



Air Quality and Greenhouse Gas Management Plan

Executive Summary

This Air Quality and Greenhouse Gas Management Plan (AQGHGMP) has been developed to address air quality related requirements of **SSD 7142** and **Environment Protection Licence (EPL) 3141** as relevant to open cut mining operations associated with the United Wambo Open Cut Coal Mine Project (United Wambo).

The key management and mitigation measures contained within the AQGHGMP are included in **Table ES-1-1**.

Table ES-1-1: Air Quality and Greenhouse Gas Management and Mitigation Measures

No.	Mitigation/Management Measure	Section	Timing
1	United Wambo has been designed to minimise air quality impacts with a range of mitigation and management measures incorporated into the Mine design. These measures are included in Section 11.1.1 .	11.1.1	Ongoing
2	Control and mitigation measures to be implemented by United Wambo are detailed in Table 11-1 and Table 11-3 .	11.1.1.1 11.4	As per Table 11-1 and Table 11-3
3	United Wambo will utilise a daily weather and dust risk forecasting tool to predict the likelihood of adverse conditions for dust generation and assist operational dust management. A daily report showing forecast weather conditions and predicted dust risk will be emailed to mining supervisors, control room operators and environment and community personnel generally before 7:00 am.	11.1.2.1	Daily
4	Mining supervisors are to review the daily forecast report prior to the prestart shift meeting and discussed with the oncoming crew during the preshift meeting, including any contingency measures to be employed during the course of the shift. Further review of dust risk, weather conditions and performance of control measures will also be discussed during the Daily Production Meeting (or equivalent).	11.1.2.1	Daily
5	United Wambo will implement a dust surveillance camera network to allow supervisors and mine management to remotely monitor operational dust management. Mining supervisors will assess visual dust conditions demonstrated by the camera network against the United Wambo Dust TARP .	11.1.2.2	Ongoing
6	The surveillance camera network will also be used to investigate peak dust episodes, community complaints and identify dust sources.	11.1.2.2	As required

No.	Mitigation/Management Measure	Section	Timing
7	United Wambo will take all reasonable and feasible best practice air quality mitigation measures. The basis for continuous improvement of air quality mitigation measures will be through the ongoing monitoring of dust impacts and the corrective/preventative action process outlined in the <i>United Wambo Environmental Management Strategy (EM Strategy)</i> and <i>Section 13.1.2</i> of this Plan. Through the development of corrective/preventative actions, United Wambo will investigate ways to reduce the air quality impacts generated by the operation. Any new mitigation measures that are implemented as a result of these investigations will be reported in the Annual Review.	11.6.1	Ongoing
8	United Wambo will also maintain awareness of new technologies for air quality impact mitigation through participation in relevant industry groups.	11.6.1	Ongoing
9	United Wambo will progressively develop the forecasting of potential environmental impacts as both site based experience and appropriate technologies become available.	11.6.2	Ongoing
10	General awareness training is provided to all new employees and contractors as part of the United Wambo Site Specific Induction Program. Additional training will be provided to employees and contractors based on the <i>Training Needs Analysis</i> .	11.8	Ongoing
11	The locations of air quality and meteorological monitoring equipment in the vicinity of United Wambo are shown in <i>Figure 12-1</i> and <i>Table 12-1</i> .	12.1	Ongoing
12	The monitoring equipment, frequency of monitoring and relevant monitoring standards are summarised in <i>Table 12-2</i> .	12.1	Ongoing
13	The air quality monitoring program will be reviewed in accordance with <i>Section 11.7</i> . Any changes to the number, type or location of monitors will need to be approved by the Department of Planning and Environment.	12.1	As required
14	Meteorological monitoring is currently undertaken in the two locations listed above, and includes the parameters outlined in <i>Table 12-3</i> .	12.1.1	Ongoing

No.	Mitigation/Management Measure	Section	Timing
15	Meteorological stations are operated in accordance with NSW Noise Policy for Industry and Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales . Each meteorological station is capable of continuous real-time measurement of temperature lapse, and will collect sigma-theta data, that is, the standard deviation of the horizontal wind direction. Sigma theta will be used to estimate the atmospheric stability class (an indication of the temperature lapse rate) in accordance with the procedures of the US EPA (2000) .	12.1.1	Ongoing
16	United Wambo operate a series of real time continuous Tapered Element Oscillating Microbalance (TEOM) monitoring units that are used to assess operations on a real time basis and to provide information that can be used to respond to air quality issues. Each unit records the following data that can be used to assess air quality from the complex: • real time PM₁₀ concentrations in µg/m³; • real time PM_{2.5} concentrations in µg/m³; • rolling 24 hour average PM₁₀ concentrations in µg/m³; and • wind direction, wind speed and rainfall.	12.1.3	Continuously
17	Each real time air quality monitoring unit is fitted with alarming capabilities that can advise mining personnel that air quality at the monitor has reached the trigger levels detailed in Section 12.2 . Alarms are sent via SMS to relevant United Wambo Staff to warn that air quality is reaching the predetermined limit. Action can then be instigated to modify operations where practical.	12.1.3	Ongoing

No.	Mitigation/Management Measure	Section	Timing
18	United Wambo will undertake a campaign of PM_{2.5} monitoring to provide local PM_{2.5} monitoring data to confirm that the predictions of PM_{2.5} in the Air Quality Impact Assessment (AQIA) are accurate. The proposed PM_{2.5} campaign monitoring will include sites at Warkworth and along Redmanvale Road and will include: • monitoring of PM_{2.5} concurrently and co-located with the PM₁₀ TEOM monitors. Refer to Figure 2-1 and Table 12-1 for locations; • campaign monitoring for a period forecast to be 3 – 6 months pending a review of whether suitable north-west winds have been observed during that time; • comparing the PM_{2.5} concentration estimates to the EPA's 25 µg/m³ criterion; • identifying whether further PM_{2.5} campaign monitoring would be required; and • if further PM_{2.5} monitoring is required as a result of the campaign monitoring above, then United Wambo would develop an implementation program at this time in consultation with DPIE.	12.1.4	Upon commencement of mining
19	Alarms will be sent via SMS to relevant United Wambo Staff including but not limited to: the Environment and Community Department (Environment & Community Manager (ECM), Environment & Community Coordinator (ECC), Environment & Community Officer (ECO)) and the Production Department (Mining Supervisors).	12.2	Every alarm
20	Meteorological triggers are defined in Table 12-4 and are applied to wind speed, ambient air temperature and rainfall data logged at 5-minute intervals. Weather alarms will be sent via SMS to the recipients listed above in Section 12.2.1. In the event an alarm is triggered, the site will record any mitigating actions taken in response to the alarms in accordance with the site procedures. This includes relocating, modifying or ceasing operations as necessary to minimise dust generation.	12.2.1	Ongoing
21	The real time dust monitoring data is filtered for wind direction to identify the potential for United Wambo activities being the source of the alarm. Wind direction ranges have been calculated based on the position of each monitor relative to United Wambo operations to ensure the alarms are representative of impacts from United Wambo. The wind direction ranges are provided in Table 12-5 and are reviewed annually to ensure they remain consistent with the progressing mining operations. Alarm triggers for the 24 hours rolling averages do not have wind direction triggers.	12.2.2	Ongoing

No.	Mitigation/Management Measure	Section	Timing
22	Glencore's Air Quality Control System (AQCS) comprises meteorological forecasting and dust dispersion modelling for United Wambo. This system provides early warning of adverse meteorological conditions and potential dust risks, thus facilitating proactive management of mining activities to reduce dust generation potentials. Meteorological and dust risk forecasts from the AQCS are automatically sent via email to the Environment and Community Department and key personnel from the Mine Production Department. Forecasts can also be accessed via the website (http://envforecasting.com) and include two-day forecasts of dust risk index, dust transport, and meteorological conditions.	12.2.3	Ongoing
23	Mining Supervisors are to review the daily forecast prior to beginning of each shift. Based on the dust transport contour plots, dust risks are assigned as Level 1, Level 2 and Level 3 depending on the risk of dust transmission off site. In the event that high dust risks are forecast, the Mining Supervisor and/or Mining Superintendent will plan for contingency measures to ensure that dust generation potentials are reduced. The Environment and Community Department is responsible for providing additional environmental information. This information will be used to inform the production personnel's actions. Further review of dust risk, weather conditions and the performance of control measures will also be discussed during the Daily Production Meeting.	12.2.3	Every shift
24	All air quality monitoring data is maintained in accordance with the EM Strategy and maintained on the premise for a period of 4 years.	12.3	Ongoing
25	Environmental monitoring result summaries, compliance with Consent and Licence conditions and any required modifications to the air quality monitoring program will be reported in the Annual Review.	13	Annually
26	Summaries will also be made available to the public via the United Wambo Project Website (www.unitedproject.com.au) in accordance with the EPA requirements for publishing monitoring data.	13	Monthly
27	Air quality monitoring results will also be presented at Community Consultative Committee (CCC) Meetings.	13	Quarterly

No.	Mitigation/Management Measure	Section	Timing
28	If monitoring results identify an exceedance of the criteria outlined in , except where predicted in the relevant EIS, and except where a negotiated agreement has entered into in relation to the impact, United Wambo will notify regulators (DPIE and EPA) immediately. Affected landowners will be notified as soon as practicable (no longer than 7 days) as per Section 13.1.1 .	13.1	All exceedances
29	A report will be produced and provided to the DPIE and other relevant agencies. The report will include: - a description of the date, time, and nature of the exceedance/incident; - identification of the cause (or likely cause) of the exceedance/ incident; - a description of what action has been taken to date; and - details of the proposed measures to address the exceedance/incident.	13.1	Within 7 days of an incident
30	Air quality monitoring results and compliance with Consent and Licence Conditions will be reported in the Annual Return to the EPA and in the Annual Review. A summary of air quality monitoring results will be presented at CCC meetings and will also be made available to the public via the United Wambo Project Website. These results will be updated monthly.	13.1	Annually Quarterly Monthly
31	Measured levels above the criteria do not necessarily constitute non-compliance. In these circumstances, additional investigations will be carried out to determine compliance. The specific investigations to be carried out are shown in Table 13-1 .	13.1	As required
32	In accordance with Condition D4 of SSD 7142 , and to the satisfaction of the Planning Secretary, United Wambo will, within one month of approval of SSD 7142 : - notify the tenants of any mine-owned land of their rights under the SSD 7142 consent; and - send a copy of the “Mine Dust and You” (NSW Health, 2017) Factsheet to the owners/tenants of any land where the predictions in the EIS identified that dust emissions generated by the development are likely to be greater than the relevant air quality criteria.	13.1.1	Complete

No.	Mitigation/Management Measure	Section	Timing
33	As soon as practicable and no longer than 7 days after obtaining monitoring results as showing an exceedance of the criteria outlined in Table 2.1 , United Wambo will: - provide the details of the exceedance to any affected landowners and tenants; and - provide to any affected land owners and tenants a copy of the NSW Health Fact Sheet entitled “Mine Dust and You” (NSW Health, 2017).	13.1.1	Within 7 days of exceedance
34	Table 13-2 summarises the potential air quality issues that may arise and the appropriate corrective action(s) that will be taken.	13.1.2	As required
35	United Wambo maintains a dedicated free-call community response line that is advertised at least quarterly in the local newspapers, provided in each edition of the Community Newsletter and displayed on the United Wambo website (www.unitedproject.com.au).	13.2	Ongoing
36	A summary of complaints received and actions taken is presented in the Annual Review and to the United Wambo CCC as part of the operational performance review. A complaints register is to be updated monthly on the United Wambo website located at www.unitedproject.com.au .	13.2	Annually Monthly
37	If a landowner considers the operation to be in exceedance of the impact assessment criteria, they may request an independent review of the effects of the operation on their land. Such a request must be made in writing to the Secretary of the DPIE. If the Secretary determines that an independent review is to be undertaken, United Wambo will follow the procedures outlined in Conditions D8 to D10 of SSD 7142 .	13.3	As required

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1. Project Description

The United Wambo Open Cut Coal Mine (United Wambo) is situated approximately 15 kilometres west of Singleton, near the village of Warkworth, New South Wales (**Figure 1-1**). United Wambo is a 50:50 joint venture between neighbouring mines operated by United Collieries Pty Limited (United) and Wambo Coal Pty Limited (Wambo).

