

ENV-AIR-PLN-001 Air Quality and Greenhouse Gas Management Plan

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1.0 INTRODUCTION

1.1 Background

This Air Quality and Greenhouse Gas Management Plan (AQGHGMP) has been developed for Boggabri Coal Operations Pty Ltd (BCOPL), a wholly owned subsidiary of Idemitsu Australia Resources Pty Limited (IAR) (80%), Chugoku Electric Power Australia Resources Pty Ltd (10%) and NS Boggabri Pty Limited (10%).

Boggabri Coal Mine (BCM) is located 15 km north-east of the township of Boggabri in north-western New South Wales (NSW). BCM is an open cut coal mine that has been operating since 2006. Truck and excavator operations are used to mine a run-of-mine (ROM) coal, which is crushed and screened to produce a thermal coal product or washed in the Coal Handling Preparation Plant (CHPP) to produce coking or pulverised coal injected (PCI) product. Product coal is loaded onto trains via a loading facility at the mine site, and transported by rail for overseas consumption via the Port of Newcastle.

Project Approval 09_0182 (a State Significant Development Approval (SSD 09_0182)) for the BCM was granted by the NSW Planning Assessment Commission (PAC) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 18 July 2012, and has been modified on nine occasions to date. This has provided approval for the production of up to 8.6 million tonnes per annum (Mtpa) of product coal until December 2036, and the transport of up to 10 Mtpa of product coal by rail (up to 8.6 Mtpa from BCM and up to 3 Mtpa from Tarrawonga Coal Mine (TCM)) (subject to agreement).

Schedule 3, Condition 31 of the SSD 09_0182 requires the preparation of an AQGHGMP. This plan has been prepared to fulfill these requirements. Consultation with the Boggabri Coal Community Consultative Committee (CCC) and the Environment Protection Authority of NSW (EPA) was undertaken during the preparation of the AQGHGMP (refer to Section 2.0).

All BCOPL staff and contractors working at the BCM are required to operate in accordance with the AQGHGMP.

1.2 Purpose and application of this AQGHGMP

The purpose of the AQGHGMP is to comply with Schedule 3, Condition 31 of the SSD 09_0182, and to ensure compliance with the air quality and greenhouse gas management conditions.

This AQGHGMP applies to BCOPL employees and contractors at BCM and covers all areas within the 'project approval boundary' as defined in Development Consent SSD 09_0182. The project approval boundary is shown in Figure A-1 in Appendix A.

2.0 STATUTORY REQUIREMENTS

BCOPL will operate in accordance with Schedule 3, Conditions 31 and 31A of the SSD 09_0182 which requires the preparation of an AQGHGMP. The specific requirements of the AQGHGMP are listed in Table 2-1 together with a reference to where each condition is addressed in this document.

Additional conditions of the SSD 09_0182 relevant to air quality and greenhouse gas management are provided in Appendix B.

Table 2-1: SSD 09_0182 AQGHGMP conditions

Applicable Condition	Requirements of SSD 09_0182	AQGHGMP reference
Schedule 3, Condition 31	The Proponent must prepare an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Secretary.	Entire AQGHGMP document
Schedule 3, Condition 31(a)	This plan must be prepared in consultation with the EPA and the CCC, and be submitted to the Secretary for approval within 6 months from the date of project approval.	Entire AQGHGMP document
Schedule 3, Condition 31(b)	This plan must integrate the recommendations of a Site Specific Best Management Determination and Reactive Dust Management Strategy prepared to the satisfaction of the EPA.	Section 6.1 and Appendix C
Schedule 3, Condition 31(c)	This plan must describe the measures that would be implemented to ensure: • best management practice is being employed, consistent with the development of the site specific best management determination and reactive dust management strategy • the air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events • the Scope 1 and Scope 2 greenhouse gas emissions are minimised • compliance with the relevant conditions of this consent.	Section 6.1 and Appendix C Section 6.1 and Appendix C Section 7.0 Entire AQGHGMP document
Schedule 3, Condition 31(d)	This plan must describe the proposed air quality management system.	Entire AQGHGMP document
Schedule 3, Condition 31(e)	This plan must include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities.	Section 6.1.3 and Appendix C
Schedule 3, Condition 31(f)	This plan must include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring.	Section 11.4
Schedule 3, Condition 31(g)	This plan must include an air quality monitoring program that:	

Applicable Condition	Requirements of SSD 09_0182	AQGHGMP reference
	- uses a combination of real-time monitors and supplementary monitors to evaluate the performance of the project - adequately supports the proactive and reactive air quality management system - includes PM_{2.5} monitoring - includes a trigger response/reactive management protocol to be used in combination with the real time PM₁₀ monitoring sites and the site meteorological weather station - includes monitoring of occupied project-related residences, subject to the agreement of the tenant - evaluates and reports on the effectiveness of the air quality management system - Includes a protocol for determining any exceedances of the relevant conditions in this approval.	Section 8.0 Section 8.0 Section 8.1 Appendix C Section 8.1 Section 8.1 Section 9.0
Schedule 3, Condition 31(h)	This plan must include a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative air quality impacts of all mines within the Precinct.	Refer to the Boggabri-Tarrawonga-Maules Creek Complex (BTM Complex) Air Quality Management Strategy (Parsons Brinkerhoff, 2017).
Schedule 3, Condition 31A	The proponent must implement the Air Quality and Greenhouse Gas Management Plan as approved by the Secretary	Entire AQGHGMP document

3.0 AIR QUALITY CRITERIA

3.1 Air quality assessment criteria

BCOPL will act in accordance with Schedule 3, Condition 27 of Development Consent SSD 09_0182. BCOPL will operate the project in a way to ensure particulate matter emissions generated by the project do not exceed the criteria listed in Table 3-1 and Table 3-2 at any residence on privately-owned land or on more than 25% of any privately-owned land.

Table 3-1: Long term criteria for particulate matter

Pollutant	Averaging period	^{a,c} Criterion
Particulate matter < 10 µm (PM ₁₀)	Annual	^a 25 µg/m ³
Particulate matter < 2.5 µm (PM _{2.5})	Annual	^a 8 µg/m ³

Table 3-2: Short term criteria for particulate matter

Pollutant	Averaging period	^b Criterion
Particulate matter < 10 µm (PM ₁₀)	24 hour	50 µg/m ³
Particulate matter < 2.5 µm (PM _{2.5})	24 hour	25 µg/m ³

Notes for Table 3-1 and

Table 3-2: Short term criteria for particulate matter

:

- a. Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources).
- b. Incremental impact (i.e. incremental increase in concentrations due to the project on its own).
- c. Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.

In addition, Schedule 3, Condition 28 states that BCOPL must ensure that particulate matter emissions generated by the BCM do not exceed the criteria listed in Table 3-1 and Table 3-2, at any occupied residence on any mine owned land (including land owned by adjacent mines) unless:

- a. All reasonable and feasible avoidance and mitigation measures have been employed to prevent exceedance of the criteria.
- b. The tenant, and landowner (where owned by a mine other than the BCOPL), has been notified of health risks in accordance with the notification requirements under Schedule 4 of Development Consent SSD 09_0182.
- c. The tenant on project owned land can terminate their tenancy agreement without penalty, subject to giving reasonable notice, and BCOPL uses its best endeavours to provide assistance with relocation and sourcing of alternative accommodation.
- d. Air mitigation measures such as air filters, a first flush roof water drainage system and/or air conditioning) are installed at the residence, if requested by the tenant and landowner (where owned by a mine other than BCOPL).

- e. Particulate matter air quality monitoring is undertaken to inform the tenant and landowner (where owned by a mine other than the BCOPL) of potential health risks.
- f. The monitoring data are provided to the tenant in an appropriate format, for a medical practitioner to assist the tenant in making an informed decision on the health risks associated with occupying the property, to the satisfaction of the Secretary.

3.2 Air quality acquisition criteria

BCOPL will act in accordance with Schedule 3, Condition 29 of Development Consent SSD 09_0182 which states that if particulate matter emissions generated by the BCM exceed the relevant cumulative criteria, in Table 3-3 and

Table 3-4 at any residence on privately-owned land or on more than 25% of any privately-owned land, upon receiving a written request for acquisition from the landowner, BCOPL must acquire the land in accordance with the procedures in conditions 8 and 9 of Schedule 4.

Table 3-3: Long term acquisition criteria for particulate matter

Pollutant	Averaging period	^{a,c} Criterion
Particulate matter < 10 µm (PM ₁₀)	Annual	^a 25 µg/m ³
Particulate matter < 2.5 µm (PM _{2.5})	Annual	^a 8 µg/m ³

Table 3-4: Short term acquisition criteria for particulate matter

Pollutant	Averaging period	^{a,c} Criterion
Particulate matter < 10 µm (PM ₁₀)	24 hour	^a 150 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	24 hour	^b 50 µg/m ³
Particulate matter < 2.5 µm (PM _{2.5})	24 hour	^b 25 µg/m ³

Notes for Table 3-3 and

Table 3-4:

- a. Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources).
- b. Incremental impact (i.e. incremental increase in concentrations due to the project on its own).
- c. Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.

4.0 EXISTING ENVIRONMENT

4.1 Sensitive receptors

The BCM is located in proximity to a number of sensitive receptors (e.g. residences) that are privately owned, owned by BCOPL, or by mines in the surrounding area, or jointly owned by several mines in the area.

