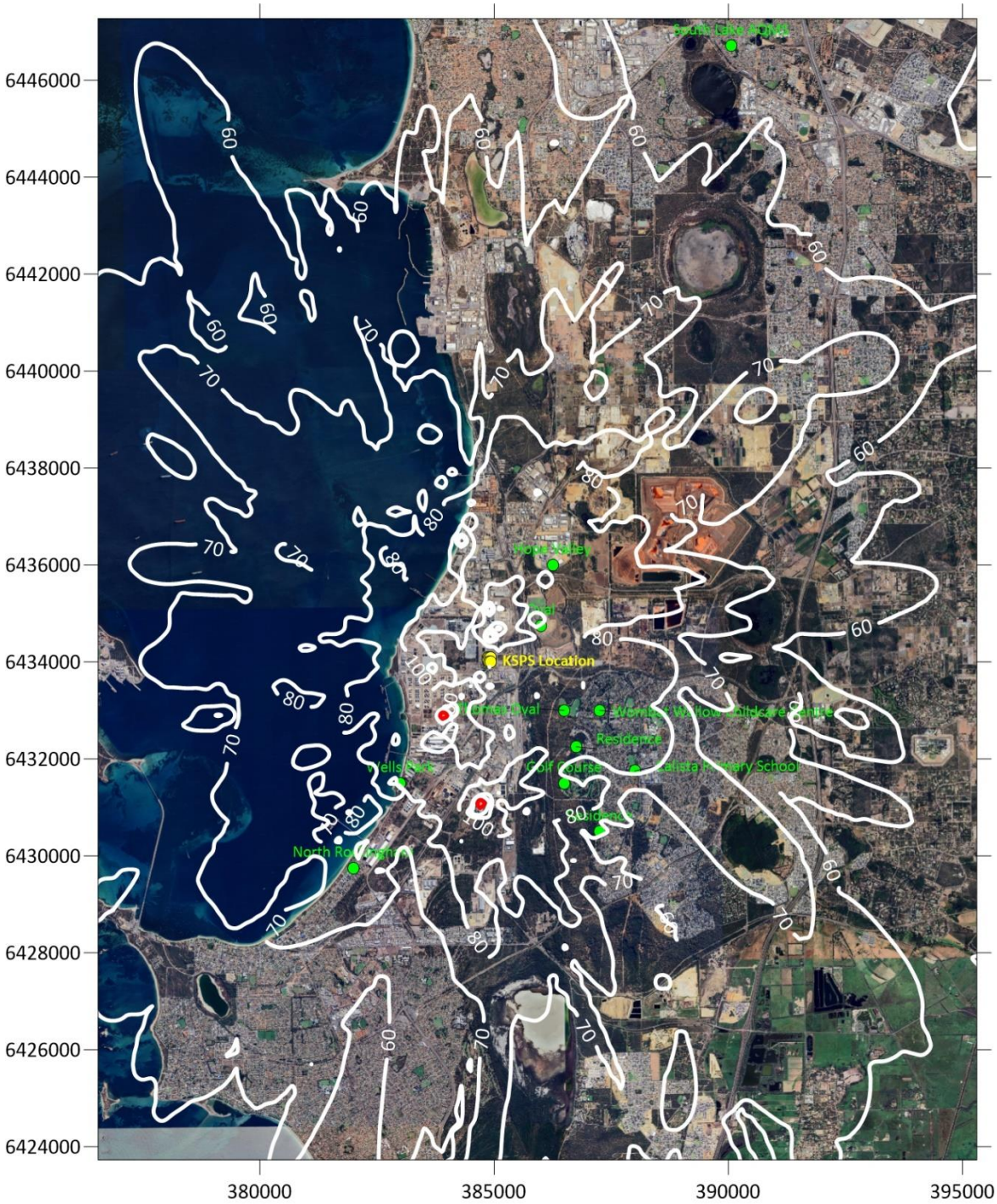


Figure 18: Predicted Maximum 1-hour Average GLCs of NO_2 (Across Modelled Domain) – Scenario 2: All Future Sources

Confidential

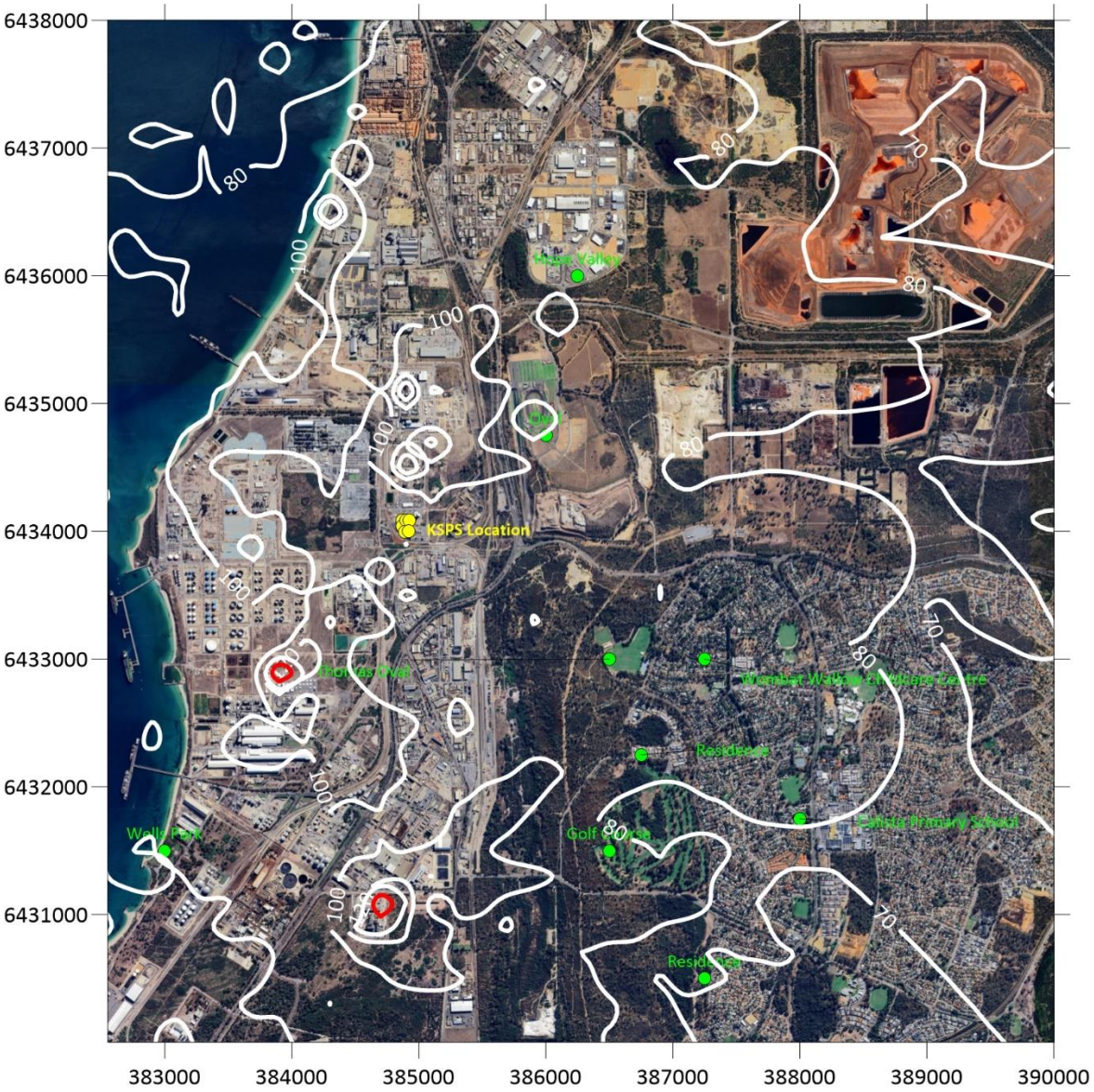


Figure 19: Predicted Maximum 1-hour Average GLCs of NO_2 (Zoomed In) – Scenario 2: All Future Sources

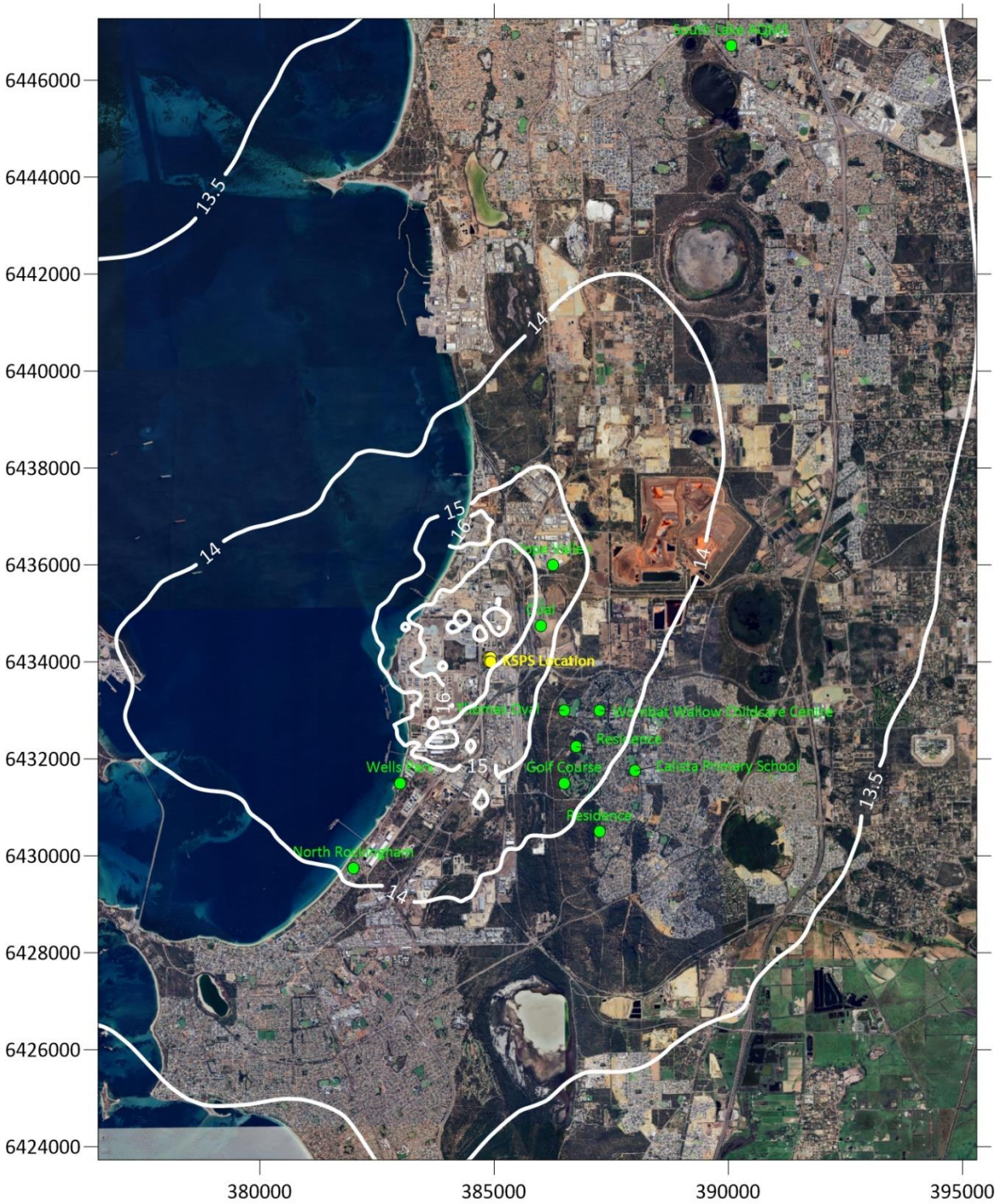


Figure 20: Predicted Annual Average GLCs of NO_2 (Across Modelled Domain) – Scenario 2: All Future Sources