United Collieries Pty Limited (United) is owned 95 per cent by Abelshore Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore) and 5 per cent by the Construction, Forestry, Mining and Energy Union (CFMEU), which is managed by Glencore. Wambo Coal Pty Limited (Wambo) is a subsidiary of Peabody Energy Australia Pty Limited.

United Wambo combines the existing open cut operations at Wambo with a new open cut coal mine at United. United Wambo has approval to extract up to 10 million tonnes per annum (mtpa) of Run of Mine (ROM) coal from the combined Wambo Open Cut (Wambo Pit) and United Open Cut (United Pit). All coal is transported and processed through the Wambo Coal Handling and Processing Plant (CHPP) and transported by rail from Wambo to the Port of Newcastle for export.

Open cut mining is managed by United Wambo on behalf of the joint venture, whilst Wambo will continue to manage the CHPP, train loading facilities, and Wambo's continued underground mining operations.



Figure 1-1: Locality Plan

2. Purpose

The purpose of this Air Quality and Greenhouse Gas Management Plan (AQGHGMP) is to describe the management and mitigation strategies, procedures, controls and monitoring programs that will be implemented to manage air quality and greenhouse gas emissions at United Wambo.

The AQGHGMP is intended to meet statutory and internal requirements, particularly the Glencore Coal Assets Australia (GCAA) Standards, **Development Consent SSD 7142** and the **Environment Protection Licence (EPL) 3141**.

3. Scope

The AQGHGMP applies to all United Wambo employees, and contractors working for, or on behalf of, United Wambo within the project approval boundary. This AQGHGMP forms part of **United Wambo's Environmental Management System (EMS)** and should be read in conjunction with the **United Wambo Environmental Management Strategy (EM Strategy)**.

This AQGHGMP applies to all Phase 1A, Phase 1B, and Phase 2 activities at United Wambo and addresses the relevant conditions of **SSD 7142** and **EPL 3141**.

This AQGHGMP excludes the operations at the Wambo underground mine, CHPP, and train loading facility. These activities will continue to be managed by Wambo in accordance with the relevant development consent conditions. This AQGHGMP contains a protocol for the allocation of individual air quality and greenhouse gas emissions to the United Wambo or Wambo Mines.

4. Objectives of the Air Quality and Greenhouse Gas Management Plan

The objectives of this AQGHGMP are to:

- ensure air quality management measures are effective and implementable at United Wambo to reduce the potential for impacts on ambient air quality, including source-specific dust controls and site-wide Management Systems and Procedures;
- describe the systems used for the early identification of adverse meteorological conditions likely to result in dust impacts, and the triggering of timely 'high management actions' to reduce dust emissions during such periods, recognising that cumulative air quality is a key issue for the local community;
- establish an air quality monitoring system to assess the air quality impact on surrounding sensitive receivers and performance against **SSD 7142** and **EPL 3141** specific air quality impact assessment criteria;
- provide a framework for raising awareness, and training of employees, to support effective and timely identification, reporting and mitigation of dust;
- outline the process to minimise greenhouse gas emissions from the operation;
- manage air quality related community complaints in a timely and effective manner;

- detail the requirement for reporting air quality criteria exceedances to the relevant stakeholders; and
- ensure that air quality management is integrated into the entire life of mine, from mine planning to mine rehabilitation and closure.

5. Statutory Requirements

This AQGHGMP has been prepared to fulfil the air quality related requirements of **SSD 7142** and **EPL 3141**.

5.1 Development Consent

United Wambo received **Development Consent (SSD 7142)** in accordance with Part 4 of the **Environmental Planning & Assessment Act 1979 (EP&A Act)** from the NSW Independent Planning Commission (IPC), on 29 August 2019. Conditions within **SSD 7142** relating to air quality management, and where these are addressed within this document, are provided in **Table 5-1**.

Table 5-1: SSD 7142 Requirements for Air Quality Management

Condition	Condition Details	AQGHGMP Section																
B24	The Applicant must ensure that no offensive odours, as defined under the POEO Act, are emitted from the site.	11.2																
B25	The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances of the criteria listed in Table 3 at any residence on privately-owned land. Table 3: Air quality criteria <table> <tr> <th>Pollutant</th><th>Averaging period</th><th>Criterion</th></tr> <tr> <td rowspan="2">Particulate matter < 10 µm (PM₁₀)</td><td>Annual</td><td>^{a, c} 25 µg/m³</td></tr> <tr> <td>24 hour</td><td>^b 50 µg/m³</td></tr> <tr> <td rowspan="2">Particulate matter < 2.5 µm (PM_{2.5})</td><td>Annual</td><td>^{a, c} 8 µg/m³</td></tr> <tr> <td>24 hour</td><td>^b 25 µg/m³</td></tr> <tr> <td>Total suspended particulate (TSP) matter</td><td>Annual</td><td>^{a, c} 90 µg/m³</td></tr> </table> Notes: ^a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources). ^b Incremental impact (i.e. incremental increase in concentrations due to the development on its own). ^c Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.	Pollutant	Averaging period	Criterion	Particulate matter < 10 µm (PM ₁₀)	Annual	^{a, c} 25 µg/m ³	24 hour	^b 50 µg/m ³	Particulate matter < 2.5 µm (PM _{2.5})	Annual	^{a, c} 8 µg/m ³	24 hour	^b 25 µg/m ³	Total suspended particulate (TSP) matter	Annual	^{a, c} 90 µg/m ³	11
Pollutant	Averaging period	Criterion																
Particulate matter < 10 µm (PM ₁₀)	Annual	^{a, c} 25 µg/m ³																
	24 hour	^b 50 µg/m ³																
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	24 hour	^b 25 µg/m ³																
Total suspended particulate (TSP) matter	Annual	^{a, c} 90 µg/m ³																
B26	The air quality criteria in Table 3 (above) do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the air quality criteria, and the Applicant has advised the Department in writing of the terms of this agreement.	10.2																

Condition	Condition Details	AQGHGMP Section
B27	Particulate matter emissions generated by the development must not exceed the criteria listed in Table 3 (above) at any occupied residence on mine-owned land (including land owned by another mining company) unless:	13
B27 (a)	the tenant and landowner (if the residence is owned by another mining company) have been notified of any health risks associated with such exceedances in accordance with the notification requirements under PART C of this consent;	13.1.1
B27 (b)	the tenant of any land owned by the Applicant can terminate their tenancy agreement without penalty at any time, subject to giving 14 days' notice;	10.5.1
B27 (c)	air quality monitoring is regularly undertaken to inform the tenant and landowner (if the residence is owned by another mining company) of the likely particulate matter emissions at the residence; and	12
B27 (d)	data from this monitoring is presented to the tenant and landowner in an appropriate format for a medical practitioner to assist the tenant and landowner in making informed decisions on the health risks associated with occupying the property.	13
B28	The Applicant must:	
B28 (a)	- take all reasonable steps to: a) minimise odour, fume and particulate matter (including PM₁₀ and crustal and combustion PM_{2.5}) emissions of the development; b) eliminate or minimise the risk of spontaneous combustion; c) improve energy efficiency and reduce greenhouse gas emissions of the development; d) minimise any visible off-site air pollution generated by the development; and e) minimise the extent of potential dust generating surfaces exposed on the site at any given point in time;	11.2 11.2 11.6 11.1 11.1.1
B28 (b)	excluding existing equipment transferred from the Wambo Mining Complex, ensure that all 'non-road' mobile diesel equipment used in undertaking the development includes reasonable and feasible diesel emissions reduction technology;	11.1.1
B28 (c)	operate a comprehensive air quality management system that uses a combination of predictive meteorological and air quality forecasting and real-time monitoring to guide the day to day planning of mining operations and the implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this consent;	11.1.2 12.2

Condition	Condition Details	AQGHGMP Section
B28 (d)	minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see note (c) in Table 3 of Condition B25 above);	12.1.1
B28 (e)	carry out regular air quality monitoring to determine whether the development is complying with the relevant conditions of this consent; and	12
B28 (f)	regularly assess meteorological and air quality monitoring data, and modify operations on the site to ensure compliance with the relevant conditions of this consent.	12.2
B29	The Applicant must prepare an Air Quality and Greenhouse Gas Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	
B29 (a)	be prepared by a suitably qualified and experienced person/s;	8
B29 (b)	be prepared in consultation with the EPA;	7
B29 (c)	- describe the measures to be implemented to ensure: a) compliance with the air quality criteria and operating conditions in this consent; b) best practice management is being employed (including in respect of minimisation of greenhouse gas emissions from the site and energy efficiency); and c) the air quality impacts of the development are minimised during adverse meteorological conditions and extraordinary events;	11 11.6.1 11.1.2
B29 (d)	describe the air quality management system in detail; and	11 12
B29 (e)	- include an air quality monitoring program, undertaken in accordance with the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007), that: a) establishes a diesel combustion emissions baseline b) uses monitors to evaluate the performance of the development against the air quality criteria in this consent and to guide day to day planning of operations; c) adequately supports the air quality management system; and d) includes a protocol for identifying any air quality-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events.	11.5 12.1 12 13.1
B30	The Applicant must not commence Phase 1B until the Air Quality and Greenhouse Gas Management Plan is approved by the Planning Secretary.	3
B31	The Applicant must implement the Air Quality and Greenhouse Gas Management Plan as approved by the Planning Secretary.	8