Sensitive receptors surrounding the BCM were identified in the air quality impact assessment (AQIA) to support the development application for BPOP's modification 8 (MOD8). The assessment was completed by Airen Consulting (2022) and is hereafter referred to as 'the AQIA'. The sensitive receptors identified in the AQIA are listed in Table 4-1.

Table 4-1: Sensitive receptors surrounding the BCM

ID (from the AQIA)	Ownership
1	Whitehaven Coal
4	Private
18	BCOPL
20	BCOPL
23	BCOPL
25	BCOPL
27	BCOPL
32	Whitehaven Coal
33	Whitehaven Coal
35	Mine Joint Owed
43	Whitehaven Coal
44	Private
48	Private
52	BCOPL
54	Mine Joint Owed
63	Whitehaven Coal
67	BCOPL
68	BCOPL
69	BCOPL
79	BCOPL

ID (from the AQIA)	Ownership
85	Whitehaven Coal
86	Whitehaven Coal
88	Whitehaven Coal
90	Private
94	Mine Joint Owed
95	Mine Joint Owed
98	Whitehaven Coal
100	Whitehaven Coal
115	Private
140	Private
147	Private
158	Private
159	Whitehaven Coal
182	Whitehaven Coal
181	Whitehaven Coal
180	Whitehaven Coal
179	BCOPL
178	BCOPL
177	BCOPL
176	BCOPL
185	Whitehaven Coal
186	Whitehaven Coal
187	Whitehaven Coal
192	Whitehaven Coal
190	Whitehaven Coal
165	Private
191	Whitehaven Coal
193	Whitehaven Coal

4.2 Neighbouring mining operations and exploration activities

BCM is located within an existing mining precinct centred within and around the Leard State Forest, known as the BTM Complex (formerly referred to as Leard State Forest Precinct). In addition to the BCM, the BTM Complex includes the existing Tarrawonga Coal Mine (TCM) to the south, and Maules Creek Coal Mine to the northwest.

Tarrawonga Coal Pty Ltd, a subsidiary of Whitehaven Coal, currently operates the TCM, which is an open cut mining operation located southeast of and adjacent to the BCM. The mine has been in operation since June 2006.

The Maules Creek Coal Mine, also owned by Whitehaven Coal, received Project Approval under the EP&A Act in October 2012 and commenced mining operations in 2015.

A figure showing the locations of neighbouring mining operations is provided in Appendix A.

A joint air quality management strategy for the BTM Complex is detailed in the *BTM Complex Air Quality Management Strategy* (Parsons Brinkerhoff, 2017).

4.3 Baseline data

4.3.1 Introduction

The most common emission to air from open cut coal mining is dust, also referred to as particulate matter. Key metrics for particulate matter include:

- total suspended particulate (TSP);
- particulate matter with equivalent aerodynamic diameter of 10 micrometres or less (PM₁₀);
- particulate matter with equivalent aerodynamic diameter of 2.5 micrometres or less (PM_{2.5}); and
- deposited dust.

An air quality monitoring network has been in place at BCM since August 2005. The network includes:

- five meteorological stations;
- two high-volume air samplers (HVASs);
- four tapered element oscillating microbalances (TEOMs);
- three dust deposition gauges; and
- four portable real-time PM₁₀ monitors (e-samplers).

Further detail on the monitoring network is provided in Section 8.0.

4.3.2 Meteorology

Of the five meteorological stations located around BCM, the automatic weather station (AWS) known as 'MET' is sited closest to mining operations and is used for compliance monitoring. The MET AWS records temperature, wind speed, wind direction, rainfall, sigma-theta, and solar radiation data in 15-minute increments.

Annual and seasonal wind roses generated from the wind speed and direction data recorded by the MET AWS between 2019 and 2023 are presented in Figure 4-1 and Figure 4-2, respectively.

The annual wind roses show prevailing winds from the south-east and north-west directions. The annual average recorded wind speed ranged from 1.9 m/s to 2.2 m/s, while the frequency of calm conditions (wind speeds less than 0.5 m/s) occurred between 9.8% to 15.8% percent of the time.

The seasonal wind roses show that in summer and autumn, the prevailing winds were from the south-east, while winds from north-east were dominant during the winter. The mean wind speed ranged from 1.6 m/s in winter to 2.4 m/s in summer. The frequency of calm conditions ranged from 6.7% in summer to 19.8% in winter.

Figure 4-1: Annual wind speed and direction at MET AWS – 2019 to 2023

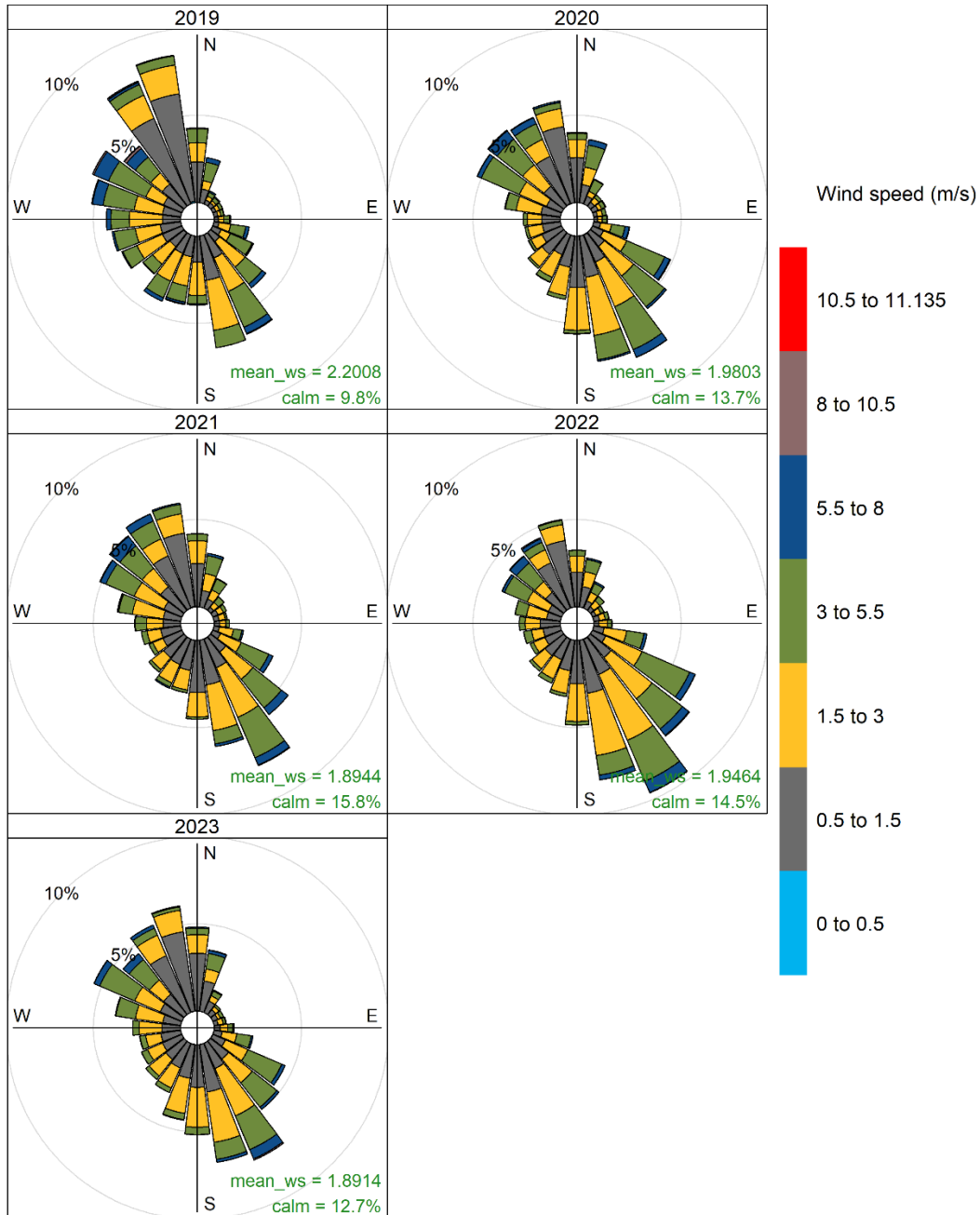
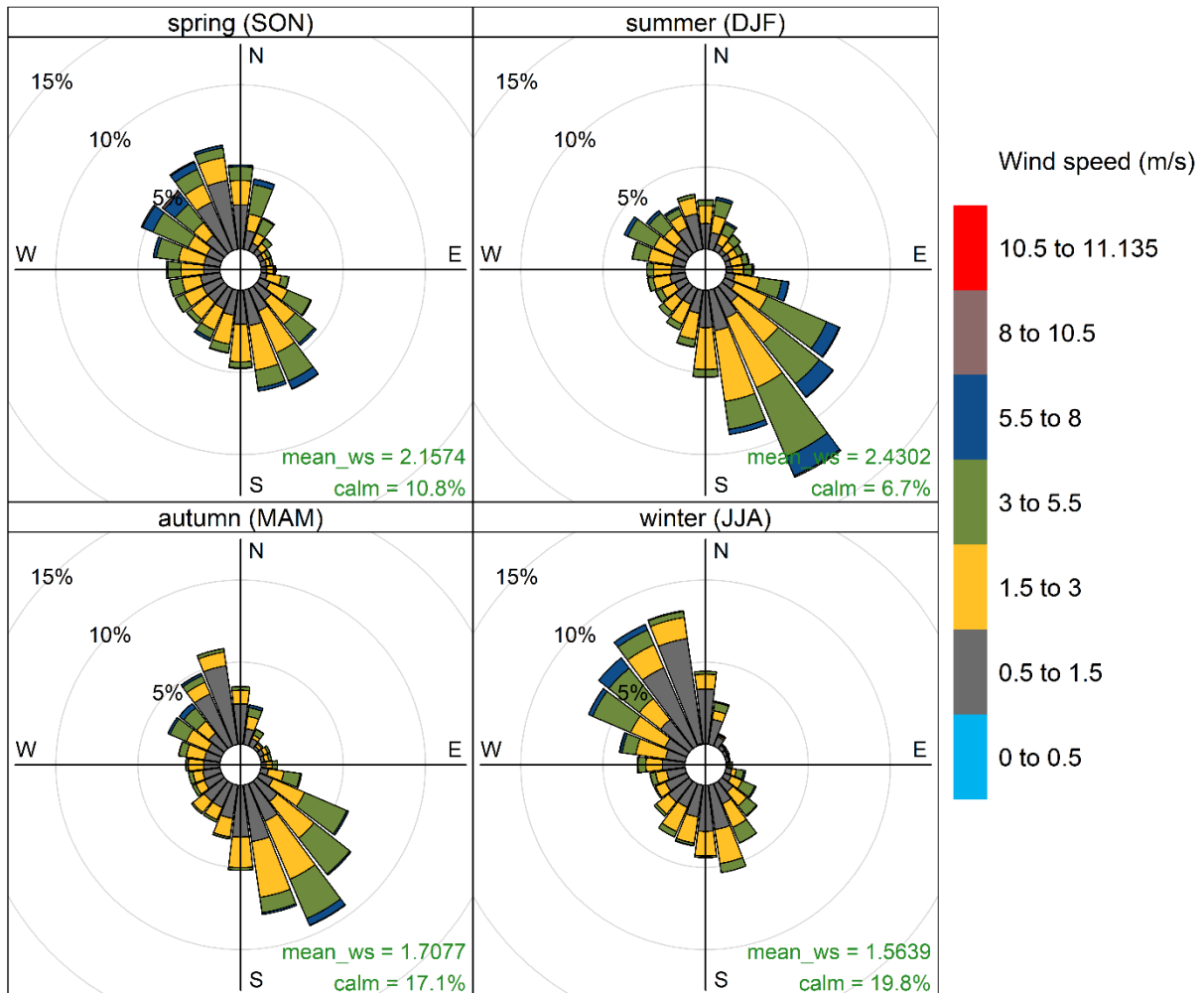