Confidential

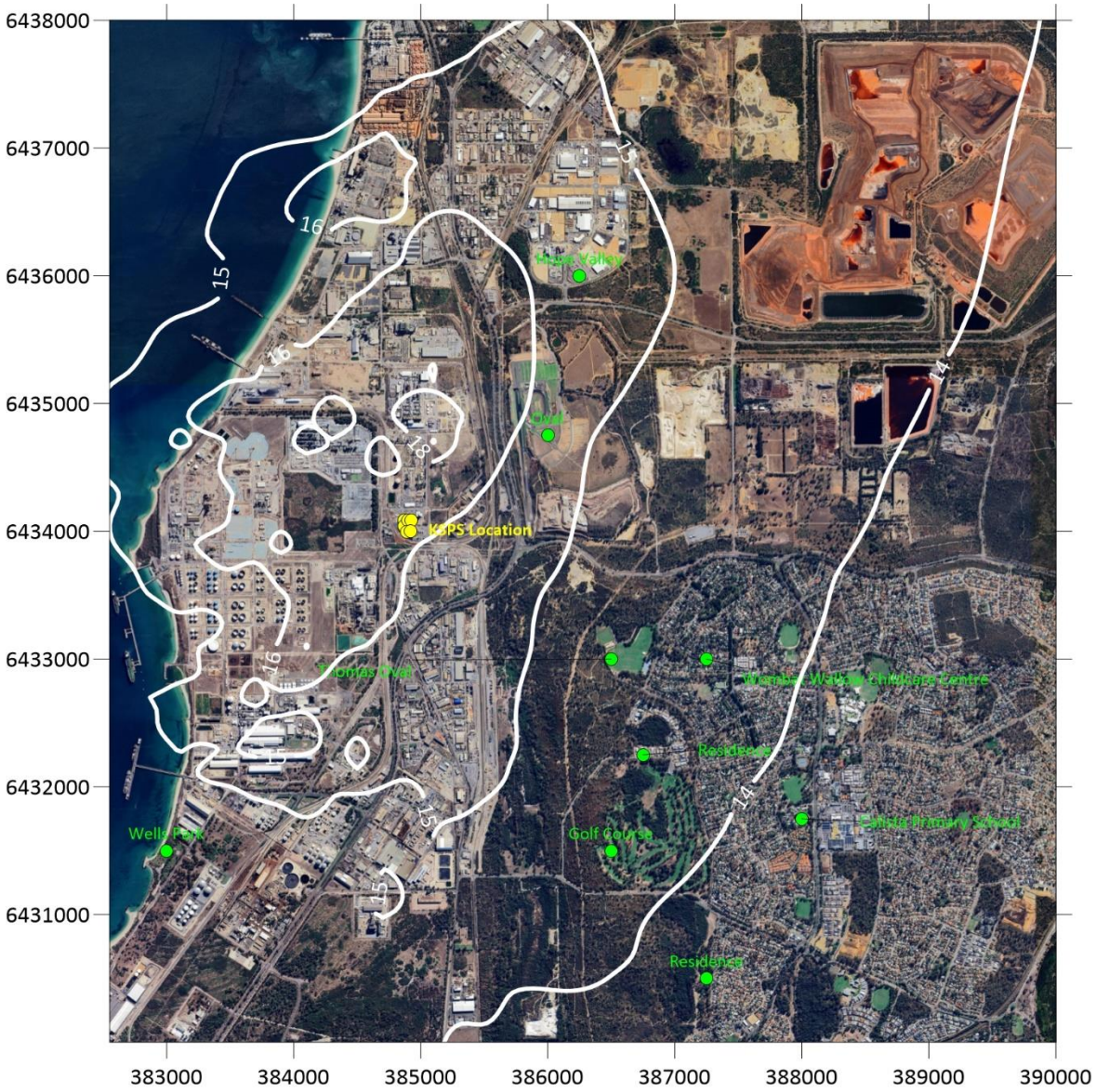


Figure 21: Predicted Annual Average GLCs of NO_2 (Zoomed In) – Scenario 2: All Future Sources

Confidential

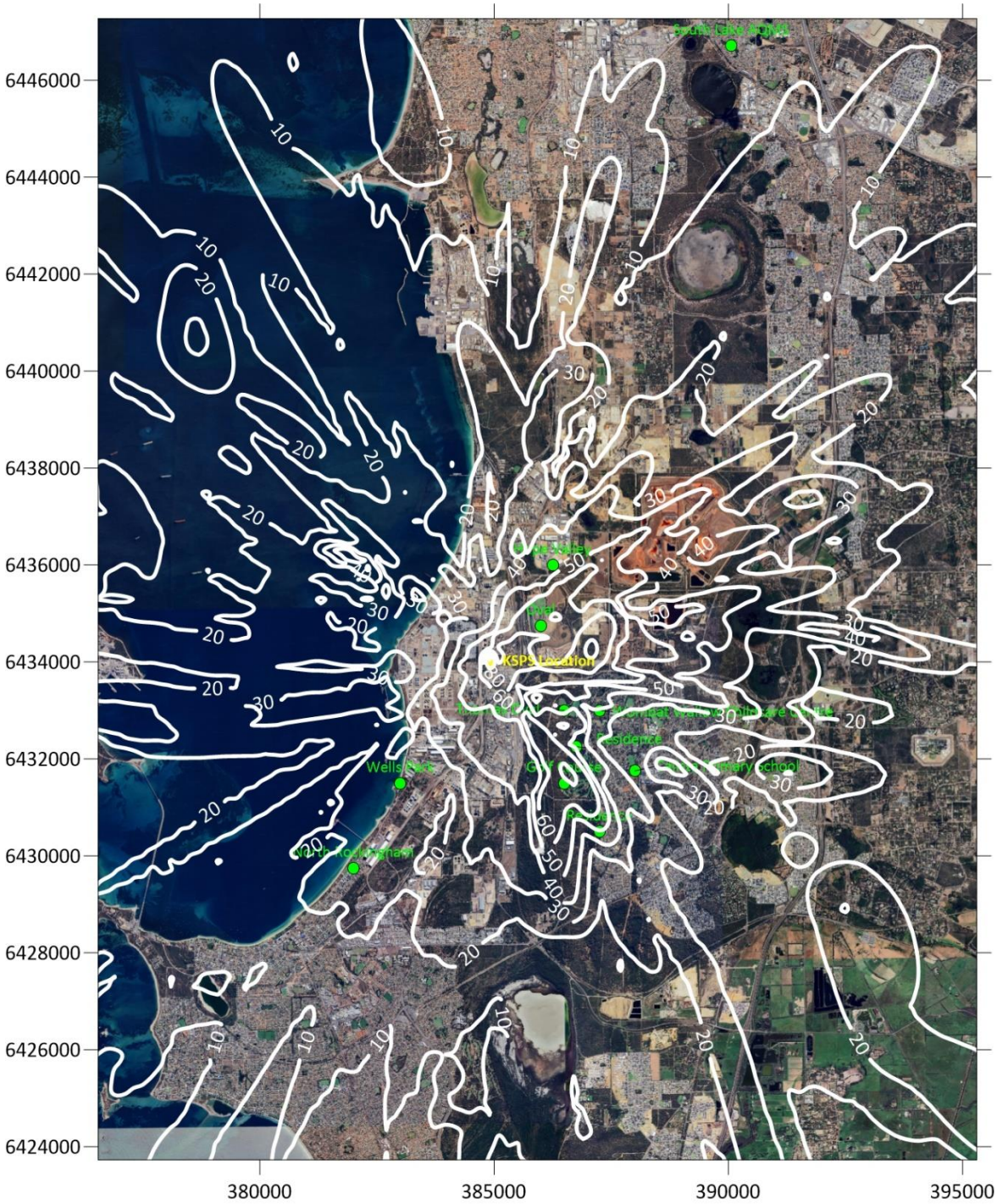


Figure 22: Predicted Maximum 1-hour Average GLCs of NO_2 (Across Modelled Domain) – Scenario 3a: Normal Operations in Isolation