Condition	Condition Details	AQGHGMP Section
B32	The Applicant must prepare an Management Plan for the development to the satisfaction of the Planning Secretary. This plan must set out protocols that require the Applicant to use all reasonable and feasible measures to ensure that any coal extracted from the development that is to be exported from Australia, is only exported to countries that are: a) parties to the Paris Agreement within the United Wambo Nations Framework Convention on Climate Change; or b) countries that the Planning Secretary considers have policies for reducing greenhouse gas emissions that would otherwise be similar to policies that would be required of that country if it were a party to the Agreement at a) above; as at the date of sale. The purpose of the Export Management Plan is to ensure that all reasonable and feasible measures are adopted by the Applicant to minimise greenhouse gas emissions identified as Scope 3 emissions in the EIS to the greatest extent practicable.	United Wambo Export Management Plan
B33	The Applicant must not commence Phase 1B until the Export Management Plan is approved by the Planning Secretary.	United Wambo Export Management Plan
B34	The Applicant must implement the Export Management Plan as approved by the Planning Secretary for the life of the development.	United Wambo Export Management Plan
B35	The Planning Secretary may determine that the Export Management Plan should be amended if it is satisfied that a change to obligations arising under the United Wambo Nations Framework Convention on Climate Change or Paris Agreement, or the policies of a country that is within B32(b) above, necessitates an amendment to the Export Management Plan.	United Wambo Export Management Plan
B36	The Planning Secretary may determine that the Applicant is no longer required to implement the Export Management Plan if, due to the existence of other State or Federal legal mechanisms introduced by the NSW or Commonwealth Governments regulating the subject matter of the Export Management Plan, there is no longer any need for the Export Management Plan to be implemented by the Applicant.	United Wambo Export Management Plan

Condition	Condition Details	AQGHGMP Section
B37	Prior to the commencement of Phase 1B and for the remaining life of the development, the Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the site that: a) complies with the requirements in the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007); b) is capable of continuous real-time measurement of wind speed, wind direction sigma theta and temperature; and c) is capable of measuring meteorological conditions in accordance with the NSW Industrial Noise Policy (EPA, 2000), unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA	12.1.1
E5	Management Plan Requirements The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include where relevant:	
E5	a) summary of relevant background or baseline data;	10
E5	b) details of:	
E5	i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);	5
E5	ii) any relevant limits or performance measures and criteria; and	10
E5	iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	10
E5	c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c) of SSD 7142 ;	1
E5	d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	11
E5	e) a program to monitor and report on the:	
E5	i) impacts and environmental performance of the development	11 12
E5	ii) effectiveness of the management measures set out pursuant to paragraph d);	11 12 13

Condition	Condition Details	AQGHGMP Section
E5	f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	11
E5	g) a program to investigate and implement ways to improve the environmental performance of the development over time;	11
E5	h) a protocol for managing and reporting any:	
	i. incident, non-compliance or exceedance of any impact assessment criterion and performance criterion;	13
	ii. complaint; or	13
	iii. failure to comply with other statutory requirements; and	13
	iv. a protocol for periodic review of the plan.	13
	<i>Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.</i>	

5.2 Environmental Protection Licence

United Wambo operates under **EPL 3141**, issued by the **NSW Environment Protection Agency (EPA)** under the authority of the **Protection of the Environment Operations Act 1997 (POEO Act)**. Conditions within **EPL 3141** that regulate air quality at the United Wambo are provided in **Table 5-2**.

Table 5-2: EPL 3141 Requirements for Air Quality Management

Schedule	Condition	Section Addressed
Schedule 4 Condition 03	O3 Dust O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises. O3.2 All trafficable areas, coal storage areas and vehicle manoeuvring areas in or on the premises must be maintained, at all times, in a condition that will minimise the generation, or emission from the premises, of wind-blown or traffic generated dust. O3.3 All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.	11
Schedule 5 Condition M2	M2 Requirement to monitor concentration of pollutants discharged M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of	12

Schedule	Condition	Section Addressed																												
	each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns: M2.2 Water and/ or Land Monitoring Requirements Point 10 <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Faecal Coliforms</td><td>colony forming units per 100 millilitres</td><td>Quarterly</td><td>Grab sample</td></tr><tr><td>pH</td><td>pH</td><td>Quarterly</td><td>Grab sample</td></tr></table> M2.3 Air Monitoring Requirements Point 4,5,6,7 <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>PM10</td><td>micrograms per cubic metre</td><td>Continuous</td><td>AM-22</td></tr></table> Point 8 <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Total suspended particles</td><td>micrograms per cubic metre</td><td>Every 6 days</td><td>AM-15</td></tr></table> M2.4 The Licensee must use real-time data from the meteorological station (EPA Point 3) to calculate real-time stability class for the purpose of managing noise generated on the premises and for noise compliance monitoring against noise limits, in accordance with the EPAs Noise Policy for Industry (2017).	Pollutant	Units of measure	Frequency	Sampling Method	Faecal Coliforms	colony forming units per 100 millilitres	Quarterly	Grab sample	pH	pH	Quarterly	Grab sample	Pollutant	Units of measure	Frequency	Sampling Method	PM10	micrograms per cubic metre	Continuous	AM-22	Pollutant	Units of measure	Frequency	Sampling Method	Total suspended particles	micrograms per cubic metre	Every 6 days	AM-15	
Pollutant	Units of measure	Frequency	Sampling Method																											
Faecal Coliforms	colony forming units per 100 millilitres	Quarterly	Grab sample																											
pH	pH	Quarterly	Grab sample																											
Pollutant	Units of measure	Frequency	Sampling Method																											
PM10	micrograms per cubic metre	Continuous	AM-22																											
Pollutant	Units of measure	Frequency	Sampling Method																											
Total suspended particles	micrograms per cubic metre	Every 6 days	AM-15																											
Schedule 5 Condition M3	M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with: a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or	12.1.1																												

Schedule	Condition	Section Addressed																
	b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place. <i>Note: The Protection of the Environment Operations (Clean Air) Regulation 2010 requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".</i> M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.																	
Schedule 2 Condition P1	P1 Location of monitoring/discharge points and areas P1.1 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area. P1.2 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point. Air <table><tr><th>EPA identi- fication no.</th><th>Type of Monitoring Point</th><th>Type of Discharge Point</th><th>Location Description</th></tr><tr><td>4</td><td>Ambient Air Monitoring</td><td></td><td>PM10 TEOM at co-ordinates 314118, 6393961 (Easting, Northing) identified as AQ01 on Figure 1.</td></tr><tr><td>5</td><td>Ambient Air Monitoring</td><td></td><td>PM10 TEOM at co-ordinates 312055, 6390321 (Easting, Northing) identified as AQ02 on Figure 1.</td></tr><tr><td>6</td><td>Ambient Air Monitoring</td><td></td><td>PM10 TEOM at co-ordinates 304502, 6398490 (Easting, Northing) identified as AQ03 on Figure 1.</td></tr></table>	EPA identi- fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description	4	Ambient Air Monitoring		PM10 TEOM at co-ordinates 314118, 6393961 (Easting, Northing) identified as AQ01 on Figure 1.	5	Ambient Air Monitoring		PM10 TEOM at co-ordinates 312055, 6390321 (Easting, Northing) identified as AQ02 on Figure 1.	6	Ambient Air Monitoring		PM10 TEOM at co-ordinates 304502, 6398490 (Easting, Northing) identified as AQ03 on Figure 1.	12.1
EPA identi- fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description															
4	Ambient Air Monitoring		PM10 TEOM at co-ordinates 314118, 6393961 (Easting, Northing) identified as AQ01 on Figure 1.															
5	Ambient Air Monitoring		PM10 TEOM at co-ordinates 312055, 6390321 (Easting, Northing) identified as AQ02 on Figure 1.															
6	Ambient Air Monitoring		PM10 TEOM at co-ordinates 304502, 6398490 (Easting, Northing) identified as AQ03 on Figure 1.															

Schedule	Condition	Section Addressed												
	<table> <tr> <td>7</td><td>Ambient Air Monitoring</td><td>PM10 TEOM at co-ordinates 305928, 6399587 (Easting, Northing) identified as AQ04 on Figure 1.</td></tr> <tr> <td>8</td><td>Ambient Air Monitoring</td><td>TSP HVAS at co-ordinates 314300, 6394930 (Easting, Northing) identified as HVAS01 on Figure 1.</td></tr> </table> P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises. Noise/Weather <table> <tr> <th>EPA identi- fication no.</th><th>Type of monitoring point</th><th>Location description</th></tr> <tr> <td>3</td><td>Meteorological Station – to determine meteorological conditions for noise monitoring</td><td>Meteorological Station at co-ordinates 321259, 6397526 (Easting, Northing) identified as WS2 on Figure 2.</td></tr> </table> P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "United Wambo Joint Venture Projects Environmental Protection Licence 3141 Plan of the Premises dated 4/12/19 EPA Reference DOC19/1043296-5. P1.6 For the purposes of Condition P1.2 and P1.3, Figure 2 refers to the plan titled "United Wambo Joint Venture Project Environment Protection Licence Plan of Premises" dated 4/12/19 EPA Reference DOC19/1043296-5. <i>Note: The datum for grid references in this licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.</i>	7	Ambient Air Monitoring	PM10 TEOM at co-ordinates 305928, 6399587 (Easting, Northing) identified as AQ04 on Figure 1.	8	Ambient Air Monitoring	TSP HVAS at co-ordinates 314300, 6394930 (Easting, Northing) identified as HVAS01 on Figure 1.	EPA identi- fication no.	Type of monitoring point	Location description	3	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological Station at co-ordinates 321259, 6397526 (Easting, Northing) identified as WS2 on Figure 2.	
7	Ambient Air Monitoring	PM10 TEOM at co-ordinates 305928, 6399587 (Easting, Northing) identified as AQ04 on Figure 1.												
8	Ambient Air Monitoring	TSP HVAS at co-ordinates 314300, 6394930 (Easting, Northing) identified as HVAS01 on Figure 1.												
EPA identi- fication no.	Type of monitoring point	Location description												
3	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological Station at co-ordinates 321259, 6397526 (Easting, Northing) identified as WS2 on Figure 2.												
Schedule 3 Condition L4	L4.5 Offensive blast fume must not be emitted from the premises. Definition: Offensive blast fume means post-blast gases from the detonation of explosives at the premises that by reason of their nature, duration, character or quality, or the time at which they are emitted, or any other circumstances: 1. are harmful to (or likely to be harmful to) a person that is outside the premises from which it is emitted, or	10.1 11.2												

Schedule	Condition	Section Addressed
	2. interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted.	

6. Glencore Coal Assets Australia Requirements

The Glencore Coal Assets Australia (GCAA) *Air Quality Management Protocol (GCAA-625378177-10324)* outlines the minimum requirements for dust management and mitigation at Glencore operations and establishes a framework for coordinated dust management. The primary objectives of the protocol is to achieve compliance with regulatory standards, conditions and commitments, and mitigate air quality related risks and complaints. The protocol has been developed to:

- provide guidance on effective dust management measures implementable at surface operations to reduce the potential for impacts on ambient air quality, including source-specific dust controls and site-wide management systems and procedures;
- provide a framework for the use of automated systems for early identification of adverse meteorological conditions likely to result in dust impacts, and the triggering of timely 'high management actions' to reduce dust emissions during such periods;
- provide guidance and direction for awareness raising and training of employees to support effective and timely identification, reporting and mitigation of dust;
- establish minimum requirements for dust management across GCAA sites, and provide the framework for coordinated dust management by sites; and
- provide guidance so that dust management is integrated into the entire life of mine, from mine planning to mine rehabilitation and closure.