Figure 4-2: Seasonal wind speed and direction at MET AWS – 2019 to 2023



4.3.3 Air quality

4.3.3.1 Particulate matter

BCOPL's 'Glenhope' HVAS is used for compliance monitoring of PM₁₀ at the BCM. The HVAS records PM₁₀ once every six days. Maximum 24-hour average and annual average concentrations for the period between 2019 and 2023 are provided in Table 4-2.

Exceedances of the 24-hour average impact assessment criteria of 50 µg/m³ were recorded in 2019, 2020, and 2023. Exceedances of the annual average impact assessment criteria of 25 µg/m³ were recorded in 2019. It should be noted that ambient air quality during this period was influenced by intensifying drought conditions and extensive bushfires events across eastern Australia.

Table 4-2: Maximum 24-hour average and annual average PM₁₀ concentrations – Glenhope HVAS

Averaging period	2019	2020*	2021	2022	2023
Maximum 24-hour average PM ₁₀	N/A	34.0	36.0	20.6	75.8
Annual average PM ₁₀	N/A	13.8	9.6	7.0	14.8

Note: µg/m³ = micrograms per cubic metre.

The Glenhope HVAS was established in June of 2020 following the relocation from the Coonboobindi monitoring location.

The Wilberoi East TEOM is used for compliance monitoring of PM₁₀ and PM_{2.5} concentrations at the BCM. Maximum 24-hour average and annual average concentrations for the period between 2019 and 2023 are provided in Table 4-3.

Exceedances of the 24-hour average impact assessment criteria of 50 µg/m³ for PM₁₀ and 25 µg/m³ for PM_{2.5} were recorded in 2019, 2020, and 2023. Exceedances of the annual average impact assessment criteria of 25 µg/m³ for PM₁₀ and 8 µg/m³ for PM_{2.5} were recorded in 2019. As discussed above, exceedances of the criteria in 2019 and 2020 were largely driven by drought conditions and extensive bushfires in Australia.

It is noted that, during 2019, there were 53 exceedances of the maximum 24-hour average PM₁₀ criteria recorded at the Wilberoi East TEOM. These were classified as extraordinary events (due to widespread dust storms, bushfires etc.) as described in the *BCOPL 2019 Annual Review* (BCOPL 2020a). With extraordinary event days excluded, the maximum 24-hour average PM₁₀ concentration at the Wilberoi East TEOM as presented in the 2019 Annual Review, was 49.3 µg/m³. The annual average PM₁₀ concentration was 24.4 µg/m³.

During 2020, there were five exceedances of the maximum 24-hour average PM₁₀ criteria recorded at the Wilberoi East TEOM that were classified as extraordinary events in the *BCOPL 2020 Annual Review* (BCOPL 2021). The maximum 24-hour average PM₁₀ concentration at the Wilberoi East TEOM as presented in the 2020 Annual Review, was 102.4 µg/m³. The annual average PM₁₀ concentration was 14.5 µg/m³.

Table 4-3: Maximum 24-hour average and annual average PM₁₀ and PM_{2.5} concentrations – Wilbero East TEOM

Averaging period	2019	2020	2021	2022	2023
PM₁₀ concentrations (µg/m³)					
Maximum 24-hour average	210.4	117.6	32.7	43.7	81.9
Annual average	36.7	15.4	8.9	9.0	15.8
PM_{2.5} concentrations (µg/m³)					
Maximum 24-hour average	118.6	53.9	9.5	16.8	55.0
Annual average	12.0	5.9	3.9	3.8	5.8

Note: µg/m³ = micrograms per cubic metre

4.3.3.2 Dust deposition

The annual average dust deposition levels (i.e. insoluble solids) recorded at BCM for the years between 2019 and 2023 are provided in Table 4-4.

The annual average dust deposition levels across the three dust deposition gauges ranged from 0.8 to 2.9 g/m²/month. In all years presented, the dust deposition levels were below the criterion of 4 g/m²/month.

Table 4-4: Annual average dust deposition rates between 2019 and 2023

Dust deposition gauge ID	2019	2020	2021	2022	2023
D4	2.3	2.1	1.2	0.9	1.1
D5	1.7	1.2	0.8	1.0	1.2
D6	2.9	1.3	0.8	0.8	0.9

Note: g/m²/month = grams per metre squared per month

5.0 EMISSION SOURCES AND PREDICTED IMPACTS

5.1 Overview

As described in Section 4.3, the most common emission to air from open cut coal mining is particulate matter in the form of TSP, PM₁₀, PM_{2.5} and deposited dust.

Plant and equipment engines also emit pollutants including carbon monoxide (CO), oxides of nitrogen (NO_x) and particulate matter, and to a lesser extent sulphur dioxide (SO₂). Post-blast fumes generate nitric oxide (NO) emissions which, in turn, oxidises to create nitrogen dioxide (NO₂).

The AQIA provided estimates of emissions from the operations of the mine in 2023 and in 2027. These emissions were then used to predict air quality impacts in these years. The key sources and pollutants addressed in the AQIA were:

- particulate matter (TSP, PM₁₀ and PM_{2.5}) from mining dust;
- PM₁₀, PM_{2.5}, and NO₂ from diesel exhaust;
- NO₂ from post-blast fumes; and
- greenhouse gas emissions (as CO₂-equivalent (CO₂-e)¹).

5.2 Air quality emissions

The AQIA identified the following sources of air quality emissions:

- clearing and transportation of topsoil material;
- drilling and blasting activities in pit area;
- transport of waste rock to waste rock stockpile areas;
- waste rock stockpile management and shaping by dozers;
- transport of coal material to the ROM pad;
- dozers sorting and working on ROM coal stockpiles;
- wind erosion associated with active pits, waste rock stockpiles, topsoil stockpiles, coal product material stockpiles and other exposed (non-vegetated) surfaces; and
- grading of haul roads.

The AQIA concluded that the most significant source of particulate matter emissions from BCM would be associated with the movement of vehicles on unpaved roads. Waste rock stockpile operations and wind erosion for exposed surfaces were also determined to be significant sources of particulate matter emissions.

NO_x emissions from diesel exhaust and post-blast fumes were also estimated in the AQIA.

¹ CO₂-equivalent is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential, by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

5.3 Greenhouse gas emissions

GHG emissions from the BCM were quantified in the AQIA. The GHG emissions from the BCM are principally associated with on-site energy consumption, specifically diesel combustion (Scope 1 emissions) and consumption of purchased electricity (Scope 2 emissions). The BCM features conventional drill, blast, and haul techniques, which largely depend on the use of diesel-powered equipment. Indirect Scope 3 emissions from transportation, energy production, and use of coal, were also estimated.