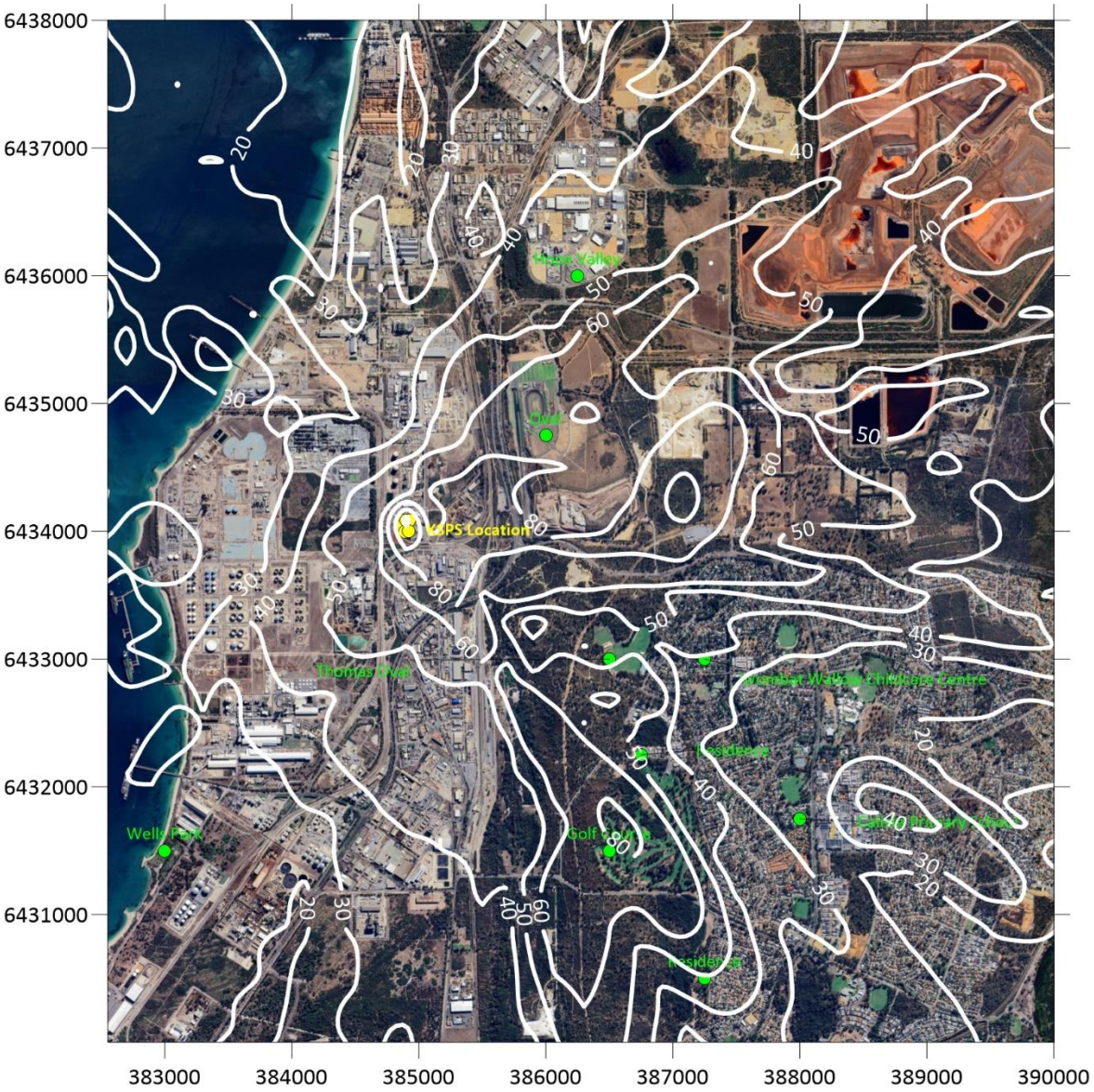


Figure 23: Predicted Maximum 1-hour Average GLCs of NO_2 (Zoomed In) – Scenario 3a: Normal Operations in Isolation

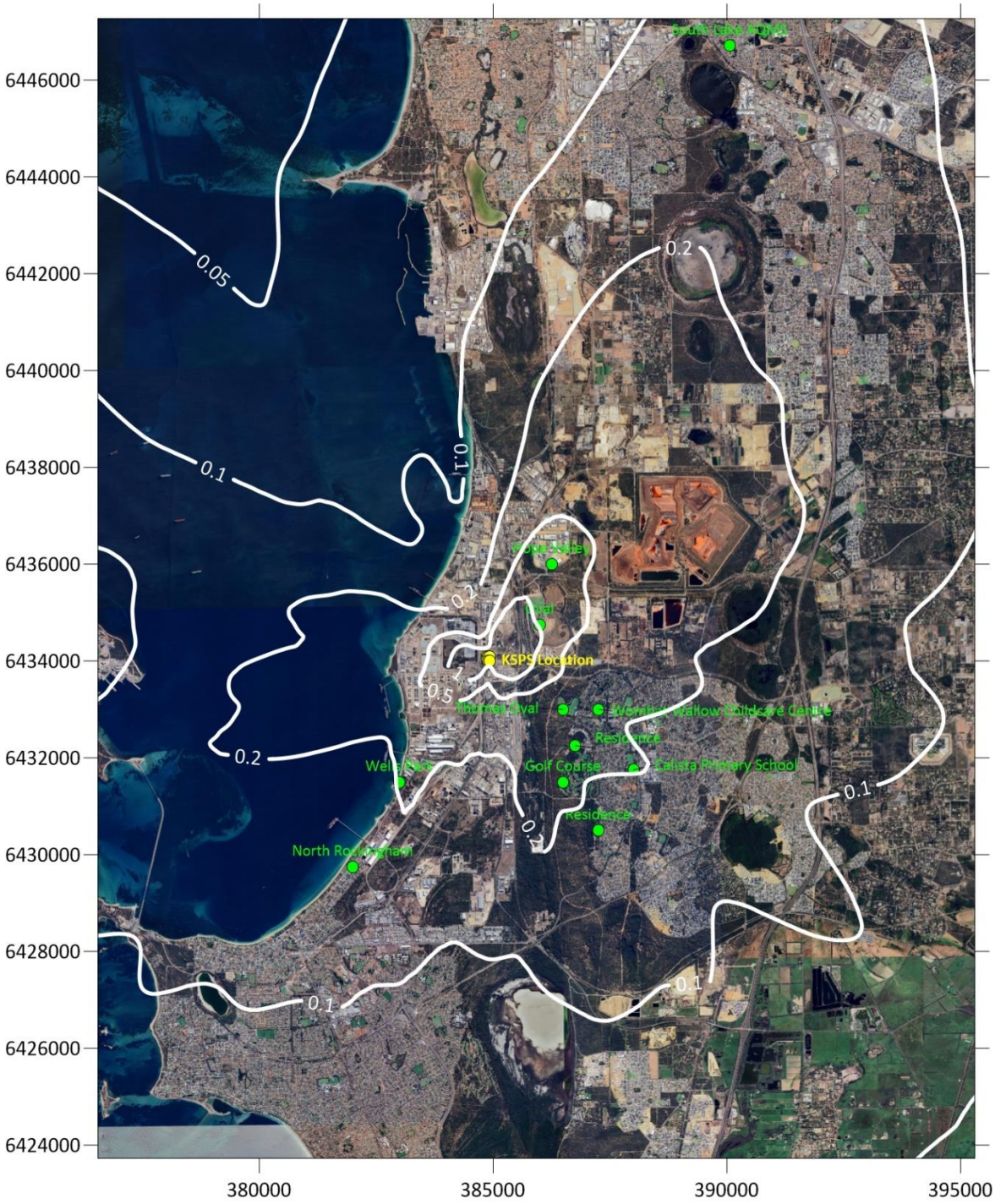


Figure 24: Predicted Annual Average GLCs of NO_2 (Across Modelled Domain) – Scenario 3a: Normal Operations in Isolation

Confidential

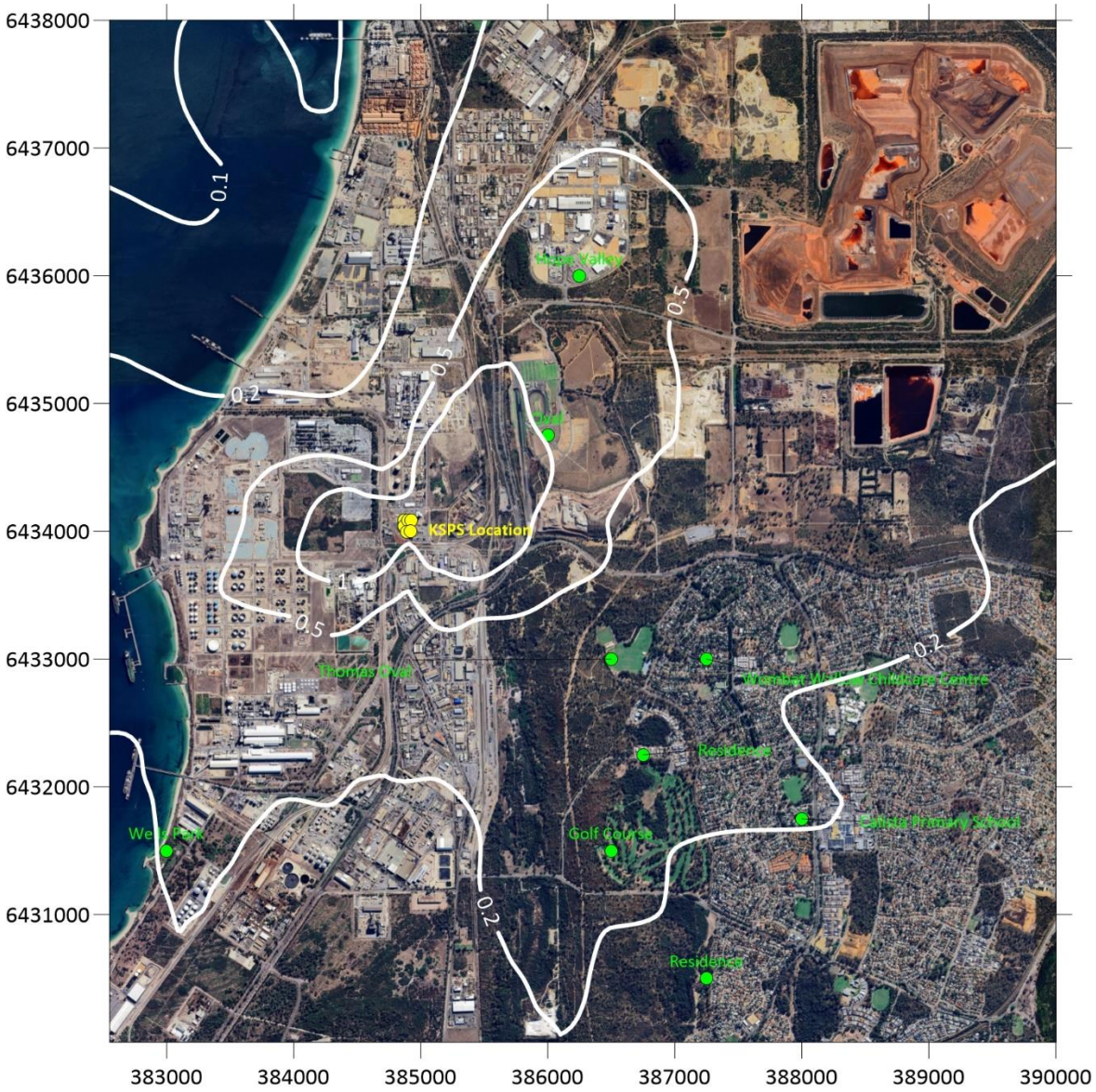


Figure 25: Predicted Annual Average GLCs of NO_2 (Zoomed In) – Scenario 3a: Normal Operations in Isolation