The requirements of the GCAA Protocol have been included in this *Air Quality and Greenhouse Gas Management Plan*.

7. Stakeholder Consultation

Condition B29 (b) of **SSD 7142**, requires this AQGHGMP to have been prepared in consultation with the EPA and submitted to the Planning Secretary for approval.

The EPA was contacted and provided with the opportunity to provide comment and feedback on the management plans prepared for **SSD 7142**, including the AQGHGMP, on 21 September 2018 and 5 August 2020. The EPA noted that they do not undertake consultation for management plans and, as such, offered no comment in relation to these plans apart from ensuring that the plans consider the conditions of any Environment Protection Licence conditions in force at the time (Appendix D). The **EPL 3141** conditions relating to air quality are described in **Section 5.2**.

8. Preparation of the Air Quality and Greenhouse Gas Management Plan

In recognition of the requirements of Condition B29 (a) of **SSD 7142**, the AQGHGMP prepared by United Wambo has been reviewed by a suitably experienced and qualified person, Shane Lakmaker, from Jacobs. A letter of confirmation from Jacobs is provided in **Appendix A - Correspondance from Jacobs**.

9. Hold Point

In accordance with Condition B30 of **SSD 7142**, the Applicant must not commence Phase 1B until the AQGHGMP is approved by the Planning Secretary. As discussed in **Section 7**, the AQGHGMP was approved on 13 July 2020 prior to the commencement of Phase 1B.

10. Planning

10.1 Potential Impacts

The key air quality issues to be managed at United Wambo include:

- dust (that is, particulate matter in the form of TSP, PM₁₀, or PM_{2.5}) from general mining activities;
- fume (that is, NO_x emissions) from blasting; and
- odour and other substances due to potential spontaneous combustion.

Dust

Dust emissions from general mining activities are from a variety of sources including material handling, material transport, processing, wind erosion, and blasting. These emissions mainly comprise of particulate matter in the form of TSP, PM₁₀, and PM_{2.5}.

The United Wambo Open Cut Coal Mine Project – Environmental Impact Statement (EIS) (Umwelt 2016) provided estimates of emissions from all significant dust-generating activities/sources at United Wambo. The three most significant sources, in terms of TSP emissions, are:

- coal and overburden haulage, resulting in wheel-generated dust;
- exposed mining and emplacement areas, resulting in wind-generated dust; and
- loading and unloading coal and overburden to trucks

The emission sources have been identified in order to develop the most effective management measures and to target the most significant sources.

Fume

Post-blast fume can be produced in non-ideal explosive conditions of the ammonium nitrate/fuel oil (ANFO) and visible as an orange/brown plume.

Post-blast fumes comprise of oxides of nitrogen (NO_x) including nitric oxide (NO) and nitrogen dioxide (NO₂). In general, at the point of emission, NO will comprise the greatest proportion of the total emission. Typically this is 90% by volume of the NO_x. The remaining 10% will comprise mostly NO₂. It is the NO₂ which has been linked to adverse health effects.

Odour

Spontaneous combustion of coal and other carbonaceous materials is the main potential source of odour. “Self-heating” occurs when coal and other carbonaceous materials undergo an exothermic reaction when exposed to oxygen in the air, to generate heat. This process causes the temperature of the material to rise which in turn accelerates the oxidation and, in turn, the heat generation process. As the material temperature rises above about 70°C, the temperature acceleration is rapid enough to result in ignition of the material. This ignition is referred to as spontaneous combustion.

The propensity of coal (or carbonaceous material) to self-heat and potentially combust is governed by many factors but most commonly by the type of coal, the carbon content, the size of the particles, the material temperature, the presence of oxygen and quantity of coal. Spontaneous combustion results in the emission of noxious gases including carbon dioxide, carbon monoxide, sulphur dioxide, hydrogen sulphide, nitrogen oxides, acid mist and a range of volatile organic compounds.

The emissions to air have the potential to lead to the following hazards:

- adverse health effects due to inhalation;
- nuisance effects due to odour;
- fire and hot material; and
- smoke and effects on visibility.

10.2 Air Quality Criteria

Condition B25 of **SSD 7142** specifies that United Wambo must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances of the criteria listed in **Table 10-1** unless United Wambo have a written agreement with the landowner.

Table 10-1: Air Quality Criteria

Pollutant	Averaging Period	Criterion
Particulate matter < 10 µm (PM ₁₀)	Annual	^{a, c} 25 µg/m ³
	24 hour	^b 50 µg/m ³
Particulate matter < 2.5 µm (PM _{2.5})	Annual	^{a, c} 8 µg/m ³
	24 hour	^b 25 µg/m ³
Total suspended particulate (TSP) matter	Annual	^{a, c} 90 µg/m ³



Note

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

10.3 Baseline Data

An assessment of the existing air quality environment of the area surrounding United Wambo was undertaken during the preparation of the **United Wambo Open Cut Coal Mine Project – Environmental Impact Statement (EIS) (Umwelt 2016)**, including the accompanying **Air Quality Impact Assessment, (Jacobs 2016)**. As part of these assessments, background air quality and meteorological data were collated and analysed for United Wambo.

10.3.1 Existing Air Quality Environment

The existing air quality environment has been characterised by monitoring data collected from a network of monitors operated by United, Wambo, nearby Hunter Valley Operations, and the EPA. This monitoring network included:

- one High Volume Air Sampler (HVAS) measuring PM₁₀ for Hunter Valley Operations (Warkworth);
- five HVAS monitors measuring Total Suspended Particulates (TSP) emissions for Wambo and Hunter Valley Operations (Warkworth, HV01, HV02, HV03, HV04);
- four Tapered Element Oscillating Microbalance (TEOM) monitors measuring PM₁₀ concentrations (AQ1, AQ2, AQ3, AQ4) for Wambo;
- nineteen of United and Wambo Dust Deposition Gauges surrounding United Wambo;
- three EPA TEOM monitors measuring PM₁₀ concentrations;
- two EPA monitoring stations measuring PM_{2.5} concentrations at Singleton and Camberwell; and
- one air quality monitoring site located in Singleton that records NO₂ concentrations for the EPA.

The locations of the monitoring sites used to determine the baseline data are illustrated in **Figure 10-1**. The air quality monitoring locations were representative of the nearest and/or most potentially affected residences surrounding the project area.

A summary of the baseline air quality monitoring results, as presented in **Appendix 7** of the **EIS, United Wambo Open Cut Coal Mine Project – Air Quality Impact Assessment (Jacobs, 2016)** is provided in

Table 10-2 to Table 10-6.

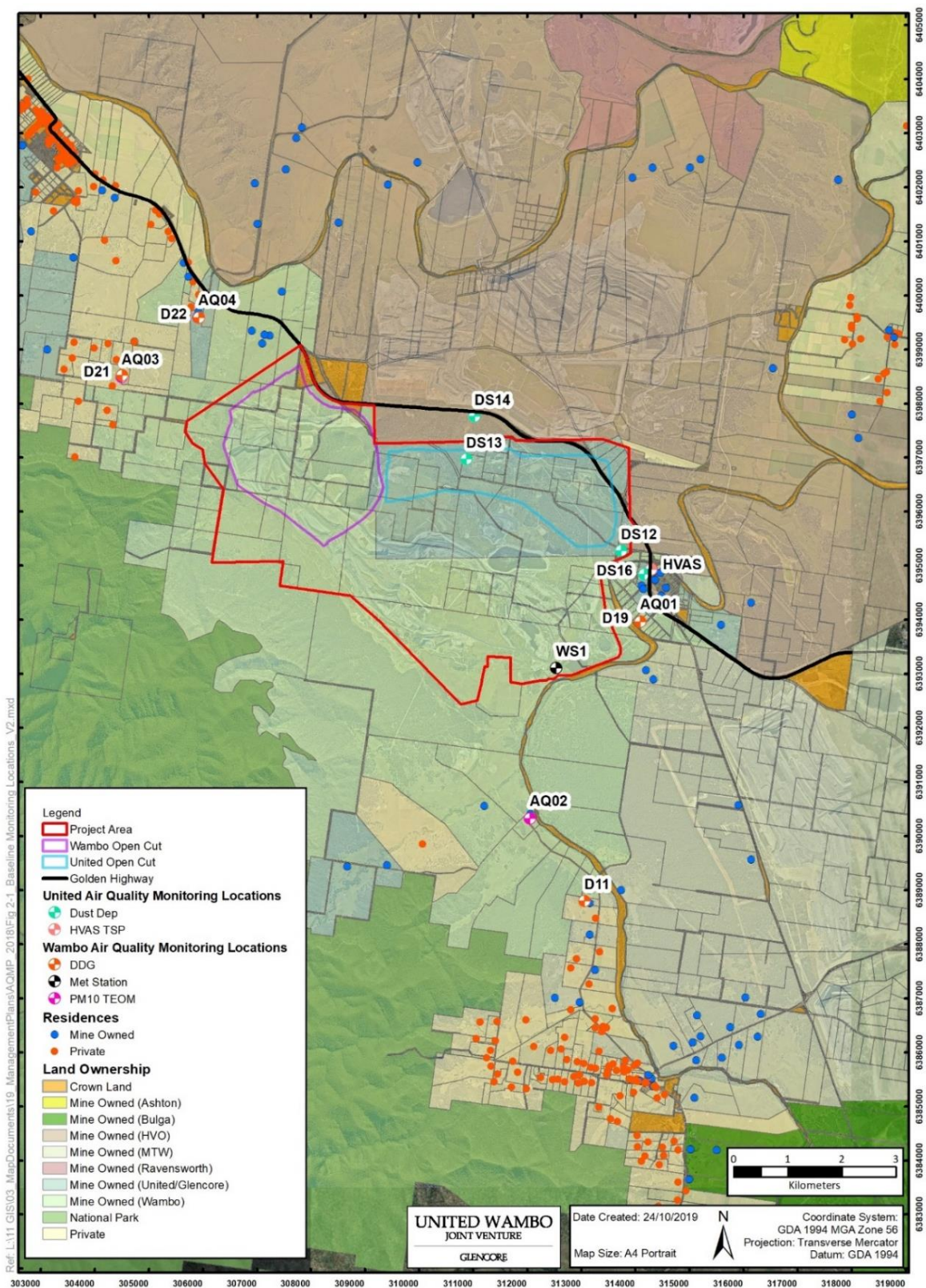


Figure 10-1: United and Wambo Baseline Air Quality Monitoring Network

Table 10-2: Baseline Data, PM₁₀ Concentrations

Year	Jerrys Plains (EPA)	Maison Dieu (EPA)	Warkworth (EPA)	AQ01	AQ02	AQ03	AQ04	Warkworth HVAS
Maximum 24-hour average in $\mu\text{g}/\text{m}^3$								
2011	17*	78*	26*	49*	83*	43*	42*	60
2012	44	88	50	47	76	47	45	68
2013	63	84	65	65	97	71	65	63
2014	64	64	68	55	70	51	56	75
2015	70	77	68	52	55	43	74	39
2016	43	48	42	49	49	39	44	40
2017	51	79	51	66	52	39	49	46
2018	201	192	162	152	164	144	125	62
2019	227 ^A	446 ^A	182 ^A	59	18	25	25	163
Number of days above 24-hour average criteria								
2011	0*	8*	0*	0*	2*	0*	0*	3
2012	0	20	0	0	7	0	0	1
2013	6	28	8	4	20	1	3	2
2014	6	6	3	2	2	1	1	3
2015	1	5	3	1	3	0	2	0
2016	0	0	0	0	0	0	0	0
2017	5	1	9	5	2	0	0	0
2018	11	25	16	15	9	6	12	2
2019	54 ^A	66 ^A	59 ^A	9	1	9	6	9
Annual Average in $\mu\text{g}/\text{m}^3$								
2011	13*	22*	20*	17*	17*	15*	15*	20*
2012	11	26	21	21	21	17	18	19
2013	19	26	21	19	23	17	17	22
2014	18	23	21	18	19	15	18	13
2015	15	20	18	16	16	13	17	16
2016	17	20	19	16	18	14	16	15
2017	18	23	22	21	19	15	17	19
2018	24	28	26	26	24	19	25	24
2019	32 ^A	38 ^A	33 ^A	24	18	25	25	32