The AQIA estimated that the annual Scope 1 and 2 GHG emissions generated by operations of the BCM would total 0.28 Mt CO₂-e per year.

BCOPL continues to calculate and report Scope 1 and 2 GHG emissions annually in accordance with the requirements of the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act).

5.4 Predicted impacts

The AQIA used the estimated emissions of particulate matter and NO_x as inputs into dispersion modelling. The study predicted concentrations at sensitive receptors (as listed in Section 4.1) and across a modelling domain.

The AQIA summarised the predicted impacts as follows:

- The only potential for BCM to cause exceedances of the criteria (particularly in the case of 24-hour PM₁₀) is when existing background levels are already approaching the criteria. In these cases, the modelling indicated that the contribution from the BCM was minor compared with the background (up to 3 µg/m³ at one receptor). It was concluded that the risk of exceedance could be managed through the application of appropriate air quality management measures.
- Post-blast fume emissions are not expected to result in exceedances of NSW EPA NO₂ assessment criteria.
- Emissions from diesel exhaust (particulate matter and NO₂) were predicted to be below the assessment criteria.
- Direct (Scope 1 and 2) GHG emissions from the BCM would contribute to 0.08 Mt CO₂-e on an annual basis. This represents less than 0.02% of Australia's annual emissions in 2020.

6.0 AIR QUALITY MANAGEMENT

6.1 Dust mitigation

Air quality at BCM will be managed in accordance with the assessment criteria outlined in table 3-1 and 3-2.

6.1.1 Pollution reduction programs

The following Site-Specific Dust management Pollution Reduction Programs (PRPs) have previously been included in the BCM RPL (12407):

1. PRP Coal Mine particulate Matter Control Best Practice, completed 29 Jne 2012
2. PRP Wheel Generated Dust, completed 15 August 2014
3. PRP Disturbing and Handling Overburden under Adverse Conditions, completed 15 August 2014
4. PRP Trial of Best Practice Measures for Disturbing and Handling Overburden completed 14 April 2014
5. PRP Coal Mine Wind Erosion of Exposed Land Assessment Completed 14 July 2015

Site specific reactive dust management strategies determined in the relevant PRP's (1, 2 & 3) have been integrated into site dust mitigation measures in table 6-1.

6.1.2 Dust mitigation measures

The primary measures that will be implemented to control and/or minimise dust emissions from activities at the BCM are summarised in Table 6-1.

Table 6-1: Air quality mitigation measures for operational activities

Activity/ risk	Air quality mitigation measures
Speed limits	- Speed limits are applied within the project boundary to minimise wheel generated dust. In areas with no speed signposted, the following limits apply: - mine infrastructure area unsealed roads – 40 km/h - around workshop, product stockpiles and park-up areas – 20 km/h.
Adverse conditions	- Undertake visual assessment of mining areas to identify dominant sources of air emissions and modify operations as required. - Use real-time data from TEOMs, meteorological station and forecasts to predict: - weather conditions - dust levels. - Review measured data to determine if operations are a significant contributor to recorded particulate matter levels.
Maintenance	Undertake regular maintenance on all mobile equipment to minimise air quality impacts.
Drilling	- Fit all drill rigs with dust suppression equipment. - Drill operators are to inspect the dust suppression system on drill rigs at the start of each shift to ensure it is fully operational before commencing work.

Activity/ risk	Air quality mitigation measures
	• Drill rig water tanks will be monitored and re-filled when required.
Blasting	• Stem blast holes to prevent venting explosion gases. • Design blasts to avoid venting of explosive force. • Postpone blasting during adverse meteorological conditions (i.e. wind speed > 7 m/s, low cloud cover, and during temperature inversions stability class G or higher). • Further detail and mitigation measures are provided in the BCOPL Blast Management Plan (including measures to minimise blast fumes and NO_x generation).
Disturbance	• Minimise the amount of ground disturbance where practicable. • Revegetate disturbed areas as soon as practical after disturbance. • Where required, undertake water cart dust suppression on unsealed roads and trafficable areas.
Haul road management	• Minimise overburden and ROM coal haulage distances through mine planning. • Maximise water cart efficiency through planning. • Track water cart utilisation and modify operations as required. • Assign high water cart priority to grader routes and freshly-graded haul roads. • Establish 1–2 m windrows where practicable on all haul roads and around ROM stockpiles to minimise the generation of wind-blown dust.
Loading/unloading ROM coal and overburden	• Avoid ripping softer overburden during periods of higher winds (i.e. > 7 m/s). • Minimise spillage from truck loading and unloading, and cleaning spills up as soon as practical. • Where required, minimise drop heights when loading/unloading coal and overburden. • Consider relocating dumping to areas that minimise the potential for dust during adverse weather conditions.
Topsoil stripping	• Where possible, use machinery that minimises the generation of dust during topsoil stripping. • Relocate/reschedule stripping, handling, and emplacement of topsoil during high winds.
Topsoil stockpiling	• Revegetate longer-term topsoil stockpiles to prevent wind-blown dust in accordance with the BCM Soil Management Protocol.
Rehabilitation	• Revegetate topsoiled areas as soon as practicable after spreading to minimise the generation of wind-blown dust. • Undertake rehabilitation of overburden dumps as soon as practicable.
Coal handling plant	• Use dust suppression on product coal stockpiles to minimise dust generation where required. • Use covers on ROM coal conveyors (i.e. dry coal) and bin enclosures on conveyor transfer points*. • Use sprinklers for dust suppression at the ROM bin. • Consider the use of choked feeds on all bins. • Consider increasing the rate of watering of the ROM bin and product stockpiles during visible dust emissions. • Maintain minimum drop heights from stackers to stockpiles. • Load trains with the loading chute at lowest practical position to minimise dust generation.

Activity/ risk	Air quality mitigation measures
	• Coal profiling during the loading process • Minimise and clean up spills during loading/unloading of coal. • Undertake regular inspections and maintenance of dust suppression equipment. • Where practical, maintain windrows and wind-barriers around ROM coal stockpiles to minimise wind-blown dust.

** Product coal conveyors (i.e. tripper style stackers) are uncovered allow stacking of coal on the product coal stockpile. Reject coal is sufficiently wet (i.e. 22% moisture) to minimise dust emissions from conveyors and transfer points.*

6.1.3 Risk response matrix

BCOPL will use real-time measurements from the TEOMs located at Tarrawonga, Wilberoi East, Goonbri and Velyama, and the portable real-time mobile air quality monitors² located at mine-owned properties or other properties near the mine, as shown in Figure A-1 in Appendix A, to respond to elevated dust levels or adverse meteorological conditions. These monitors provide BCOPL with the ability to initiate dust mitigation measures based on predetermined trigger levels.

Appendix C provides the risk response matrix implemented at BCM to manage the risk of dust emissions from mining activities. When the real-time TEOM or portable air-quality monitors record particulate matter levels over the 'investigate and prepare' trigger levels, or when adverse meteorological conditions are recorded, a 'dust investigation alert' will be issued and dust management measures will be considered. In the event that dust levels or meteorological conditions are recorded above the 'action trigger' in Appendix C, and it is determined that the elevated dust concentrations are a result of BCM operations, the dust action response measures will be considered by BCOPL and implemented where necessary. Dust preparation and action response measures include:

Preparation actions:

- Reviewing monitoring data to identify appropriate preparation responses.
- Investigating potential causes of elevated dust or areas that are most at risk of dust generation during adverse weather conditions.
- Observing whether appropriate levels of dust suppression are being applied.
- Preparing sites for actions to reduce dust emissions.
- Ensuring that dust suppression equipment on drill rigs is functional.
- Preparing for additional watering of product coal stockpiles and conveyor transfer points.
- Preparing for water cart reallocations to dust generating areas.
- Preparing to reschedule blasting activities during adverse meteorological conditions.
- Preparing to increase the use of water carts on haul roads, ROM stockpiles, and ancillary areas.
- Preparing to relocate trucks, dozers and graders away from high-risk dust areas.
- Planning for the rescheduling of topsoil stripping, handling and emplacement.

Response actions:

- Amending working hours or working locations during unfavourable dust dispersion conditions.
- Temporary rescheduling of work within an area that is identified as a likely contributor to dust emissions until acceptable controls are implemented. This includes rescheduling drilling, topsoil handling, overburden handling, coal handling, or blasting activities.
- Increasing spraying of water to managed dust on windrows, stockpiles, and batters.
- Modifying coal, topsoil, or overburden handling operations.
- Reallocating or supplying additional water carts to dusty areas.
- Should an unforeseen extraordinary external dust event occur, BCOPL will initiate responses in accordance with the risk response matrix, as described above. The specific response actions taken will be commensurate with the magnitude of impact, as identified through monitoring.

² BTM Complex Plan allows for the staged implementation of real-time air quality monitors to verify the number of samplers required to achieve the monitoring outcomes for BCM.

6.2 Offensive odours

Schedule 3, Condition 23 of Development Consent SSD 09_0182 states that BCOPL must ensure that no offensive odours are emitted from the BCM as defined under the POEO Act.