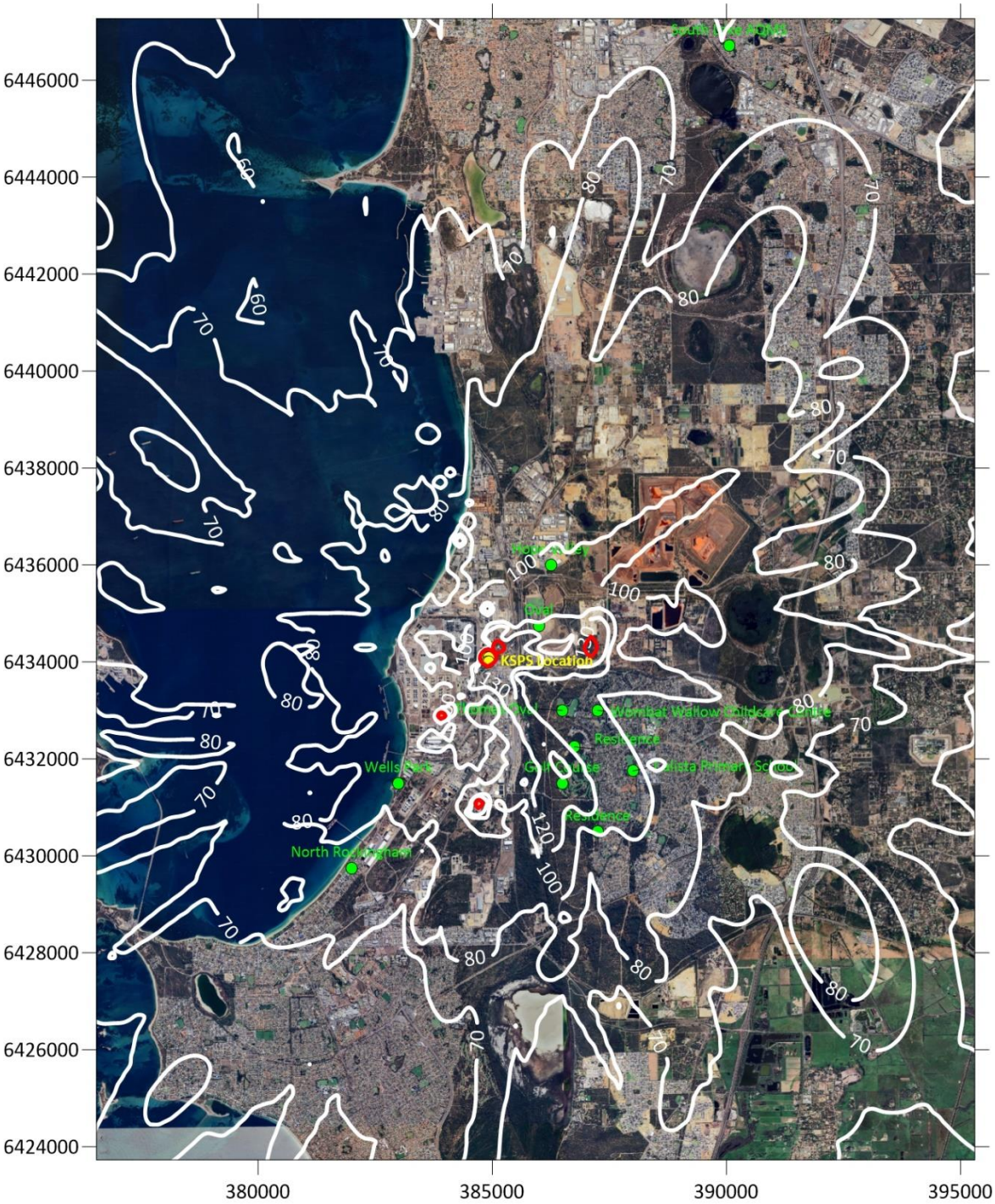


Figure 26: Predicted Maximum 1-hour Average GLCs of NO_2 (Across Modelled Domain) – Scenario 3b: Normal Operations - Cumulative

Confidential

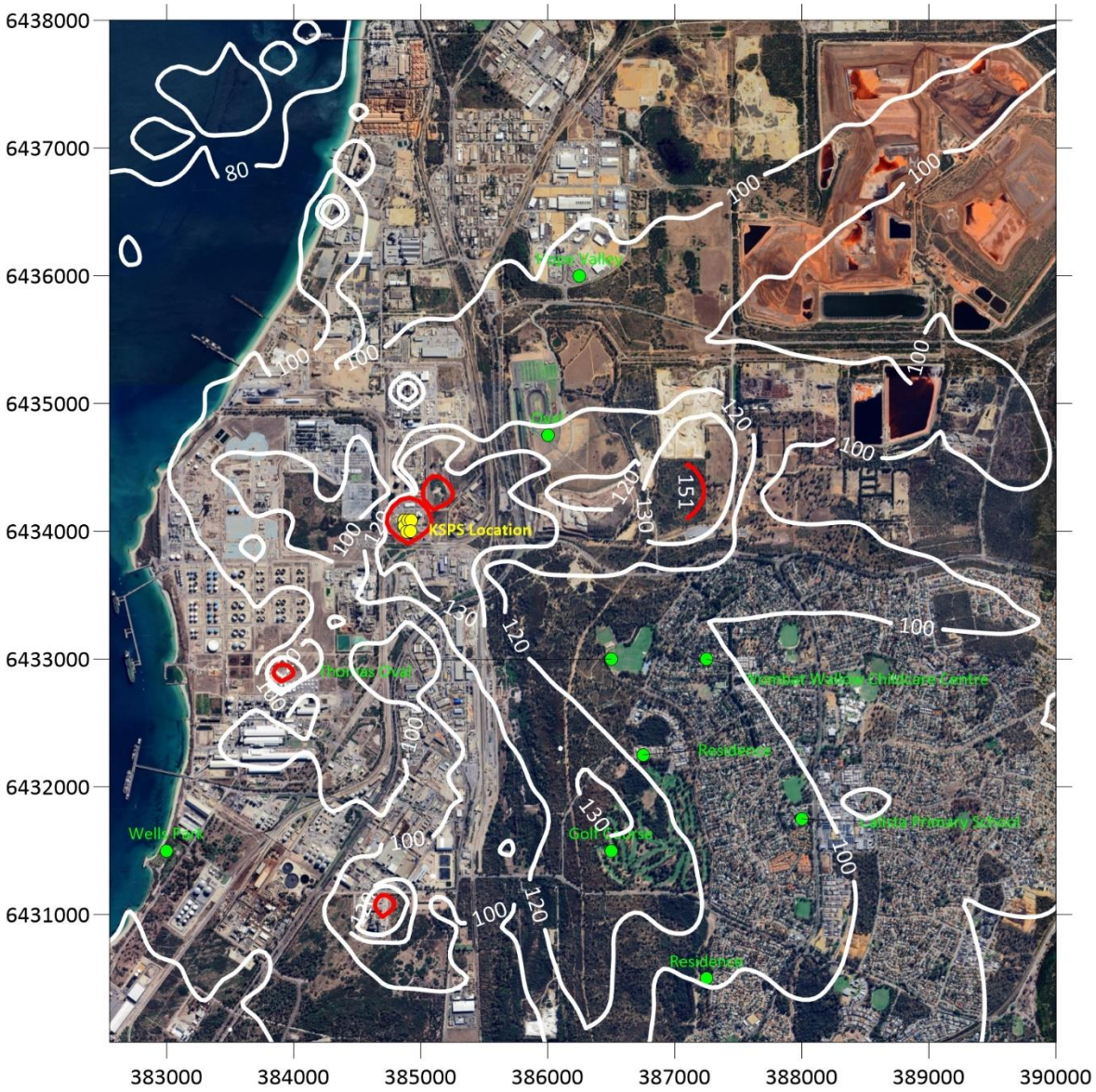


Figure 27: Predicted Maximum 1-hour Average GLCs of NO_2 (Zoomed In) – Scenario 3b: Normal Operations - Cumulative