* Based on incomplete year of data

^A Data does not exclude days deemed 'extraordinary' by DPIE

Table 10-3: Baseline Data, PM_{2.5} Concentrations

Year	Camberwell (EPA)	Singleton (EPA)
Maximum 24-hour average in µg/m³		
2011	23	22
2012	20	20
2013	30	23
2014	32	29
2015	24	25
2016	21	28
2017	25	30
2018	23	19
2019	240	236
Number of days above 24-hour average criteria		
2011	0*	0
2012	0	0
2013	1	0
2014	1	1
2015	0	0
2016	0	2
2017	0	1
2018	0	0
2019	24	22
Annual Average in µg/m³		
2011	8.5*	7.6
2012	7.5	8.0
2013	8.2	7.9
2014	7.8	7.8
2015	7.2	7.6
2016	7.5	7.9
2017	7.4	8.2
2018	8.4	8.1
2019	10.5	10.9

Table 10-4: Baseline Data, TSP Concentrations

Year	Warkworth (HVO)	HV01	HV02	HV03	HV04
Annual Average in $\mu\text{g}/\text{m}^3$					
2011	50	52*	49*	32*	40*
2012	51	65	61	39	59
2013	56	61	62	41	49
2014	54	67	68	48	62
2015	52	55	51	41	61
2016	50	48	48	40	57
2017	65	69	62	50	64
2018	80	77	71	56	75
2019	80	60	63	45	63

Table 10-5: Baseline Data, Annual Average Dust Deposition Concentrations

Year	DS12*	DS13*	DS14*	DS16	D01*	D03*	D07*	D09*	D11	D12*	D17	D19*	D20*	D21	D22	D23*	D24	D25	D26*
Annual average expressed as $\text{g}/\text{m}^2/\text{month}$																			
2011	2.9	2.3	3.7	3.6	8.1	3	5.2	3.7	2	2.8	1.4	2.5	1.4	1.2	1.2	2	1.1	1.6	1.2
2012	3.0	2.5	4.8	2.6	18	2.3	5.8	4.5	2.3	3.5	1.9	3.3	1.8	1.6	1.8	1.9	1.1	2.3	1.7
2013	3.1	2.1	6.4	2.9	8.8	2.8	5.0	3.9	2.4	2.9	2.1	3.0	1.8	2.2	2.0	1.8	1.1	2.7	1.2
2014	2.5	2.5	4.5	3.2	2.9	3.1	6.0	2.0	2.5	3.3	1.8	3.2	1.8	1.9	2.2	2.1	1.4	2.8	2.1
2015	2.3	2.1	3.6	2.9	2.8	3.0	5.4	4.4	2.2	3.3	1.7	3.1	1.6	2.0	2.0	1.8	1.4	2.6	2.1
2016	3.0	2.5	4.5	2.8	3.7	2.8	3.9	2.6	2.3	3.3	1.4	2.5	1.6	1.7	2.2	1.4	1	2.8	1.9
2017	3.3	2.5	5.4	3.8	4.1	2.8	4.3	2	1.4	3	1.2	2.3	1.1	1.2	2.4	3.9	0.7	1.9	1.4
2018	3.7	2.9	5.5	3.8	-	-	-	-	1.9	-	-	3.0	-	1.6	2.5	-	-	-	-
2019	3.8	3.2	8.3	5.1	-	-	-	-	2.1	-	-	3.8	-	1.7	3.7	-	-	-	-

Table 10-6: Baseline Data, NO₂ Concentrations

Year	Singleton (EPA)
Maximum 1-hour Average in µg/m³	
2011	
2012	4.0
2013	4.1
2014	3.6
2015	3.2
2016	3.2
2017	3.6
2018	3.5
2019	3.7
Annual Average in µg/m³	
2011	0.5
2012	0.9
2013	0.9
2014	0.8
2015	0.8
2016	0.8
2017	0.8
2018	0.8
2019	0.7

In summary, the monitoring data show that:

- in terms of PM₁₀ concentrations, most monitoring sites in the vicinity of the Project have experienced at least one day above the EPA's 50 µg/m³ criterion in the past five years, but annual averages have complied with EPA criteria for all locations;
- TSP and NO₂ concentrations are below their relevant EPA criteria; and
- depositional dust levels have exceeded EPA criteria near mining areas but are below EPA criteria at sensitive receptor locations.

The two closest PM_{2.5} monitoring stations, Camberwell and Singleton, have measured PM_{2.5} concentrations which are close to, or have exceeded, national advisory reporting goals.

10.4 Meteorological Data

Local environmental conditions with direct implications for air quality management include the prevailing meteorology and location of sensitive receptors in relation to the Project. The nearest sensitive receptors are predominantly to the north-west and south-east of the Project.

Meteorological conditions are important for determining the direction and rate at which emissions from activities, such as mining, will disperse. The key meteorological parameters for air quality management are wind speed and wind direction.

Analysis of meteorological data for years 2011 – 2015, inclusive, was undertaken from four meteorological stations located within a 20 x 20 kilometre radius of United Wambo, including:

- Wambo Mine, operated by Peabody;
- Warkworth, operated by EPA;
- Maison Dieu, operated by EPA; and
- Jerrys Plains, operated by EPA;

The most representative meteorological station was determined to be Wambo Mine, as it is located closest to the existing mining operations.

The prevailing winds in the vicinity of the United Wambo Project are from either the north-west or south-east, depending on the season. This is demonstrated by the wind roses shown in **Figure 10-2** which summarise the wind data collected at Wambo Mine in 2014 (a representative year). The prevailing north-west and south-east alignment of winds means that dust generating activities will need to be managed in a way to minimise impacts to the sensitive receptors located to the south-east and north-west of the United Wambo Project.

The meteorological conditions that most commonly lead to elevated dust concentrations include:

- warm weather and extended periods without rainfall, resulting in less surface moisture;
- wind speeds greater than 5 m/s: these winds are conducive to higher wind erosion rates; and
- stable conditions, such as at night with light winds and when a temperature inversion is present. Under these conditions, plume dispersion is poor and elevated dust concentrations can occur due to mechanically generated emissions. Temperature inversions are most common during the cooler months from May to August.

The existing environment is characterised by higher rainfall in summer and lower rainfall in winter. There are prevailing north-westerly winds in autumn, winter and spring which means that sensitive receptors will be downwind of proposed mining activities works for the majority of the time.

The most effective emission mitigation measures will focus on controlling emissions under unfavourable meteorological conditions, such as dry, windy, stable night-time conditions and/or when winds are blowing from construction activities towards sensitive receptors.

The wind speed, temperature and rainfall data from the Wambo Mine Meteorological Station is shown in **Figure 10-3** with the annual statistics provided in

Table 10-7. The data shows that wind speeds are similar from year-to-year and that there can be some variation in rainfall from year-to-year.



Figure 10-2: Annual Wind Roses for Wambo Meteorological Station (2014 representative year)

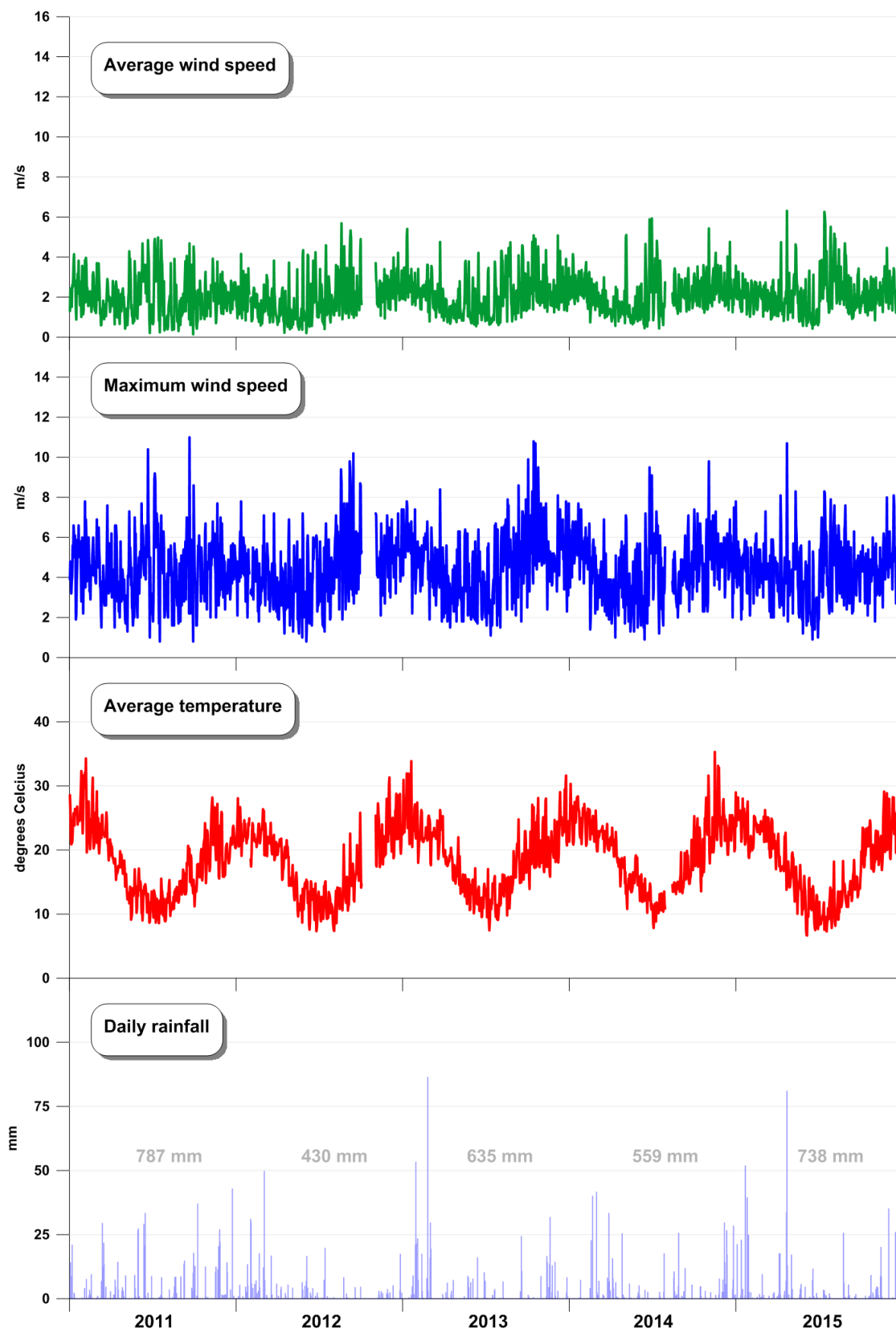


Figure 10-3: Wind Speed, Temperature and Rainfall Data from Wambo Meteorological Station