A potential source of odour from the BCM is from the spontaneous combustion of coal, and NO_x from blast fumes. BCOPL will minimise the potential for NO_x emissions by implementing the control measures in the Blast Management Plan. If material prone to spontaneous combustion is identified, any odours resulting from spontaneous combustion events will be managed as outlined in the *BCOPL Spontaneous Combustion Management Plan* (BCOPL 2020b).

7.0 GREENHOUSE GAS MANAGEMENT

Idemitsu Australia recognises the role it must play in helping the world reach its decarbonisation goals, and the role it plays in Idemitsu Kosan's medium-term plan which aims to reduce the groups CO₂ emissions by 46% (7.3 million tonnes) by the year 2030.

Australia has committed to cutting emissions by 43% from 2005 levels by 2030 and is in turn requiring a yearly scope 1 emissions reductions on all safeguard mechanism facilities. IA recognises its operations in the extractive industry must reduce impacts on the environment. This is why IA plans to go beyond simply meeting regulatory obligations and will be a driver in the development of sustainable operations.

The IA decarbonisation roadmap documents our commitment to contributing to Idemitsu Kosan Groups emissions reductions targets through its operations in Australia. This roadmap includes meeting targets of Net zero by 2050, and annual scope 1 reductions of 4.95% through a combination of abatement and offsetting.

GHG emissions from the BCM are principally associated with diesel combustion and the consumption of purchased electricity. Measures and practices designed to improve energy efficiency will assist with the management of the BCM's GHG emissions. The following management practices have been implemented by BCM to minimise emissions from the combustion of diesel and electricity consumption during the life of the mine:

General Management:

- Procurement and use of equipment incorporating best-practice emissions reduction technologies (e.g. high efficiency motors).
- Pre-start inspections at each shift on mobile plant and vehicles.
- Maintaining equipment in good operating order (e.g. routine servicing).
- Minimise engine idle time.
- Optimise the design of roads to minimise the distance travelled by construction equipment. Tracking electricity bills and fuel usage.
- Install energy-efficient electrical equipment where possible (e.g. lighting).

Improvements and Innovation:

- BCOPL has implemented tracking site-wide fuel consumption metrics including:
 - >98% fuel accountability.
 - Fuel burn per base cubic meter of material moved.
 - Fuel burn of 930E fleet.
 - Hydrogen injection trials to reduce consumption and emissions.
- Construction of a solar farm in proximity to the BCM. The solar farm began construction in 2024 and aims to provide enough energy to support all BCM's daytime operations. This initiative will result in a significant decrease in BCM's electricity consumption from the grid. Extensive revegetation works in the biodiversity offset and mine rehabilitation areas including a significant native vegetation corridor. This will create a future carbon sink.

In addition to the general measures listed above, BCOPL held workshops in 2022 to consider the short and mid-term strategies to further minimise GHG emissions. The following have been implemented:

Short term (2022-2025):

- reviewing fuel efficiencies in production;
- reviewing available technologies to reduce electricity consumption;
- encouraging staff to car-pool to and from work;
- developing a business carbon management policy and roadmap that will form part of the IAR decarbonisation strategy;
- assessing the feasibility of utilising biodiesel for mining fleet; and
- assessing the feasibility of carbon farming.

Medium term (2025+) initiatives identified during the workshop include:

- commissioning of detailed studies for alternative renewable energy supplies;
- assessing opportunities for variable speed drive units;
- assessing opportunities for diesel alternatives; and
- assessing the establishment of a carbon farming project.

8.0 MONITORING

8.1 Air quality monitoring

8.1.1 Overview

BCOLP operates a monitoring network in accordance with Schedule 3, Condition 31 of Development Consent SSD 09_0182. The BCM monitoring network does:

- use a combination of real-time and supplementary monitors.
- support proactive and reactive air quality management.
- include PM_{2.5} monitoring.
- include a trigger response/reactive management protocol incorporating real-time PM₁₀ monitoring data and on-site meteorological data.
- include monitoring of occupied project-related and private residences, subject to tenant agreement.
- evaluate and report on the effectiveness of the air quality management system; and
- include a protocol for determining exceedances of conditions of Development Consent SSD 09_0182.

BCOPL maintains an air quality monitoring network that includes a combination of compliance and supplementary air quality monitors in line with Development Consent SSD 09_0182. The compliance monitors are listed in BCM's environment protection licence (EPL 12407) and are used to assess compliance with the air quality criteria outlined in Section 3.0.

The current air quality monitoring network includes:

- five meteorological stations;
- two HVASSs;
- four TEOMs;
- three dust deposition gauges; and
- four portable real-time PM₁₀ monitors (e-samplers).

Details of BCM's monitoring network are provided in Table 8-1. A figure showing the location of each air quality monitoring site is provided in Appendix A. The air quality monitoring methods applied by BCOPL are listed in Appendix D.

Table 8-1: Air quality monitoring sites

Site ID	EPL ID	To be used for compliance monitoring?	Type	Units	Frequency	Method ^a
D4	24	Yes	Deposited dust	g/m ² /month	Monthly	AM-19
D5	25	Yes	Deposited dust	g/m ² /month	Monthly	AM-19
D6	26	Yes	Deposited dust	g/m ² /month	Monthly	AM-19
Glenhope	45	Yes	HVAS (PM ₁₀)	µg/m ³	Every 6 days	AM-18
Merriown	N/A	No ^b	HVAS (PM ₁₀)	µg/m ³	Every 6 days	AM-18
Wilberoi East	N/A	Yes	TEOM (PM ₁₀ & PM _{2.5})	µg/m ³	Continuous	AM-22
Tarrawonga	N/A	No	TEOM (PM ₁₀)	µg/m ³	Continuous	AM-22
Velyama	N/A	No	TEOM (PM ₁₀)	µg/m ³	Continuous	AM-22
Goonbri	25	No	TEOM (PM ₁₀)	µg/m ³	Continuous	AM-22
BTM Complex portable samplers (x4)	N/A	No	E-samplers (PM ₁₀)	µg/m ³	Continuous	AM-22

Note: N/A not nominated in EPL12407.

8.1.2 Real-time monitoring

BCOPL manages a real-time monitoring system at the BCM. The Wilberoi East, Tarrawonga, Velyama, and Goonbri TEOMs and meteorological station (MET) provide monitoring data to an internal website (<http://console.teledata.com.au>) in real-time. Nominated BCOPL employees and contractors are provided with a login to the website, allowing them to investigate dust levels and meteorological conditions and respond as outlined in the risk response matrix provided in Appendix C.

The real-time monitoring system sends automated text message(s) (SMS) notifying nominated employees and contractors when particulate matter levels or adverse meteorological conditions are recorded above the trigger levels specified in the risk response matrix. Once notified, the response measures in the matrix will be implemented.

8.1.3 BTM Complex monitoring network

The BTM Complex monitoring network includes monitoring stations from all three mines within the BTM Complex (Boggabri, Tarrawonga, and Maules Creek).

In addition to the BCOPL managed monitoring sites listed in Table 8-1, BCOPL will also use data from the BTM Complex air quality monitoring network to monitor compliance and assist with on-site dust management. Details of the BTM Complex air quality monitoring network are provided in the *BTM Complex Air Quality Management Strategy*, developed jointly between BCOPL, Maules Creek Coal Pty Ltd, and Tarrawonga Coal Pty Ltd (Parsons Brinkerhoff, 2017).

BCM and the BTM complex use an air quality and dispersion forecast model to provide up-to-date information on meteorological conditions and expected dust emissions in the vicinity of the mine. The forecast model uses WRF/CALMET/CALPUFF modelling systems, a standard widely used for assessing long range transport of pollutants. The forecast includes temperature, wind direction, precipitation, relative humidity, rainfall, and lightning. A general seven-day and a predictive 48hr meteorological forecast is accessed daily by certain BCM personnel to assist in planning upcoming blasting and production operations.

8.2 Meteorological monitoring

Schedule 3, Condition 32 of Development Consent SSD 09_0182 requires that BCOPL operates a meteorological station in the vicinity of the BCM that complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* (EPA 2022a, b).

BCOPL operates an AWS at BCM known as 'MET'. The MET AWS is used for compliance monitoring and records temperature, wind speed, wind direction, rainfall, sigma-theta, and solar radiation data in 15-minute increments.

The parameters recorded by the MET AWS and the method by which they must be sampled in accordance with BCM's EPL, are outlined in Table 8-2.

Table 8-2: Meteorological monitoring requirements

Parameter	Units	Frequency	Averaging Period	Method
Temperature at 2 m	°C	Continuous	15 minute	AM-4
Temperature at 10 m	°C	Continuous	15 minute	AM-4
Wind direction at 10 m	°	Continuous	15 minute	AM-2 & AM-4
Wind speed at 10 m	m/s	Continuous	15 minute	AM-2 & AM-4
Sigma theta at 10 m	°	Continuous	15 minute	AM-2 & AM-4
Rainfall	Mm	Continuous	1 hour	AM-4
Solar radiation	W/m ²	Continuous	15 minute	AM-4
Additional requirements: - Siting & Measurement	N/a	N/a	N/a	AM-1 & AM-2 AM-2 and AM-4

The MET AWS provides real-time meteorological data to BCOPL employees and contractors that is used:

- for assessing compliance;
- to guide the management of dust generating activities in line with BCM's risk response matrix (see Appendix C); and
- to address reporting requirements.