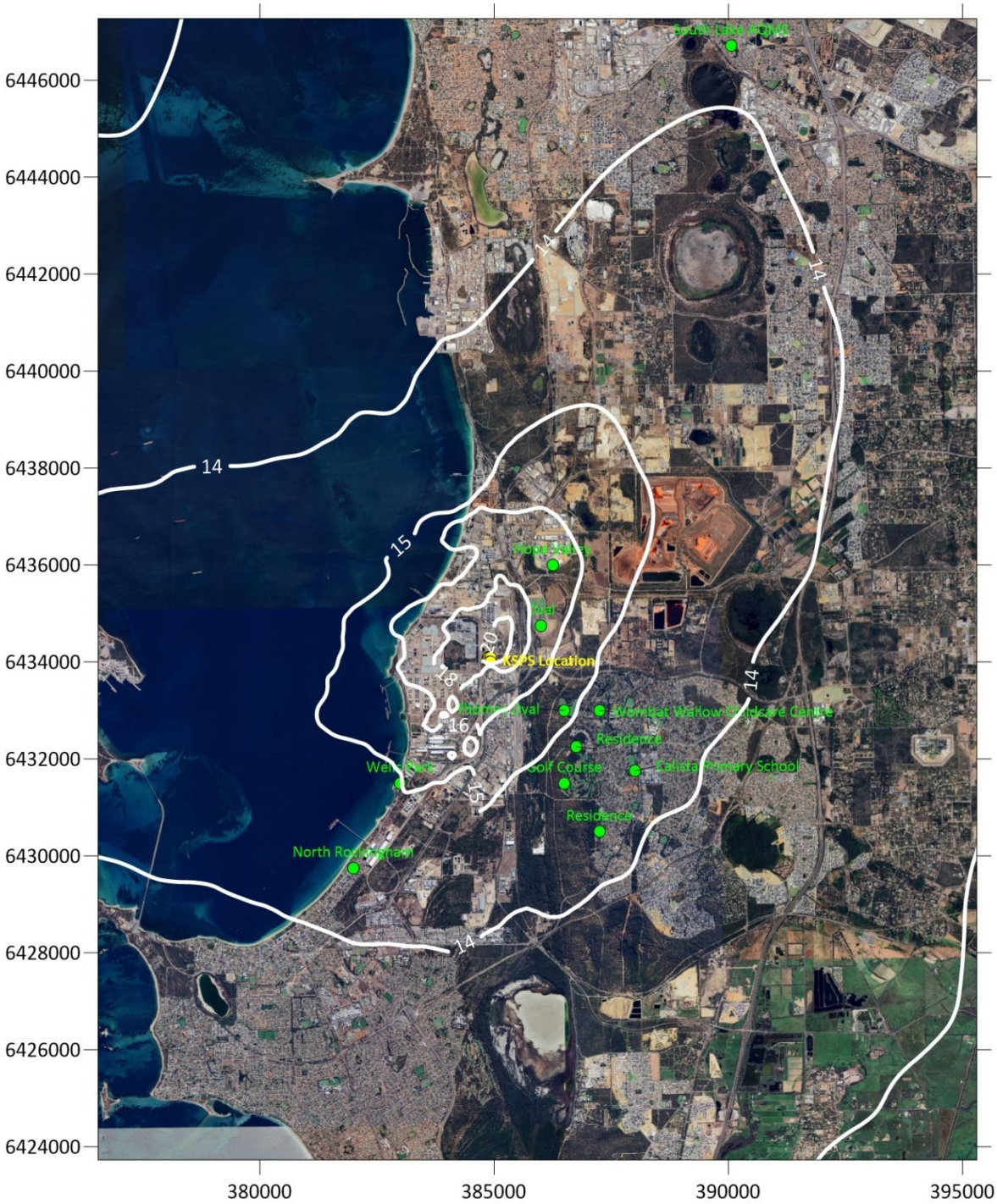


Figure 28: Predicted Annual Average GLCs of NO_2 (Across Modelled Domain) – Scenario 3b: Normal Operations - Cumulative

Confidential

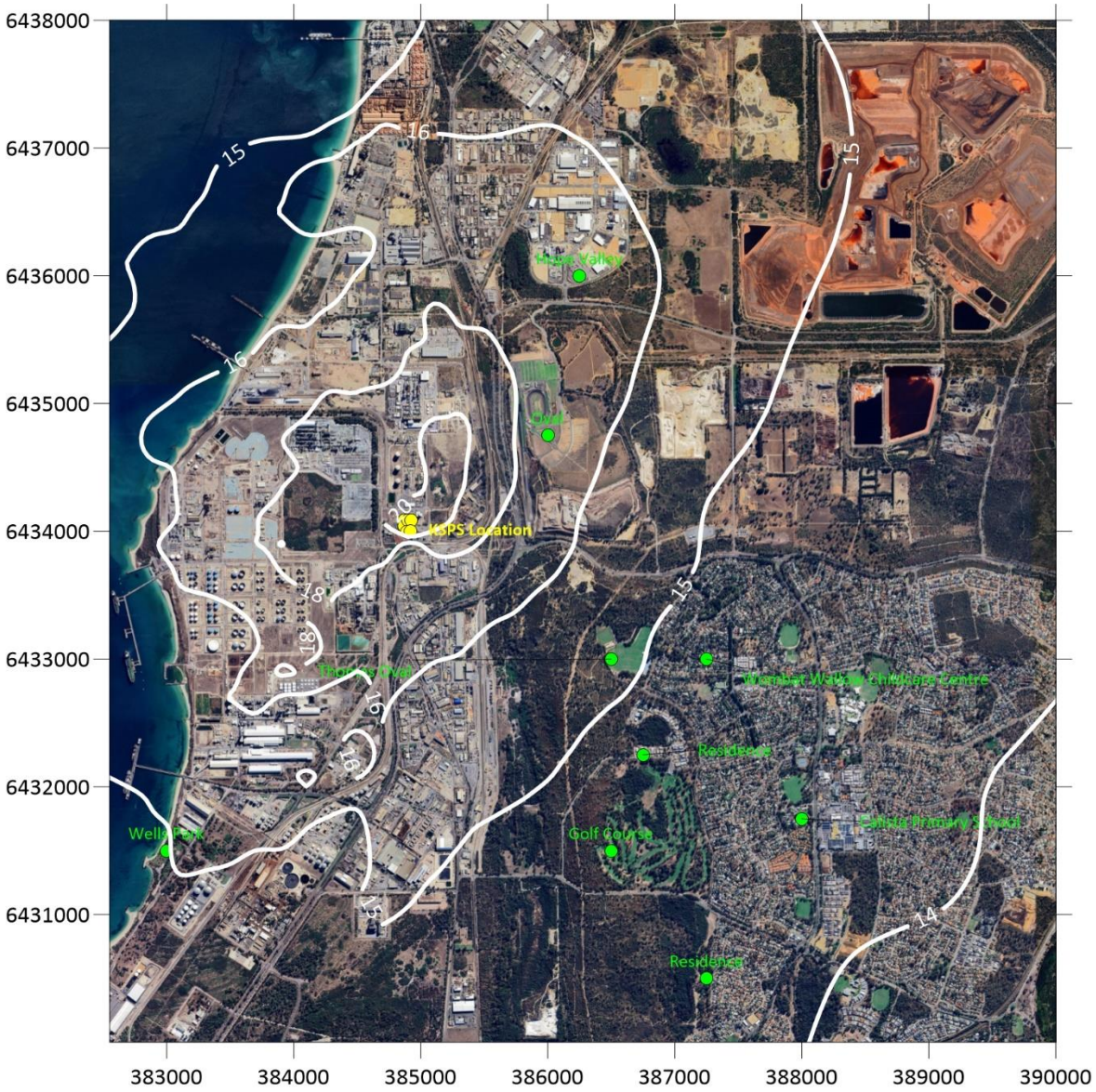


Figure 29: Predicted Annual Average GLCs of NO_2 (Zoomed In) – Scenario 3b: Normal Operations - Cumulative

Confidential

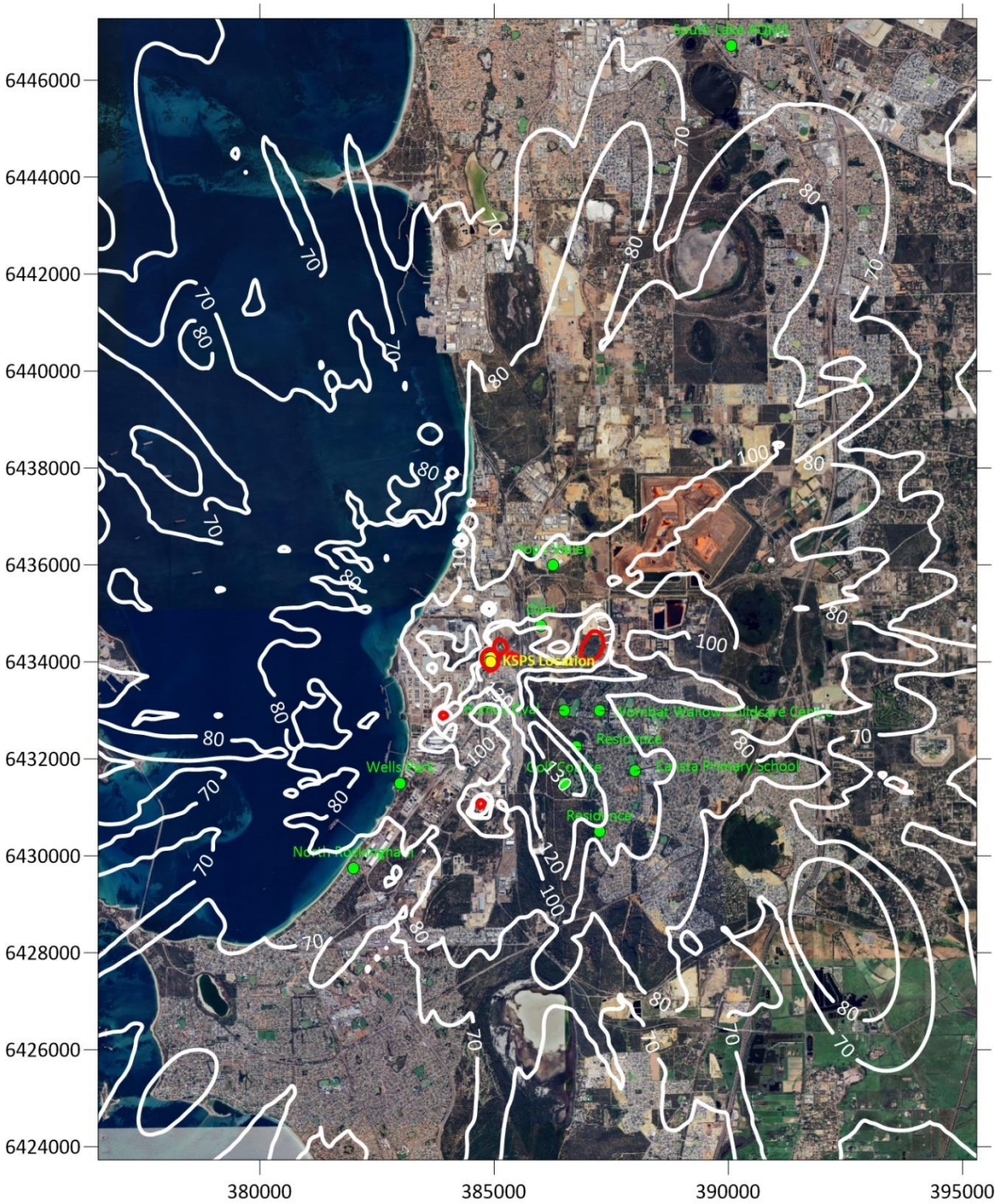


Figure 30: Predicted Maximum 1-hour Average GLCs of NO_2 (Across Modelled Domain) – Scenario 4: Start Up Operations