Table 10-7: Annual Statistics from Wambo Meteorological Station, 2011 – 2019

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mean wind speed (m/s)	2.0	1.9	2.1	2.2	2.2	2.5	2.0	2.1	2.1
Percentage of calms (%)	21	25	17	13	13	10	13	10	11
Rainfall (mm)	787	430	635	559	738	721	443	536	387

10.5 Sensitive Receivers

Properties that may potentially experience air quality impacts from United Wambo were identified and assessed in the **United Wambo Open Cut Coal Mine Project Air quality Impact Assessment (Jacobs, 2016) (AQIA)** and the Updated AQIA completed for the Independent Planning Commission in May 2018. The mining area is predominantly surrounded by mine-owned land. The closest residences are located approximately 1.5 kilometres to the north-west along the Golden Highway near Moses Crossing and Redmanvale Road.

The modelling results of the AQIA indicated that:

- there are no private residences that are predicted to experience annual average TSP or dust deposition levels above the air quality assessment criteria from United Wambo alone;
- there are approximately 41 mine-owned properties that may experience exceedances of the air quality assessment criteria due the cumulative impacts of United Wambo and all other sources;
- Receiver 19 is expected to experience an increase in the number of days above the 50 $\mu\text{g}/\text{m}^3$ criterion and annual average PM_{10} and $\text{PM}_{2.5}$ concentrations above criterion in Years 2, 6, 11 and 16 from all sources. This residence has since been purchased by United Wambo.
- A small number of vacant private landholdings located in Warkworth are also predicted to experience exceedances of the EPA's air quality assessment criteria. These landholdings are all on land zoned RU1 rural and do not meet the minimum lot size requirements for the Singleton LEP 2013 for the construction of a dwelling, and several are also located at or below the flood planning level. Therefore, based on current planning controls, a dwelling is unable to be built on these lots and no further consideration of air quality impacts on these properties will be required; and
- Warkworth is expected to experience a measureable change in the number of days above 50 $\mu\text{g}/\text{m}^3$. This is due to United Wambo as well as other neighbouring mining operations which have been assumed to be operating at maximum approved production. All other monitored locations are expected to experience no change in the number of days above 50 $\mu\text{g}/\text{m}^3$ for PM_{10} .

The location of the sensitive receivers is shown on **Figure 10-1**.

10.5.1 Mine-Owned Residences

All tenants of Glencore-owned premises are required to enter into a Residential Tenancy Agreement. In addition to the Standard Tenancy Agreements, all leases within mining impact areas contain special conditions of tenancy that the tenant is required to review and sign.

The special conditions contain clauses to bring possible mining related activities and impacts to the attention of prospective tenants to help inform their decision to occupy the residence. The conditions

also provide tenants with the option to vacate penalty free at any time during the tenancy should they determine that mining impacts are unacceptable.

11. Implementation

11.1 Dust Mitigation and Management Measures

Air Quality (Dust) Mitigation and Management Measures have been developed to minimise the impact of United Wambo operations on privately and mine-owned residences. Specifically, these measures consist of controls and practices aimed to minimise the offsite impacts caused by wind-blown, traffic generated, and blast dust.

United Wambo will utilise a range of proactive and reactive dust mitigation and management measures informed by real-time dust and meteorological monitoring systems. Proactive strategies will include utilising meteorological forecasting to plan activities in advance of potentially adverse conditions. Reactive strategies will include the modification or suspension of activities in response to a series of triggers such as visual conditions, meteorological conditions or elevated ambient air quality conditions.

These controls and practices are detailed in the following sections.

11.1.1 Design Controls

United Wambo has been designed to minimise air quality impacts with a range of mitigation and management measures incorporated into the Mine Design. These measures include design controls such as:

- development of a mine plan that allows for timely progressive rehabilitation;
- minimising the area of disturbed land at any one time as much as practicable;
- minimising the length of haul roads (where practicable) and adopting controls for haul road dust emissions;
- constructing the main haul roads with compacted gravel;
- maintaining haul roads so as to minimise dust;
- clearly defining all active roads with the development of minor roads being limited;
- constructing unsealed minor roads so as to minimise dust generation (for example, by using well-compacted select material);
- using temporary rehabilitation and stabilisation measures on disturbed land;
- progressively rehabilitating all overburden emplacement areas and disturbed land associated with United Wambo; and
- retention of buffer land and/or mine-owned lands, which predominantly surround the operation.

11.1.1.1 Operational Controls

In addition to the design controls discussed in **Section 11.1.1** above, United Wambo will implement operational controls to minimise air quality emissions which may be generated from United Wambo

operations. As part of this system, United Wambo will implement both proactive and reactive operational controls to manage dust generation and air quality emissions.

Operational controls may be implemented as required by United Wambo, and are detailed in **Table 11-1** below. These controls have been identified in consideration of the potential dust generating activities and have been developed utilising a risk-based approach. United Wambo will be responsible for the implementation of air quality measures as they relate to open cut operations, whilst Wambo will be responsible for the implementation of measures that relate to the CHPP, Train Loading Facility, and Wambo Underground Mine.

Table 11-1: Emissions Management Measures for United Wambo

Reference/ Source	Activity/ Dust Source	Emissions Management Measure	Timing	Responsibility	Evidence/ Check
EIS, Table 6.9 (i)	Stripping topsoil by scraper	Watering of haul routes	Ongoing	Open Cut Manager/ Superintendent	Shift Reports Environmental Inspection Checklist
		Restricting vehicle speeds	As required during stripping		
EIS, Table 6.9 (ii)	Drilling overburden	Water injection and/or application of water to drill cuttings upon removal	During drilling	Drill and Blast Superintendent	Shift Reports
		Dust curtains	During drilling		
		Ceasing operations when visible dust is generated	Cease during adverse weather		
EIS, Table 6.9 (iii)	Blasting overburden	Pre-blast checks including review of meteorological conditions	Prior to blasting	Drill and Blast Superintendent	Shift Reports Blasting Checklist
EIS, Table 6.9 (iv)	Hauling overburden and coal on unsealed roads	Watering of haul route	Ongoing	Open Cut Manager/ Mining Supervisor/ Superintendent	Shift Reports Purchase records Environmental Inspection Checklist
		Gravel compaction and maintenance of haul routes	Ongoing		
		Restricting vehicle speeds	As required		
		Clearly marked haul routes	Ongoing		
		Fleet optimisation to reduce vehicle kilometres travelled	Prior to purchase		
		Prompt clean-up of any material spillage	As required		

Reference/ Source	Activity/ Dust Source	Emissions Management Measure	Timing	Responsibility	Evidence/ Check
EIS, Table 6.9 (v)	Loading and unloading of overburden	Minimisation of fall distances during unloading and loading	Ongoing	Open Cut Manager/ Mining Supervisor/ Superintendent	Shift Reports Environmental Inspection Checklist
		Planning of dump locations based on weather conditions	Daily		
		Ceasing operations during adverse dust conditions	During adverse conditions		
EIS, Table 6.9 (x)	Wind erosion from partially rehabilitated dumps	Partial rehabilitation/stabilisation	As available	Environment & Community Manager/Open Cut Manager	Environmental Inspection Checklist Audits
EIS, Table 6.9 (xii)	Grading roads	Watering of haul routes	Ongoing	Open Cut Manager/ Mining Supervisor/ Superintendent	Daily Reports
		Restricting vehicle speeds	As required		
		Clearly marked routes	Ongoing		
EIS, Table 6.9 (xiii)	Machinery exhausts and plant and equipment	Appropriately servicing all machinery in accordance with manufacturer recommendations	As required	Maintenance Manager	Maintenance Records
		Targeting the maintenance so that equipment remains fit for purpose over its whole life cycle	Ongoing		
		Defining failure modes, effects and criticality with regard to air emissions	As required		
Social Opportunity and Impact Assessment, Section 5.4, Table 5.20	Windblown dust	Inspecting and as necessary cleaning drinking water tanks every 2 years for all private residences and United Wambo JV owned residences within 4 km of the mining area	Every 2 years	Environment & Community Manager	Consultation Records

11.1.2 Proactive Air Quality Management

A range of proactive management measures will be implemented by United Wambo to manage dust emissions. These proactive management measures are detailed in **Section 11.1.2.1** and **Section 11.1.2.2** below. United Wambo will seek to undertake best practice and continuous improvement for active air quality management with additional continuous improvement processes detailed in **Section 11.6.1** and **Section 11.6.2**.

11.1.2.1 Meteorological Monitoring

United Wambo will utilise a daily weather and dust risk forecasting tool to predict the likelihood of adverse conditions for dust generation and assist operational dust management, as discussed further in **Section 12.2.3**. A daily report showing forecast weather conditions and predicted dust risk will be emailed to Mining Supervisors, Control Room Operators and Environment and Community Personnel, generally before 7:00 am.

This daily forecast system provides early warning of potential adverse meteorological conditions and dust risks, thus facilitating proactive management of operational activities to reduce dust generation potential. The daily report includes a two-day forecast of:

- dust risk index;
- dust plume profile (dust risk contour plots); and
- meteorological conditions (including wind roses, vertical temperature profiles and rainfall).

Mining Supervisors are to review the daily forecast report prior to the pre-start shift meeting and discussed with the oncoming crew during the pre-shift meeting, including any contingency measures to be employed during the course of the shift.

Further review of dust risk, weather conditions and performance of control measures will also be discussed during the Daily Production Meeting (or equivalent).

11.1.2.2 Air Quality Surveillance

United Wambo will implement a dust surveillance camera network to allow supervisors and mine management to remotely monitor operational dust management. Surveillance camera imagery is accessible by personnel via TV screens located at United Wambo operations or via the internet.

Mining Supervisors will assess dust conditions demonstrated by the camera network against the **United Wambo Dust TARP**.

This will be used to monitor the implementation of controls as required and notification to operational staff to modify work methods to conditions as outlined above in **Section 11.1.2.1**.

The surveillance camera network will also be used to investigate peak dust episodes, community complaints, and identify dust sources.