9.0 INCIDENTS, NON-COMPLIANCE, AND COMPLAINT MANAGEMENT

9.1 Incident identification and notification

Development Consent SSD 09_0182 defines an 'incident' as a set of circumstances that:

- Causes or threatens to cause material harm to the environment.
- Breaches or exceeds the limits or performance measures/criteria in this approval.

Air quality incidents at BCM are defined in terms of exceedances of particulate matter criteria. Exceedances of the criteria will be identified using the existing air quality monitoring network (see Section 8.1) and the criteria listed in Section 3.1.

An investigation of the exceedance will be completed using information relevant to the time of the exceedance such as BCM operations and meteorological conditions. This will be used to determine whether the exceedance was the result of the BCM or not. Where BCM is found to have contributed to the exceedance, an upwind/downwind analysis will be performed to calculate the levels of contribution. In more complex cases, an independent expert will be engaged to investigate the exceedance.

As stated in Section 6.1.3, a risk response matrix will be used in conjunction with the monitoring program to identify exceedances of the air quality criteria and to allow the appropriate site personnel to respond with additional management and mitigation measures.

In line with Schedule 14, Condition 14 of Development Consent SSD 09_0182, BCOPL will immediately notify the Department of Planning, Housing and Infrastructure (DPHI) and any other relevant agencies after it becomes aware of an incident. The notification must be in writing via DPHI's Major Projects Website and must identify the development (including the application number and name) and set out the location and nature of the incident.

9.2 Adaptive management

In accordance with Schedule 5, Condition 2 of Development Consent SSD 09_0182, where an exceedance of criteria and/or performance measure(s) has occurred, BCOPL will, at the earliest opportunity:

- take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- consider all reasonable and feasible options for remediation (where relevant) and submit a report to the DPHI describing those options and any preferred remediation measures or other courses of action; and
- implement remediation measures as directed by the DPHI.

9.3 Non-compliance notifications

A non-compliance occurs where BCOPL has not complied with the statutory requirements of which BCM falls under (e.g. any requirements related to air quality as specified in Development Consent SSD 09_0182).

In accordance with Schedule 5, Condition 14 of the Development Consent SSD 09_0182, within seven days of becoming aware of a non-compliance, BCOPL will notify DPHI of the non-compliance. The notification will be in writing via DPHI's Major Projects Website and will:

- identify the development (including the application number and name);
- set out the condition of Development Consent SSD 09_0182 that the development is non-compliant with;
- state why it does not comply and give the reasons for the non-compliance (if known); and
- detail what actions have been, or will be, undertaken to address the non-compliance.

As noted in Development Consent SSD 09_0182, a non-conformance which has been notified as an incident will not also be notified as a non-conformance.

9.4 Complaints

A complaints management system is currently in place and is managed by BCOPL. BCOPL maintains a Community Complaints Line and online contact via the BCM website for the purpose of receiving community complaints, or enquiries.

Investigations into complaints will generally commence within 24 hours of receipt, or as soon as practical. The cause of the complaint will be analysed and actions to attempt to address the complaint taken as soon as reasonably possible. In complex cases where resolution will take more than 48 hours, BCOPL will commit to updating the community member.

A summary of complaints for each operational year is available on the Idemitsu website³. The summaries detail the date of the complaint, details of the complaint, and actions taken by BCOPL to investigate the matter. BCOPL will continue to maintain the complaints log which will be updated monthly in accordance with Schedule 5, Condition 12, of Development Consent SSD 09_0182.

³ <https://www.idemitsu.com.au/mining/operations/boggabri-coal/approvals-plans-reports/>

10.0 ROLES AND RESPONSIBILITIES

The roles and responsibilities for implementation of this AQGHGMP are presented in Table 10-1.

Table 10-1: Roles and responsibilities

Role	Responsibility
BCOPL	- Implement air quality mitigation measures in accordance with this plan. - Develop and implement specific procedures for BCOPL employees and contractors under their responsibility to facilitate compliance with this management plan. - Employees and contractors under their control are to be aware of their obligations under this management plan.
BCOPL General Manager Operations	- Provide sufficient environmental resources for effective implementation of this management plan. - If required, negotiate with affected parties to resolve ongoing complaints.
BCOPL Operations Manager	Mining and air quality mitigation measures are to be undertaken in accordance with this plan.
BCOPL Health, Safety, Environment, Community and Training (HSECT) Manager	- Provide sufficient environmental resources for effective implementation of this management plan. - Mining and air quality mitigation measures are to be undertaken in accordance with this management plan.
BCOPL CHPP Manager	Mining and air quality mitigation measures are to be undertaken in accordance with this plan.
BCOPL Environment Superintendent	- All air quality monitoring is to be undertaken according to the requirements of this management plan and relevant Australian standards. - Respond to community complaints. - Liaise with regulatory authorities regarding air quality and greenhouse gas management. - Schedule additional air quality monitoring at the site of a sensitive receptor if required, in accordance this management plan. - Exceedances are reported to the relevant regulatory authority in accordance this management plan. - Coordinate the site's real-time air quality and meteorological monitoring system. - Coordinate reviews of this management plan. - Make employees and contractors aware of their obligations under this management plan.
All BCOPL employees and contractors	- Undertake activities, as required, in accordance with this management plan under instruction from their supervisor. - Inform their Supervisor or the BCOPL Environment Superintendent of any air quality related issues as they arise.

11.0 REPORTING AND AUDITING

The air quality and greenhouse gas reporting requirements for the BCM are outlined in the following subsections.

11.1 Annual Review

As per the requirements of Schedule 5, Condition 4 of Development Consent SSD 09_0182, by the end of March each year, BCOPL must review the environmental performance of the BCM for the previous calendar year to the satisfaction of the Secretary. The review must:

- describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year;
- include a comprehensive review of the monitoring results and complaints records of the BCM over the past year, which includes a comparison of these results against the:
 - relevant statutory requirements, limits or performance measures/criteria;
 - monitoring results of previous years;
 - relevant predictions in the EA (Environmental Assessment);
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the BCM;
- identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the BCM.

11.2 NPI reporting

At the end of each financial year BCOPL reports on the emissions of certain substances to the National Pollutant Inventory (NPI). GHG emissions, energy consumption and productions data are also reported under the National Greenhouse and Energy Reporting scheme (NGERs).

11.3 Real-time monitoring reports

In accordance with Schedule 5, Condition 13 of Development Consent SSD 09_0182, BCOPL must ensure that the air quality risk response matrix and real-time monitoring data are available online and includes:

- timely publication of validated monitoring data in a clearly understandable form;
- identification of mine operational responses to monitoring data and weather forecasts; and
- provision for online input/response by members of the community and real-time engagement with regionally based regulatory compliance staff.

BCOPL currently publishes this information on its website at:

<https://www.idemitsu.com.au/mining/operations/boggabri-coal/operational-information-and-monitoring/BCOPL>

Preliminary (i.e. not validated) data is made available daily for viewing via the BCOPL website, as is undertaken by other mines in the BTM Complex. Validated data is provided on the BCOPL website for viewing monthly. Monthly real-time monitoring reports are made available within two weeks of the previous month's monitoring data being received by BCOPL.

11.4 Briefings to CCC

During meetings with CCC, members will be briefed on relevant issues arising from air quality monitoring and be provided with a summary of any air quality reports.

Independent auditing

From the end of June 2014 and every 3 years thereafter, unless the secretary directs otherwise, BCM will commission and pay the full cost of environmental audit of Boggabri Coal Mine. In accordance with Schedule 5, Condition 10 of SSD 09_0182 this audit must:

- Be conducted by a suitably qualified, experienced, and independent team of experts whose appointment has been endorsed by the Secretary.
- Include consultation with relevant agencies.
- assess the environmental performance of the project and assess whether it is complying with the requirements in this approval, and any other relevant approvals, relevant EPL/s and/or Mining Lease (including any assessment, plan or program required under these approvals)
- assess whether the Proponent is implementing best noise, blasting and air quality management practice;
- investigate and report on the measures taken to minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply, including:
 - the effectiveness of these measures in maintaining noise impacts within the relevant noise criteria in this approval and/or the limits in the relevant EPL; and
 - any additional measures available to mitigate noise impacts under such meteorological conditions
- investigate and report on the measures taken to minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events, including:
 - the effectiveness of these measures in maintaining air quality impacts within the criteria set out in section 3 of this plan
 - any additional measures available to mitigate air quality impacts under such conditions;
- review the adequacy of any approved strategy, plan or program required under the abovementioned approvals; and
- recommend measures or actions to improve the environmental performance of the project and/or any strategy, plan or program required under these approvals.

12 REVIEW

This AQGHGMP has been revised over time to reflect the input of stakeholder consultation and changes in consent conditions. A record of stakeholder consultation and the key updates made to this AQGHGMP are presented in Appendix E.

Review of the AQGHGMP will be undertaken by BCOPL in accordance with Schedule 5, Condition 5 of Development Consent SSD 09_0182, within 3 months of submitting the following:

- the Annual Review under Schedule 5, Condition 4 of Development Consent SSD 09_0182;
- incident report under Schedule 5, Condition 8 of Development Consent SSD 09_0182;
- independent audit under Schedule 5, Condition 10 of Development Consent SSD 09_0182;
- any relevant modification to Development Consent SSD 09_0182.