Confidential

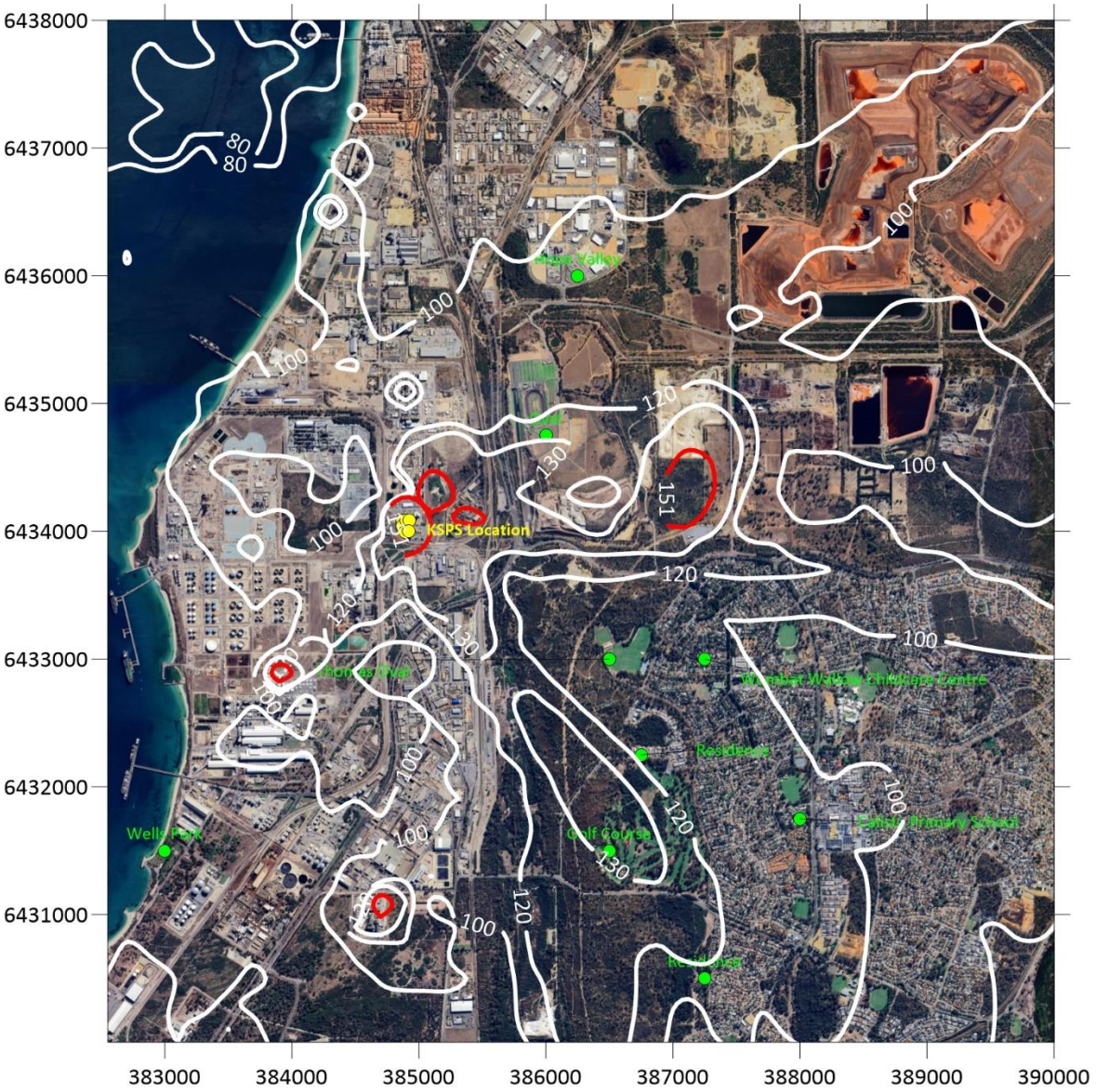


Figure 31: Predicted Maximum 1-hour Average GLCs of NO_2 (Zoomed In) – Scenario 4: Start Up Operations

Confidential

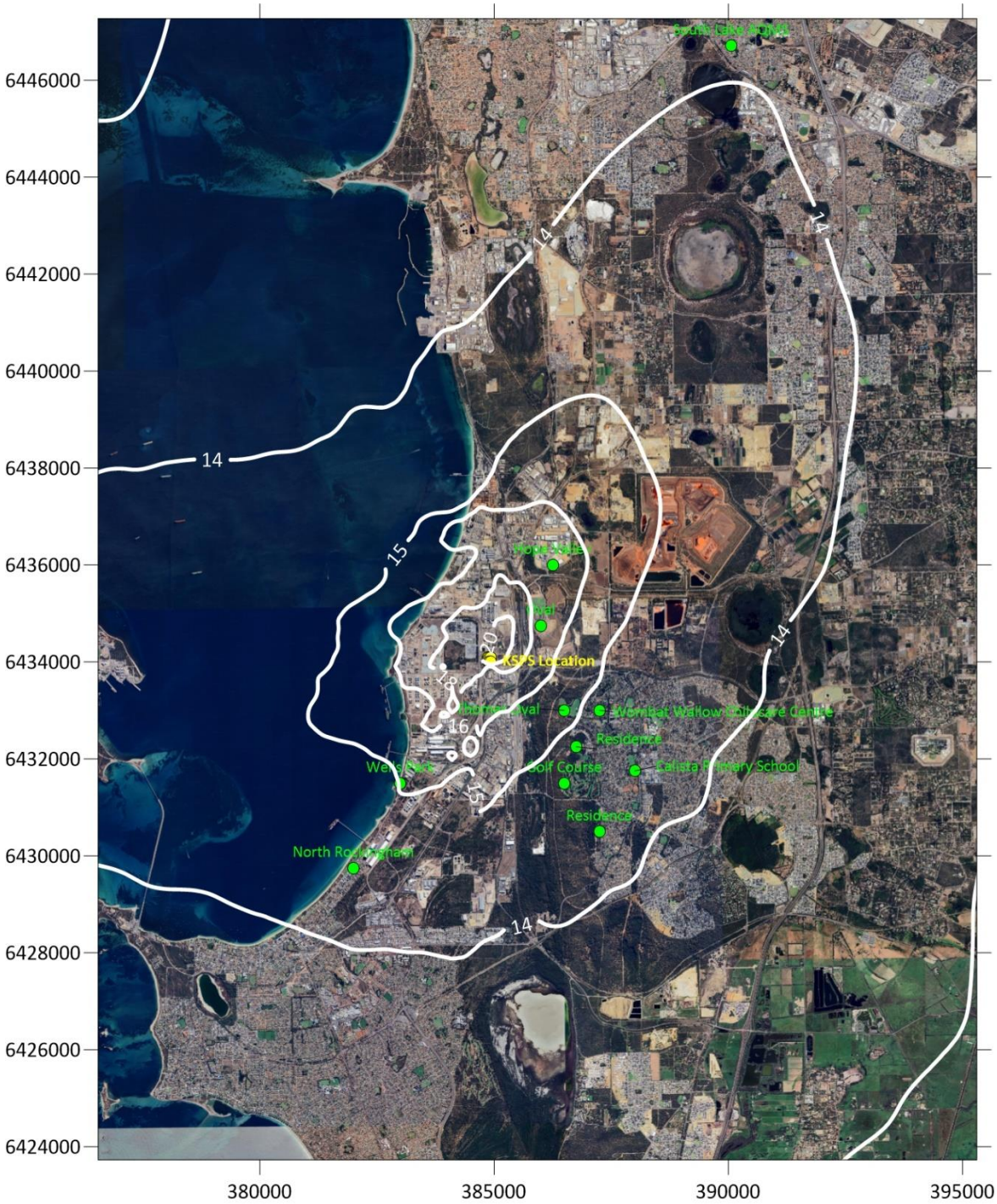


Figure 32: Predicted Annual Average GLCs of NO_2 (Across Modelled Domain) – Scenario 4: Start Up Operations

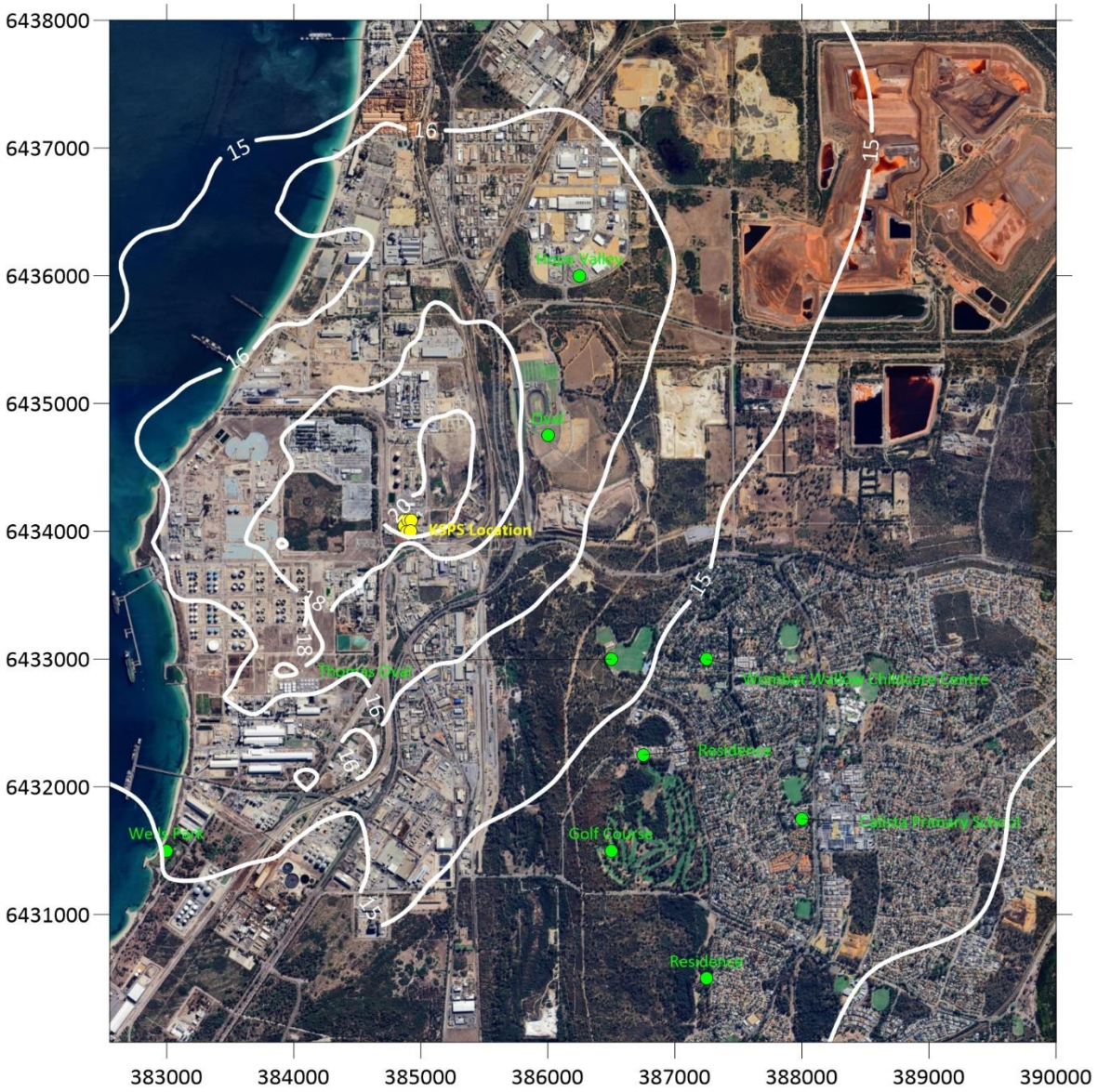


Figure 33: Predicted Annual Average GLCs of NO_2 (Zoomed In) – Scenario 4: Start Up Operations