11.2 Offsite Odours and Blast Emissions

In accordance with Condition B28 of **SSD 7142** and **Section 129** of the *POEO Act*, United Wambo is required to implement best practice air quality management, including all reasonable and feasible measures to minimise offsite odours, fume and dust emissions from the site.

The **United Wambo Blast Management Plan** details the control measures and procedures to be implemented to reduce the incidence and impact of blast related dust, fume, and odour emissions from the operation.

United Wambo have prepared and implemented a **Blast Fume Management Strategy (BFMS)** to provide fume minimisation measures at United for all surface blasting activities. The BFMS form an Appendix to the **United Wambo Blast Management Plan**.

11.3 Spontaneous Combustion

There is no history of spontaneous combustion at United or Wambo mines and site-specific coal testing shows a low propensity for spontaneous combustion. United Wambo will continue to evaluate and manage potential issues associated with spontaneous combustion.

United Wambo is committed to the management of potential air quality issues associated with spontaneous combustion. This commitment will be demonstrated by the application of a hierarchy of management controls. United Wambo hierarchy of controls applied to spontaneous combustion will be as follows:

- Elimination – processing and shipping of coal for its end use before the oxidation reaction that leads to spontaneous combustion occurs.
- Separation – Where material has or is showing signs of spontaneous combustion it is stockpiled separately from other inert coals to avoid spreading the heating.
- Engineering – Controls that minimise the impact of hot material such as establishing sprinklers/bench flooding to cool material prior to mining and selective digging and/or burying.
- Procedures – Including early identification of spontaneous combustion; dealing with heated materials; provision of protective or first response capacity; and preparing for / cleaning up after spontaneous combustion.
- Personnel skills and training – Personnel training and education on the effects of spontaneous combustion, how to manage actual and potential for spontaneous combustion in overburden emplacement areas and coal stockpiles and how to prevent incident to all people who work in affected areas.
- PPE – Including gas monitors, masks, respirators and eye protection are required when potentially exposed to spontaneous combustion.

United Wambo will use a number of measures to minimise spontaneous combustion. A summary of the mitigation measures to be implemented at United Wambo are shown in **Table 11-2**.

Table 11-2 Spontaneous Combustion Mitigation Measures

Objective	Mitigation Measure
Identify bands of mine partings and overburden waste material susceptible to spontaneous combustion. Rapid and effective burial of carbonaceous material.	Coordinate testing ahead of mining to identify material bands that need to be selectively handled given their susceptibility to heating where there have been underground workings (Woodlands Hill seam); Control overburden lift heights if spon com is predicted Maintain dumps at planned levels. Carbonaceous material is buried in a short space of time that prevents heating with a minimum depth of inert cover of 5 metres.
	During design of strips adjacent to known underground workings, the Spontaneous Combustion PHMP and

Minimise the potential for spontaneous combustion in abandoned underground workings	supporting risk assessment will be reviewed with hazards and associated controls documented and implemented.
	Where required, pack the Endwall with inert material to minimise oxygen ingress after completing coaling or as exposed.
	Placement of inert material in discrete areas of the underground workings prior to exposure of the seam.
	Any boreholes intersecting underground workings will be sealed.
Minimise the potential for spontaneous combustion in exposed coal in walls	Coal measures are moderate adiabatic self heating propensity. Mine design – pre-splitting and scaling walls.
Minimise unplanned coal losses and volume of carbonaceous material sent to overburden emplacement areas.	Minimising coal losses from coal extraction by best practice blast design and management and competent plant operators.
Minimise the potential for outbreaks of spontaneous combustion in coal stockpiles.	Coal to be stockpiled on pads which have been constructed to a design and are stable and free draining.
	Coal stockpiles to be constructed at least 10 m in from any overburden bund which may surround the perimeter of the pad. This will allow access to the toe of the stockpile for pedestrians, light vehicles and equipment for the purpose of carrying out inspections, monitoring or spontaneous combustion mitigation activities.
	The maximum height of any stockpile should not exceed a height that prevents safe reclamation by a front end loader.

11.4 Greenhouse Gas Management

United Wambo will use a number of measures to minimise greenhouse gas emissions. A summary of the mitigation measures to be implemented at United Wambo are shown in **Table 11-3**.

Table 11-3: Greenhouse Gas Mitigation Measures

Mitigation Measure	Application at United Wambo
Limiting the length of material haulage routes to reduce diesel usage and associated emissions	Length of haulage routes has been optimised to minimise dust, noise, fuel use and improve operating efficiency.
Optimising ramp gradients to reduce diesel usage and associated emissions	Ramp gradients have been optimised according to pit geometry parameters and mobile equipment performance characteristics.
Continually improve the fuel efficiency of haul trucks operating at the mine to	United Wambo will seek opportunities to use the existing trucks currently in use at Wambo and from within the Glencore and Peabody groups to maximise

Mitigation Measure	Application at United Wambo
reduce diesel usage and associated emissions	the life of this equipment. Where new trucks are purchased during the life of the Project, fuel/energy efficiency will be considered in the selection criteria. Haul road design parameters such as gradient and haul length are optimised resulting in the efficient haulage of overburden per unit of fuel consumed.
Payload management to reduce diesel usage and associated emissions	Payload will be constantly monitored and actively managed to maintain efficiency, over time reducing the overall diesel consumption of the mine and, thereby, reducing GHG emissions.
Increasing haul truck payload to reduce the number of truck loads required and consequently reduce diesel usage and associated emissions	Truck tray capacity will be reviewed as part of the efficient management of the operation, including the option of fitting custom built trays to maximise payloads. Payload will also be maximised by blasting strategies that optimise material size characteristics.
Improving rolling resistance of haul roads to reduce diesel usage and associated emissions	Haul roads are planned to be constructed on solid rock rather than on soil or subsoil material where practical.
Reducing idling times to reduce diesel usage and associated emissions	Reducing idle times will be an ongoing performance measure. Initiatives to reduce idle times will continue to be introduced over the life of the Project. A reduction in idle times will improve fuel consumption rates per volume of material moved.
Scheduling activities so that equipment operation is optimised to reduce energy usage and associated emissions	Scheduling activities to optimise equipment operation will be a routine activity. United will prepare long, medium and short term plans to optimise production. Over time, this will reduce the overall diesel consumption of the mine and, thereby, reduce greenhouse gas emissions.
Seek to continually improve the fuel efficiency and diesel emissions of mine equipment during the purchase of new equipment	United Wambo will seek opportunities to use the existing equipment currently in use at Wambo and from within the Glencore and Peabody groups to maximise the life of this equipment. Where new equipment is purchased during the life of the Project; fuel/energy efficiency and reasonable and feasible diesel emissions reduction technology will be considered in the selection criteria.
Blasting strategies to improve extraction and processing energy use efficiency and reduce associated emissions	Blast management practices will be employed to size material for optimum payloads and minimise the need for secondary treatment of waste material.
Maximising resource recovery efficiency to maximise energy use efficiency and reduce associated emissions	Long, medium and short term operational plans will be developed to optimise the recovery of approved resources.

Mitigation Measure	Application at United Wambo
Working machines to their upper design performance to optimise energy usage and associated emissions	Glencore's business objectives support and promote effective equipment utilisation and performance rates, resulting in improved fuel consumption rates per volume of material moved.
Preventing unnecessary water ingress to reduce pump energy usage and associated emissions	The surface water management system is designed to maximise separation of clean and dirty water systems. Clean water will be diverted away from mining areas, consistent with the mine water management system design outlined in the EIS.
In-pit servicing to reduce diesel usage associated with transporting equipment	Equipment will be serviced in pit, where practical, reducing unnecessary unproductive travel time and energy use.
High efficiency workshop lighting	New workshop areas will use high efficiency lighting, reducing energy use.
High efficiency heating, ventilation and cooling (HVAC) systems for administrative buildings	New administration buildings will use high efficiency HVAC systems reducing energy use.

The management of Scope 3 greenhouse gas emissions will be outlined in the **Export Management Plan** in accordance with Conditions B32 to B36 of **SSD 7142**.

11.5 Emissions

Emissions from the United Wambo operation will be from a variety of activities including material handling, material transport, processing, diesel engine exhausts, wind erosion, blasting and, potentially, the spontaneous combustion of coal. These emissions would mainly comprise of particulate matter (TSP, PM₁₀ and PM_{2.5}), although there would also be emissions from machinery exhausts such as carbon monoxide (CO), oxides of nitrogen (NO_x) and particulate matter. To a lesser extent, there would be emissions from the spontaneous combustion of coal, should that occur.

SSD-7142 Schedule 2 Condition B29(e)(i) requires a monitoring program that establishes a diesel combustion emissions baseline. **Table 11-4** shows the baseline estimate of PM_{2.5} emissions from diesel engines. It should be noted that this estimate is based on generic emission factors for the industry (from the **EPA's Air Emissions Inventory for 2008; EPA 2012**) and is not specific to data produced directly from the Original Equipment Manufacturers (OEMs) of equipment used at United Wambo. Fuel consumption will be monitored at the United Wambo operation to allow for re-calculation and assessment of any change in PM_{2.5} emissions from the baseline estimate in **Table 11-4**, and will be reported on in the Annual Review.

Table 11-4: Baseline Estimate of PM_{2.5} Emissions from Diesel Engines

Equipment	Fuel consumption (kL/y)	PM _{2.5} emission factor (kg/kL)	PM _{2.5} emissions (kg/y)
All (calculation assumes all diesel is consumed by haul trucks)	55,252,654 Year 2 of operation	2.75 EPA (2012)	152,210
Total	55,252,654	-	152,210

Controls for the emission of PM_{2.5} within the diesel exhaust include:

- servicing all machinery in accordance with maintenance contracts and adopting original equipment manufacturer recommendations for maintenance;
- targeting the maintenance to ensure equipment remains fit for purpose over its whole life cycle; and
- defining failure modes, effects and criticality.

11.6 Continuous Improvement

11.6.1 Best Practice Air Quality Mitigation Measures

The proposed dust management measures as outlined in **Section 11.1** have been compared to the measures outlined in the ***“NSW Coal Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining” (Donnelly et al, 2011).*** This comparison identified that the majority of proposed measures are consistent with best practice dust mitigation measures.

Where possible, United Wambo will implement all reasonable and feasible best practice air quality mitigation measures. The basis for continuous improvement of air quality mitigation measures will be through the ongoing monitoring of dust impacts and the corrective/preventative action process outlined in the ***United Wambo Environmental Management Strategy*** and **Section 13.1.2** of this plan. Through the development of corrective/preventative actions, United Wambo will investigate ways to reduce the air quality impacts generated by the operation. Any new mitigation measures that are implemented as a result of these investigations will be reported in the Annual Review.

United Wambo will also maintain awareness of new technologies for air quality impact mitigation through participation in relevant industry groups.