Where this review results in revisions to any of the above documents, then within 4 weeks of the completion of the revision, unless the Secretary agrees otherwise, the revised document will be submitted to the Secretary for approval.

Review of this AQGHGMP will also take place if air quality monitoring results indicate that it is warranted or in the event of any significant change to air quality management procedures at BCM.

12.0 REFERENCES

12.1 Internal

- BCOPL (2024) *Blast Management*. Prepared by EMM Consulting for Boggabri Coal Pty Ltd, March 2024.
- BCOPL (2020a). *Boggabri Coal Mine 2019 Annual Review*. Prepared by Boggabri Coal Pty Ltd, March 2020.
- BCOPL (2020b). *Spontaneous Combustion Management Plan*. Boggabri Coal Pty Ltd, September 2020.
- BCPOL (2021). *Boggabri Coal Mine 2020 Annual Review*. Prepared by Boggabri Coal Pty Ltd, August 2021.

12.2 External

- Airen Consulting (2022). *Boggabri Coal Mine Modification 8 Amendment – Air quality and greenhouse gas assessment*. Prepared by Airen Consulting for James Bailey & Associates on behalf of Boggabri Coal Operations Pty Ltd, October 2022.
- Australian Standard 3580.1414. Ambient Air - Guide for Measurement of Horizontal Wind for Air Quality Applications.
- Australian Standard AS/NZS 3580.9.6:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Suspended Particulate Matter – PM₁₀ High Volume Sampler with Size Selective Inlet – Gravimetric Method.
- Australian Standard AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.
- Australian Standard AS/NZS 3580.1.11. Ambient Air-Guide for Siting of Sampling Units.
- Australian Standard 2924.1-1984 Ambient Air - Particulate Matter Part 1 - Determination of Deposited Matter Expressed as Insoluble Solids, Ash, Combustible Matter, Soluble Solids and Total Solid.
- EPA (2022a). *Approved methods for the sampling and analysis of air pollutants in NSW*. Prepared by the NSW EPA, January 2022.
- EPA (2022b). *Ambient air monitoring guidance note*. Prepared by the NSW EPA, January 2022.
- Parsons Brinkerhoff (2017). *Air Quality Management Strategy for Boggabri – Tarrawonga – Maules Creek Complex*. Prepared by Parsons Brinkerhoff for Idemitsu Australia Resources and Whitehaven Coal Limited, May 2017.
- POEO (2010). Protection of the Environment Operations (Clean Air) Regulation 2010 (as amended).

13.0 ABBREVIATIONS

Abbreviation	Definition
AQGHGMP	Air quality and greenhouse gas management plan
AQIA	Air quality impact assessment
BCM	Boggabri Coal Mine
BCOPL	Boggabri Coal Operations Pty Ltd
BTM	Boggabri, Tarrawonga, Maules Creek
CCC	Community Consultative Committee
CHPP	Coal Handling and Preparation Plant, including By-pass crusher
CO	Carbon monoxide
CO ₂	Carbon dioxide
CO ₂ -e	Carbon dioxide equivalent
DA	Development Application
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPE	Former Department of Planning and Environment (now Department of Planning Housing and Infrastructure (DPHI))
DPHI	Department of Planning Housing and Infrastructure
EA	Environmental Assessment
EPA	Environmental Protection Authority
EP&A Act	Environmental Planning and Assessment Act, 1979
EPL	Environment Protection Licence
GHG	Greenhouse gas
HVAS	High-volume air samplers
IA	Idemitsu Australia Pty Ltd
Km	Kilometre
MOD8	Modification 8
Mt	Million Tonnes
Mtpa	Million Tonnes Per Annum
NSW	New South Wales

Abbreviation	Definition
NO _x	oxides of nitrogen
NO ₂	Nitrogen dioxide
PAC	Former NSW Planning and Assessment Commission
PM ₁₀	Particulate matter with equivalent aerodynamic diameter of 10 micrometres or less
PM _{2.5}	Particulate matter with equivalent aerodynamic diameter of 2.5 micrometres or less
POEO Act	Protection of the Environment (Operations) Act, 1997
ROM	Run of Mine
SCMP	Spontaneous Combustion Management Plan
SO ₂	Sulphur dioxide
SSD	State Significant Development
t	Tonne
TARP	Trigger Action Response Plan
TCPL	Tarrawonga Coal Pty Limited
TEOM	Tapered element oscillating microbalance
TSP	Total suspended particulates

Appendix A

Air quality monitoring network

Appendix B

Property acquisition requirements

B.1 Property acquisition

If particulate matter emissions generated by BCM exceed or contribute to an exceedance of the cumulative criteria, in Table 3-3 and Table 3-4 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, then upon receiving a written request for acquisition from the landowner BCOP must acquire the land in accordance with the procedures in Development Consent SSD 09_0182, Schedule 4, Conditions 8 and 9 as listed below.

B.1.1 SSD 09_0182 Schedule 4, Condition 8

Within 3 months of receiving a written request from a landowner with acquisition rights, the proponent must make a binding written offer to the landowner based on:

(a) the current market value of the landowner/s interest in the land at the date of this written request, as if the land was unaffected by the development, having regard to the:

- existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
- presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner/s written request, and is due to be completed subsequent to that date, but excluding any improvements that have resulted from the implementation of the additional mitigation measures required under conditions 3 and 26 of schedule 3;

(b) the reasonable costs associated with:

- relocating within the Tamworth, Narrabri, Gunnedah or Moree local government area, or to any other local government area determined by the Secretary; and
- obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is to be acquired; and

(c) reasonable compensation for any disturbance caused by the land acquisition process.

However, if at the end of this period, the Proponent and landowner cannot agree on the acquisition price of the land and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Secretary for resolution.

Upon receiving such a request, the Secretary must request the President of the NSW Division of the Australian Property institute to appoint a qualified independent valuer to:

- consider submissions from both parties;
- determine a fair and reasonable acquisition price for the land and/or the terms upon which the land is to be acquired, having regard to the matters referred to in paragraphs (a)-(c) above;
- prepare a detailed report setting out the reasons for any determination; and
- provide a copy of the report to both parties.

Within 14 days of receiving the independent value/s report, the Proponent must make a binding written offer to the landowner to purchase the land at a price not less than the independent value/s determination.

However, if either party disputes the independent valuer's determination, then within 14 days of receiving the independent value/s report, they may refer the matter to the Secretary for review. Any request for a review must be accompanied by a detailed report setting out the reasons why the party disputes the independent value/s determination. Following consultation with the independent valuer and both parties, the Secretary will determine a fair and reasonable acquisition price for the land, having regard to the matters referred to in paragraphs (a)-(c) above, the independent value/s report, the detailed report of the party that disputes the independent value/s determination and any other relevant submissions.

Within 14 days of this determination, the Proponent must make a binding written offer to the landowner to purchase the land at a price not less than the Secretary's determination.

If the landowner refuses to accept the Proponent's binding written offer under this condition within 6 months of the offer being made, then the Proponent's obligations to acquire the land must cease, unless the Secretary determines otherwise.

B.1.2 SSD 09_0182 Schedule 4, Condition 9

The Proponent must pay all reasonable costs associated with the land acquisition process described in condition 6 above, including the costs associated with obtaining Council approval for any plan of subdivision (where permissible), and registration of this plan at the Office of the Registrar-General.

Appendix C

Risk Response Matrix

Dust risk level			
	Level 0 – normal operating conditions	Level 1 – investigate & prepare	Level 2 – action required
Trigger	Alarm generated notifying conditions reverted to below trigger levels in 'Investigate' or 'Action' alarms.	- Six continuous (5 min readings) PM₁₀ concentration above 100 µg/m³ over 30 minutes; OR - Two continuous 1-hour average PM₁₀ concentrations above 50 µg/m³; OR - Six continuous average 5 min wind speeds of between 6 m/sec to 7 m/sec (i.e. 20 to 25 km/hr); OR - Three consecutive measurements Inversion equal to Class G (7).	- Six continuous (5 min readings) PM₁₀ concentration above 150 µg/m³ over 30 minutes; OR - Four continuous 1-hour average PM₁₀ concentrations above 50 µg/m³; OR - Six continuous average 5 min wind speeds > 7 m/sec (i.e. > 25 km/hr).
Dust alert level	<i>'Normal operating dust controls' alert by SMS or email to supervisors.</i>	<i>'Investigation' dust alert level received via SMS or email to supervisors.</i>	<i>'Action' dust alert level received via SMS or email to supervisors.</i>

Actions			
	Normal operating controls	Investigation responses	Action responses, <i>implement until 'dust risk level' reduced</i>
Visual inspections	- Routine visual dust inspections of BCM activities and not any off-site dust emissions sources. - Undertake routine inspections to identify the dust sources requiring dust controls	- Conduct visual inspections to identify BCM dust generating activities and note any off-site dust emission sources. - Record inspection and consider below response measures.	- Conduct visual inspections to identify BCM dust generating activities and note any off-site dust emissions sources. - Record inspection and consider below response measures.