Confidential

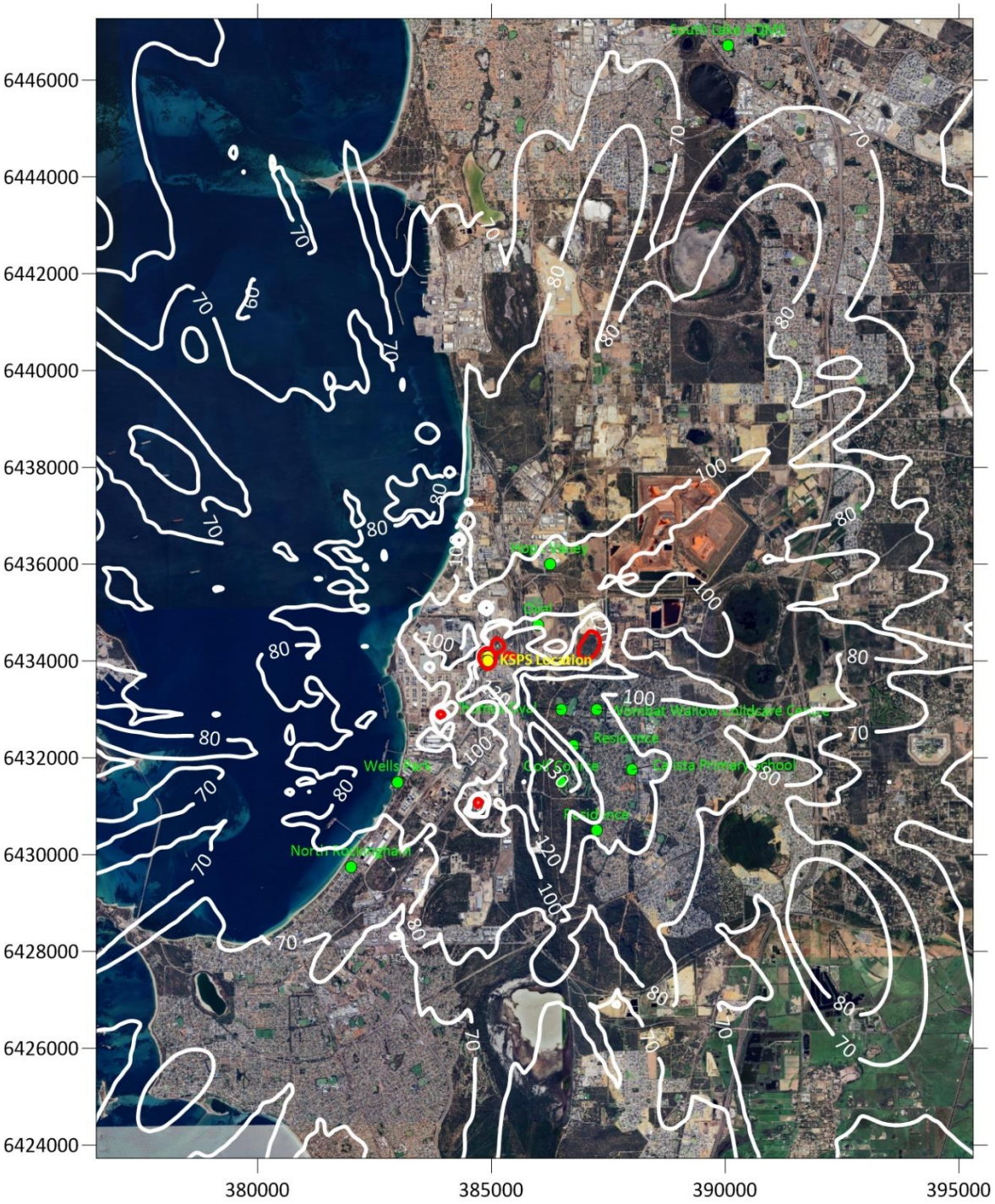


Figure 34: Predicted Maximum 1-hour Average GLCs of NO_2 (Across Modelled Domain) – Scenario 5: Shut Down Operations

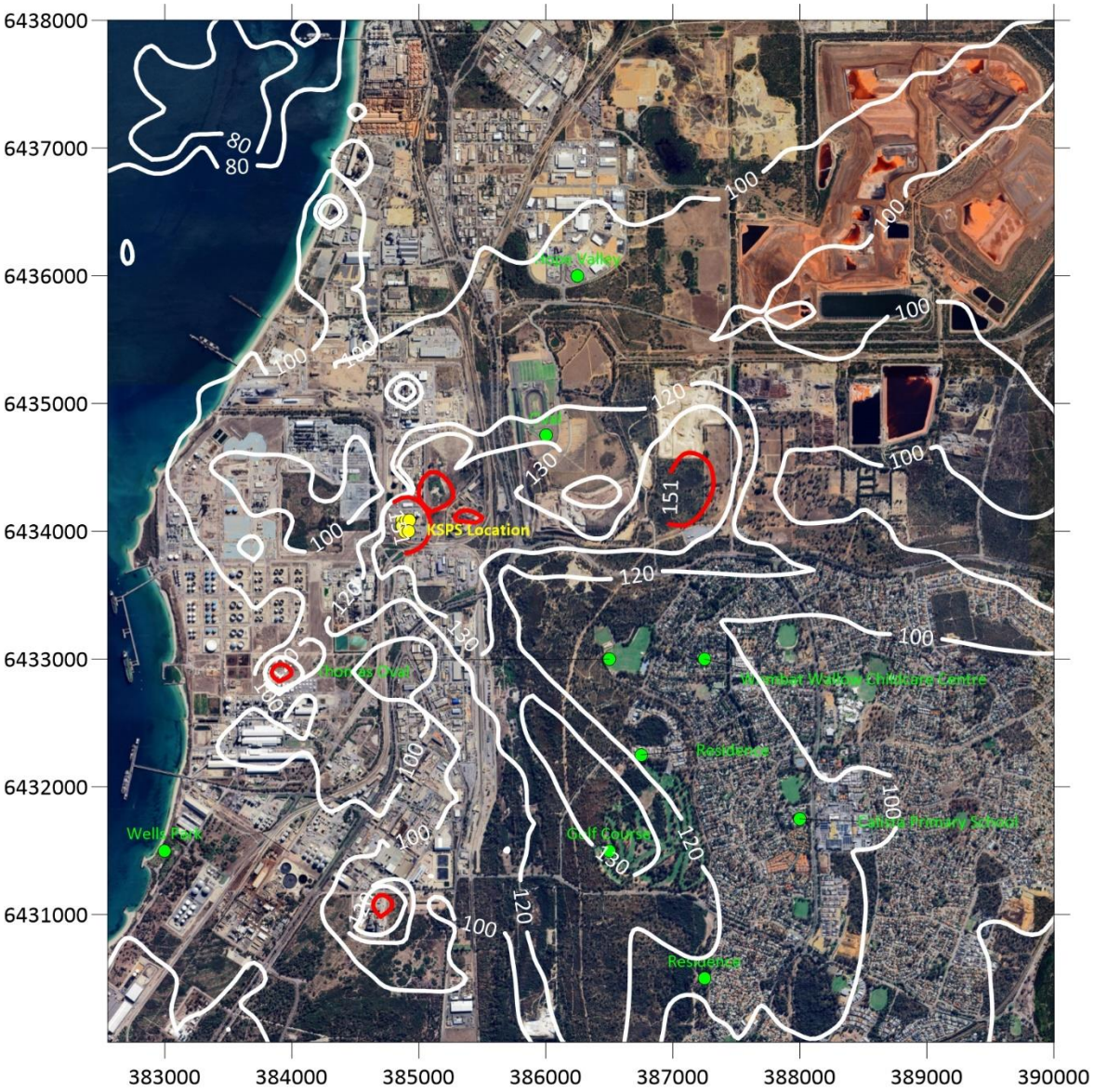


Figure 35: Predicted Maximum 1-hour Average GLCs of NO_2 (Zoomed In) – Scenario 5: Shut Down Operations

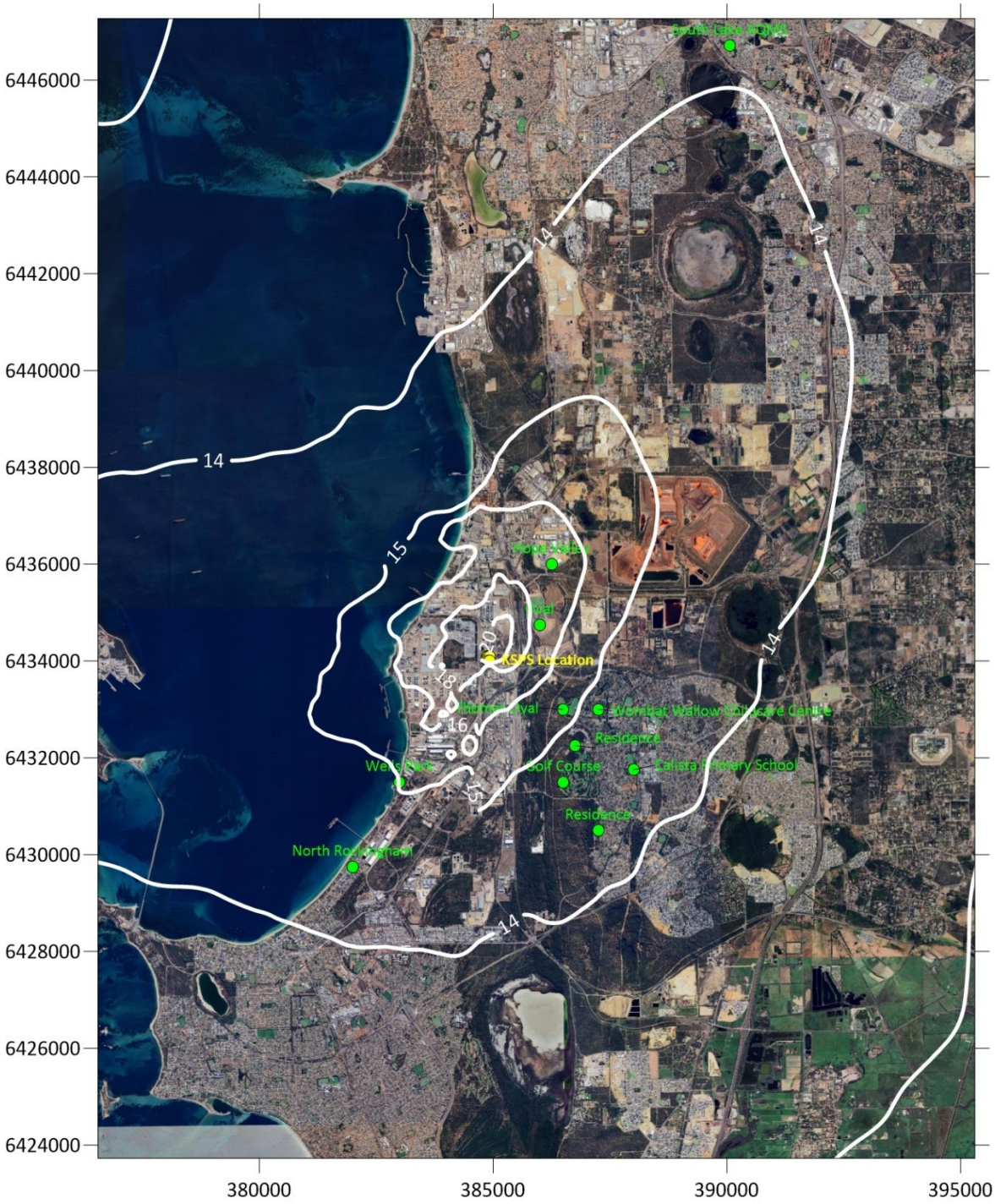


Figure 36: Predicted Annual Average GLCs of NO_2 (Across Modelled Domain) – Scenario 5: Shut Down Operations

Confidential

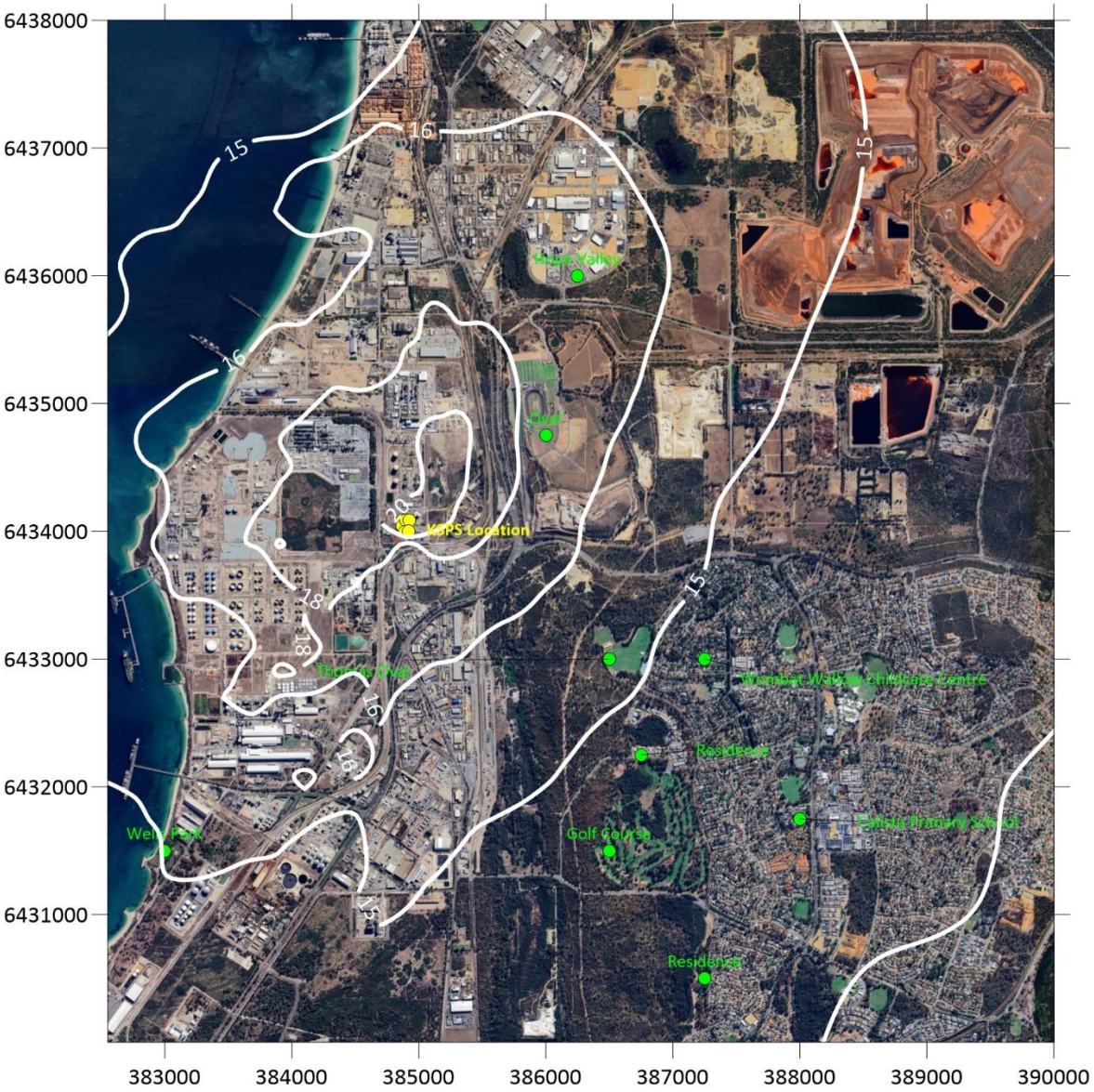


Figure 37: Predicted Annual Average GLCs of NO_2 (Zoomed In) – Scenario 5: Shut Down Operations

Confidential

6. SUMMARY

As part of the regulatory approval process, AGL requested Ramboll to undertake an assessment of the air quality impacts associated with the proposed expansion of the KSPS. The assessment has considered the potential air quality impacts arising from emissions of NOx\NO_2, associated with several scenarios.

The results of air dispersion modelling predicted maximum 1-hour average and annual average concentrations at all sensitive receptor locations in the region below the relevant ambient air quality criteria for all modelled scenarios. No exceedances of the annual average criteria were predicted at any location within the modelled domain. Exceedances of the 1-hour average criteria were recorded near the KSPS, and a single 1-hour average exceedance was predicted in an industrial area 3 km to the east of the KSPS facility for normal operations as well as the startup and shutdown scenarios.

The assessment has incorporated several conservative assumptions including the following which indicate that the results of the modelling could be considered a conservative estimate of worst case GLCs in the region:

- Emissions from the plant assumed worst case NOx concentrations as guaranteed by vendors. Emissions concentrations of NOx from the proposed turbines are expected to be significantly lower than those that were modelled.
- Modelling was undertaken assuming continuous operation of the KSPS when it is expected to operate for approximately 25% of the year.
- Emissions from shutdown and startup operations are expected to be sporadic and despite these operations only occurring for 10 minutes on each occasion it has been assumed that emissions from the plant continued for an additional 50 minutes.
- Background concentrations from non-industrial sources were based on a worst-case year.
- The model validation showed that when using an assumed background concentration of NO_2, the model was slightly overpredicting the highest predicted concentrations of NO_2 when compared to the monitored data at the North Rockingham.

Based on the outcomes of the air dispersion modelling and considering the inherent conservativity incorporated into the assessment, the expansion of the KSPS likely presents a low risk of impacting health at sensitive receptors in the region.

Ramboll would recommend that ambient air quality monitoring for NO_2 be established at or near the closest sensitive receptors (Medina) to the east of the facility to confirm that concentrations remain below ambient air guidelines once the facility is operational.

Confidential

7. LIMITATIONS

Ramboll prepared this report in accordance with the scope of work as outlined in our proposal to AGL and in accordance with our understanding and interpretation of current regulatory standards.

The conclusions presented in this report represent Ramboll's professional judgement based on information made available during this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all the written or oral information provided during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

7.1 User Reliance

This report has been prepared for AGL and may not be relied upon by any other person or entity without Ramboll's express written permission.

8. REFERENCES

Brashers and Emery, 2013. Draft User's Manual, The Mesoscale Model Interface Program (MMIF), Version 3.0, 2013-09-30, September 2013.

Department of Environment Regulation (DER), 2017. 'Guidance Statement: Risk Assessments.' February 2017.

Department of Water and Environmental Regulation (DWER), 2019. 'Redetermination of maximum permissible sulfur dioxide quantities under the Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999.' April 2019.

Department of Water and Environmental Regulation (DWER), 2020. '2019 Western Australian Air Monitoring Report', October 2020.

Emery, Tai (Emery et al.), 2001. Enhanced Meteorological Modeling and Performance Evaluation for Two Texas Ozone Episodes Published 2001 Environmental Science

EPA Victoria, 2001. '*State Environment Protection Policy (Air Quality Management).*' Published in the Victoria Government Gazette No. S 240, 21 December 2001.

Hersbach, Bell, Berrisford, Biavati, Horányi, Muñoz Sabater, Nicolas, Peubey, Radu, Rozum, Schepers, Simmons, Soci, Dee and Thépaut, 2023. ERA5 hourly data on single levels from 1940 to present. Copernicus Climate Change Service (C3S) Climate Data Store (CDS), DOI: 10.24381/cds.adbb2d47

Michalakes, Chen, Dudhia, Hart, Klemp, Middlecoff, and Skamarock, 2001. Development of a Next Generation Regional Weather Research and Forecast Model. Developments in Teracomputing: Proceedings of the Ninth ECMWF Workshop on the Use of High Performance Computing in Meteorology. Eds. Walter Zwieflhofer and Norbert Kreitz. World Scientific, Singapore. pp. 269-276.

NEPC, 2021. 'National Environmental Protection (Ambient Air Quality Measure)'. National Environmental Protection Council, December 2021.

NSW EPA, 2016. 'Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales'. State of New South Wales and the Environment Protection Authority, November 2016.

Western Air Sciences, 2024. Meteorological Modelling for Kwinana Industrial Area. July 2024