Actions			
	Normal operating controls	Investigation responses	Action responses, <i>implement until 'dust risk level' reduced</i>
General operations		- Review dust monitoring and meteorological conditions to identify appropriate preparation responses. - Investigate potential causes of elevated dust, or areas that are most at risk of dust generation during adverse weather conditions. - Prepare sites for actions to reduce dust emissions.	- Review dust monitoring and meteorological conditions to identify appropriate actions. - Consider amended working hours working locations during unfavourable dust dispersion conditions. - Consider changing, altering or modifying operations. - Consider temporary rescheduling of work within an area that is identified as a likely contributor to dust emissions until acceptable controls are implemented.
Drilling (production & exploration)	- Fit all drill rigs with dust suppression equipment. - Drill operators inspect the dust suppression system on the drill rigs at the start of each shift to ensure it is fully operational before commencing work. - Refill drill rig water tanks when required	- Dust suppression equipment on drill rigs is to be functional. - Prepare for water truck to relocate to the drill bench.	- Review all drilling outside of pit (exploration) and stop works if they are generating dust. - Review drilling operations in the pit. Cease drilling activities if they are tributing to the poor air quality conditions. If drilling operations are ceased, start up in a staged approach when dust control is reached. - Consider implementing temporary rescheduling of dust generating activities until acceptable controls are put in place.
Blasting	Undertake blasting as per the measures in the BCOPL Blast Management Plan.	Prepare to rescheduling blasting works, including postponement during adverse meteorological conditions.	Cease all blast activity until acceptable controls are implemented.

Actions			
	Normal operating controls	Investigation responses	Action responses, <i>implement until 'dust risk level' reduced</i>
Disturbance & overburden handling	- Minimise the amount of ground disturbance where practicable. - Revegetate disturbed areas as soon as practical after disturbance. - Where required undertake water cart dust suppression on unsealed roads and trafficable areas.	- Observe whether appropriate level dust suppression is being applied. - Prepare to increase the use of water carts to suppress dust operating on haul roads and ancillary roads. - Plan for relocation of overburden dumping away from exposed areas. - Prepare to relocate dozers and graders.	- Consider increasing spraying of water to manage dust on windrows, fill stockpiles and batters. - Change or alter overburden handling operations. - Review dozer and grading operations. Consider temporarily rescheduling of this activity or cease dozer and grader activities if they are contributing to the poor air quality conditions. Restart activity once control has been reached.
Haul road management	- Minimise overburden and ROM coal haulage distances through mine planning. - Maximise water cart efficiency through planning. - Track water cart utilisation and modify operations as required.	- Observe if an appropriate level of dust suppression is being applied to all utilised unsealed roads and trafficable areas. - Prepare to increase utilisation of water carts for dust suppression activities.	- Review the conditions of the haul roads and consider suspending all non-critical ancillary vehicle access to the pit. - Drive to road conditions to minimise dust & close ancillary roads. - Consider allocated water carts and/or increase the rate of water applied to unsealed roads and trafficable areas. - Consider ceasing non-essential grader and dozer operations.
Topsoil stripping	Where possible, use machinery that minimises the generation of dust during topsoil stripping.	Plan for rescheduling of topsoil stripping, handling and emplacement.	Consider ceasing topsoil stripping, handling and emplacement until acceptable weather conditions.
Rom coal stockpiles	Where possible provide for dust suppression by water cart on ROM coal stockpiles haulage routes.	Plan for additional water carts to suppress dust ROM stockpile haulage routes.	Consider additional water carts to suppress dust on ROM stockpile haulage routes.

Actions			
	Normal operating controls	Investigation responses	Action responses, <i>implement until 'dust risk level' reduced</i>
Product coal handling	- Maintain minimum drop heights from stackers to stockpiles. - Aim to load trains with the loading chute at lowest practical position to minimise dust generation. - Minimise and clean up spills during loading/unloading of coal. - Use sprinklers at ROM bins for dust suppression.	Prepare for additional watering of product coal stockpile and conveyor transfer points.	Consider additional watering of product coal stockpile and conveyor transfer points.

Appendix D

Approved methods for air quality monitoring

The relevant NSW EPA approved methods for air quality monitoring at BCM, as detailed in the 'Ambient air monitoring guidance note' (EPA, 2022) are presented in Table D-1.

Table D-1: Relevant approved air quality monitoring methods

Method no.	Parameter measured	Method
AM-1	Guide for the siting of sampling units	AS/NZS 3580.1.1
AM-2	Guide for the measurement of horizontal wind for air quality applications	AS 3580.14
AM-3	Preparation of reference test atmospheres	AS3580.2.1 or AS 3580.2.2 (as appropriate)
AM-4	Meteorological monitoring guidance for regulatory modelling applications	USEPA EPA 454/R-99-005
AM-18	Particulate matter – PM₁₀ – high volume air sampler with size selective inlet	AS 3580.96
AM-19	Particulates – deposited matter – gravimetric method	AS/NZA 3580.11.1
AM-22	Particulate matter – PM₁₀ – TEOM	AS 3580.9.8

Appendix E

Record of stakeholder consultation

Table E-1: Record of consultation specific to BCM AQHGMP

Consultation	Date	Details	Response
Boggabri Coal CCC Meeting April 2013	30.04.2013	The AQMS was presented to the CCC for comment.	The AQMS presentation was received by the CCC. General comments regarding air quality were considered in the revision of the AQMS. CCC members were invited to review the document and provide further input if desired. No further comment was received.
Air Quality and Greenhouse Gas Management Plan for Boggabri Coal Mine sent to EPA for comment	28.01.2014	The management plan contains details of the proposed AQMS for the BTM Complex	The EPA received the management plan and responded on 12.02.2014 that “the Environment Protection Authority (EPA) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives.
Air Quality and Greenhouse Gas Management Plan for Boggabri Coal Mine sent to DPE for comment	19.5.2014	The management plan contains details of the proposed AQMS for the BTM Complex	- DPE provided comments on the management plan on 5.08.2014, including: - Some government agency names need to be updated. - Some sensitive receivers have changed ownership. - Clarification of data to be received from mobile monitoring units. - Comments relating to the risk response procedures. - Comments relating to monitoring sites. - Comments relating to publication of data and notification of incidents.
Air Quality and Greenhouse Gas Management Plan sent to CCC and EPA for comment	29.04.2015	Revised dust triggers levels and control measures. Updated dust monitoring locations. Revision throughout document to wording for consistency with SSD 09_0182 conditions.	- Comments related to: - Trigger Action Response Plan (TARP) - Weather forecasting - Real-time monitoring
Air Quality and Greenhouse Gas Management Plan sent to CCC and EPA for comment	July 2016	Revised dust triggers levels and control measures. Updated dust monitoring locations. Revision throughout document to wording for consistency with SSD 09_0182 conditions.	

Consultation	Date	Details	Response
Air Quality and Greenhouse Gas Management Plan lodged with DPE for review and approval	October 2017	Updated mitigation measures, monitoring.	Minor review comments received from DPE. The Plan was updated to address comments and re-issued for approval in July 2018.

Table E-2: Summary of key changes for AQGHGMP Rev 7

Page/Section	Description of change	Justification or description
Table 5-3	Changed Project Approval to SSD 09_0182.	All responsibilities fall to Boggabri Coal as the mine owner and operator.
Table 6-1	Changed the DPE and Department of Planning and Environment to DPIE.	Roma HVAS monitor was moved to Glenhope property and was changed in a variation to EPL 12407 (Feb 2021). Velyama and Goonbri TEOMs were not listed previously and are a part of the monitoring network which allows BCOPL to respond to elevated dust levels or adverse meteorological conditions.
Section 6.1.1	Removed responsibility for implementation.	Information from the previous revision of the AQGHGMP was out of date. Since this revision a new contractor has taken over the monitoring network.
Appendix D	Updated the table with Site IDs, EPL IDs and added two TEOMs used for management purposes.	To make clear the administrative changes that have occurred in this revision.

Table E-3: Summary of key changes for AQGHGMP Rev 8

Page/Section	Description of change	Justification or description
Whole Document	Changed the DPIE and department of planning, industry and environment to DPHI and department of planning, housing and industry.	
Table 12.1	Updated monitoring methods as per the updated 'Approved methods- EPA 2022'. This included a separated-out section for ambient air monitoring.	

Page/Section	Description of change	Justification or description
Section 3	Updated air quality criteria requirements including the removal of TSP from Tables 3.1 and Table 3.3. and the inclusion of PM _{2.5} criteria in Table 3.1, Table 3.2 and Table 3.4. Removal of dust deposition criteria (Table 3.5).	As adjusted in updated consent conditions.
Section 3.3 and Section 5	Section 'Predicted impacts on sensitive receptors' reworked to include updated dispersion modelling results and removal of receptor specific conditions.	
Table 4.1	Sensitive receptor locations were updated to match most recent AQIA (Airen 2022).	
Section 4.3	Updated baseline data for meteorology and addition of air quality baseline data for BCM.	
Section 6.1 and 7.0	Air quality management measures and greenhouse gas management measures separated into standalone sections. Section 7.0 was added to include greenhouse gas management measure.	
Table 7.2	Addition of wind speed monitoring details.	To remain consistent with EPL requirements.
Section 9	Updated section to include Schedule 5, Conditions 14 and 15 of the SSD 09_0182	To include additional conditions regarding 'Incident Notification' and 'Non-compliance Notification' requirements added to the SSD 09_0182 Development consent updated in 2023 following the approval of MOD9.
Appendix A	Figure updated.	Some monitoring locations had been modified since previous revision.