11.6.2 Active Air Quality Management

As noted in **Section 11.1.2**, the Mining Supervisor will utilize the daily weather forecast information to assess the potential impacts the weather conditions may have on mining operations and environmental impacts. United Wambo will progressively develop the forecasting of potential environmental impacts as both site based experience and appropriate technologies become available. In addition, GCAA is also undertaking a continuous improvement program to identify and implement, where feasible, management mechanisms which provide for the prediction of potential dust emission levels based on predicted meteorological information. This continuous improvement program will also review technologies available to accurately measure meteorological information.

The long term objective of the air quality component of the active management system is to:

- provide an estimate of the probability of the impacts occurring;
- quantify the extent of the potential impacts; and
- provide a mechanism to assess the change that could occur due to meteorological conditions and mine operations, and tailor the mining activities, where possible, to suit the forecast conditions.

11.7 Change Management

All changes to operations, facilities, plant equipment and production processes are required to be assessed in accordance with the change management process. Change management will be undertaken at United Wambo in accordance with the **EM Strategy**, which provides the following process for managing the risks associated with change:

- identify the change;
- assess the potential risks associated with the change and develop a risk management plan;
- approve the change subject to the risk management plan;
- communicate and implement the change and risk management actions;
- monitor and evaluate the change and risk management plan; and
- document the change management process.

11.8 Training

Effective implementation and maintenance of this plan depends on the competency of the United Wambo Workforce and its Contractors. General dust emission reduction training is provided to all new employees and contractors as part of the United Wambo Site Specific Induction program.

Additional training will be provided to Employees and Contractors based on the **Training Needs Analysis**. This training will be targeted to provide employees and contractors with specific skills and knowledge to enable them to manage air quality in accordance with this Management Plan and corresponding procedures. This training will include a familiarisation of statutory requirements, implementation of the Air Quality and Greenhouse Gas Management Plan, understanding the current air quality monitoring network, and the implementation of air quality mitigation measures.

12. Monitoring

12.1 Monitoring

All air quality monitoring is undertaken in accordance with the statutory requirements associated with the United and Wambo EPLs and Development Consent Conditions, which specify required methods of sampling, analysis and frequency of monitoring.

The United Wambo air quality monitoring program includes a combination of TSP and PM₁₀ High Volume Air Samplers (HVAS), continuous PM₁₀ monitoring units (TEOMs) and a campaign of two continuous PM_{2.5} monitoring units (TEOMs). Monitors are positioned to allow for the contribution of United Wambo operations to local air quality to be determined for both nearby residents and tenanted properties owned by United Wambo and other mining companies.

Historic dust deposition gauges have been removed from the monitoring network due to being superseded with more contemporary air quality monitoring equipment and dust deposition criteria not being issued with the ***SSD 7142 Development Consent Conditions***.

The locations of air quality and meteorological monitoring equipment in the vicinity of United Wambo are shown in ***Figure 12-1***. ***Figure 12-1*** and ***Table 12-1*** and have been chosen to be representative of the surrounding areas, including at nearest privately-owned residences. The monitoring equipment, frequency of monitoring and relevant monitoring standards are summarised in ***Table 12-2***.

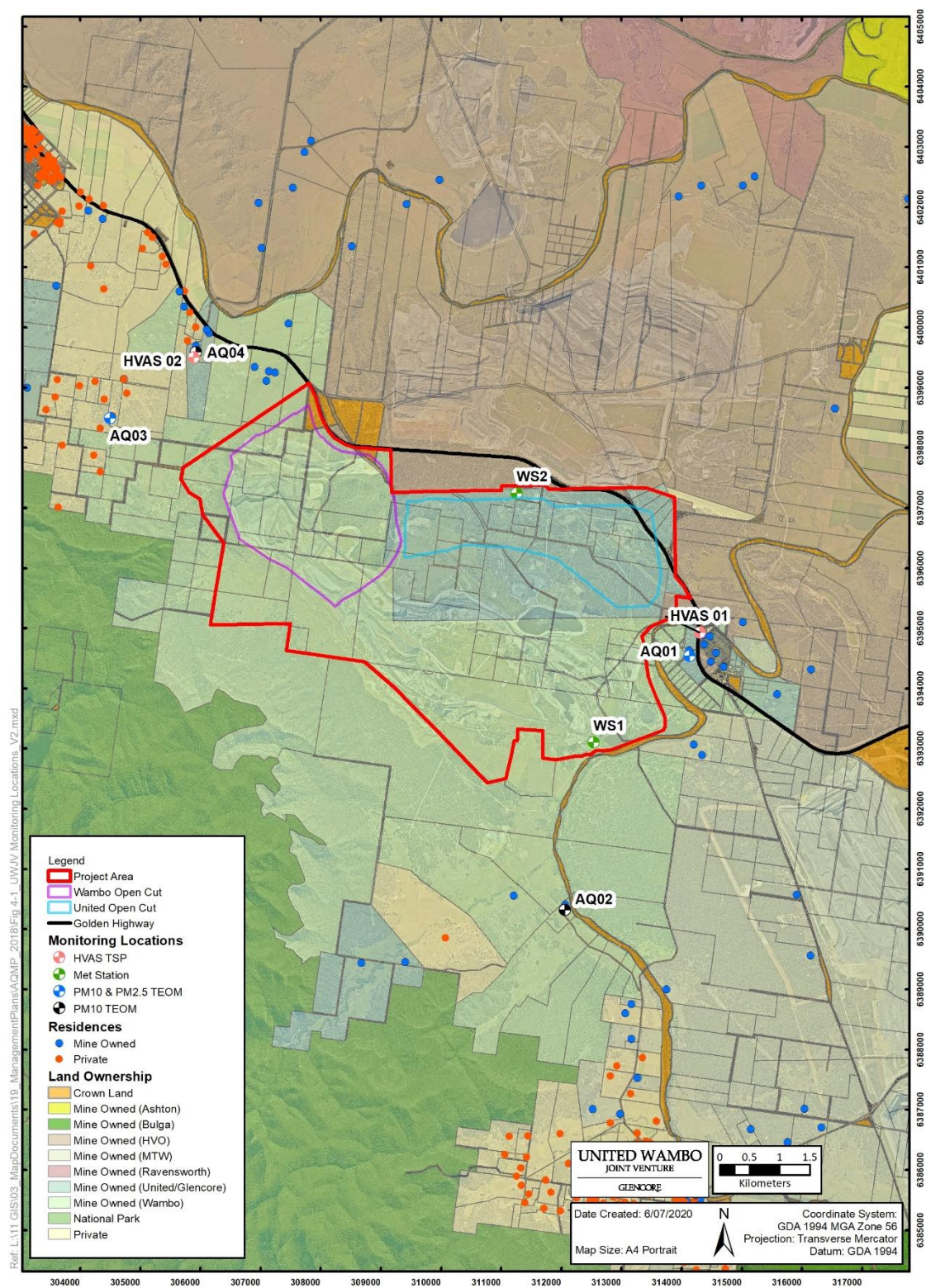


Figure 12-1: Air Quality Monitoring Locations

Table 12-1: Air Quality Monitoring Locations

Monitoring Site	Parameter	Easting	Northing	Location
AQ01 – Warkworth	PM ₁₀ and PM _{2.5}	314129	6394541	Located to the east of the Mine: downwind monitor when wind from north-west, upwind monitor when wind is from the south-east
AQ02 – North Bulga	PM ₁₀	312055	6390321	Located to the south east of the Mine: downwind monitor when wind from north-west, upwind monitor when wind is from the south-east
AQ03 – Redmanvale Rd	PM ₁₀ and PM _{2.5}	304502	6398490	Located to the north-west of the Mine: downwind monitor when wind from south-east, upwind monitor when wind is from the north-west
AQ04 – Moses Crossing	PM ₁₀	305928	6399587	Located to the north-west of the Mine: downwind monitor when wind from south-east, upwind monitor when wind is from the north-west
HVAS 01	TSP	314300	6394930	Warkworth (HVAS 01 is owned and operated by Hunter Valley Operations, with results forwarded to United Wambo monthly)
HVAS 02	TSP	314300	6394930	Moses Crossing (HVAS 02 is owned and operated by Hunter Valley Operations, with results forwarded to United Wambo monthly) – representative of residences to the north-west of United Wambo
WS1	Met	312536	6393108	Near MIA
WS2	Met	311529	6397247	North of United Open Cut

Table 12-2: Equipment, Frequency and Standards of Monitoring

Monitoring site(s)	Indicator(s)	Equipment Type	Frequency	Standard	Purpose
HVAS 01, HVAS 02	TSP	HVAS	Six-day cycle	AS/NZS 3580.9.3:2015	Compliance
AQ02 and AQ03	PM ₁₀	TEOM	Continuous	AS/NZS 3580.9.8:2008 (R2018)	Compliance and management
AQ01 and AQ04	PM ₁₀ and PM _{2.5}	TEOM	Continuous	AS/NZS 3580.9.16:2016 – PM ₁₀ AS/NZS 3580.9.13:2013 – PM _{2.5}	Compliance and management
WS1, WS2	Meteorology	Met Station	Continuous	AS 3580.14:2011	Compliance and management

This air quality monitoring program will be reviewed in accordance with **Section 11.7**. Any changes to the number, type or location of monitors will need to be approved by the Department of Planning and Environment.

12.1.1 Meteorological Monitoring

Meteorological monitoring is undertaken in accordance with the Development Consent and EPL. The meteorological monitoring provides United Wambo with information to allow for the most appropriate response to changes in weather conditions.

Meteorological monitoring is currently undertaken in the two locations listed above, and includes the parameters outlined in **Table 12-3**.

Table 12-3: Parameters Measured at Meteorological Monitoring Stations

Parameter	Sampling Method ¹	Units of Measure	Averaging Period ²	Frequency
Rainfall	AM-4	mm	1 hour	Continuous
Wind Speed at 10 metres	AM-2 & AM-4	m/s	15 minutes	Continuous
Wind Direction at 10 metres	AM-2 & AM-4	Degrees	15 minutes	Continuous
Temperature at 2 metres and 10 metres	AM-4	Celsius	15 minutes	Continuous
Sigma Theta (at 10 metres)	AM-2 & AM-4	Degrees	15 minutes	Continuous
Total Solar Radiation (at 10 metres)	AM-4	Watts/m ²	15 minutes	Continuous
Lapse Rate ³	-	°C /100m	-	-



Note

¹ Dec, 2007: approved methods for the Sampling and Analysis of Air Pollutants in NSW

2 Lapse rate will be calculated from measurements made at 2m and 10m

The continuous monitoring network includes two ten-metre tower weather stations, WS1 and WS2, located to the south-east and north, respectively, of the active mining areas. These stations have been sited generally in accordance with **AS/NZS 3580.1.1:2007: Methods for Sampling and Analysis of Ambient Air - Guide to Siting Air Monitoring Equipment**.

All meteorological stations are capable of continuous real-time measurement of temperature lapse rate in accordance with the **NSW Noise Policy for Industry** and **Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales**. Each meteorological station will collect sigma-theta data, that is, the standard deviation of the horizontal wind direction. Sigma theta will be used to estimate the atmospheric stability class (an indication of the temperature lapse rate) in accordance with the procedures of the **US EPA (2000)**.

12.1.2 High Volume Air Samplers (HVAS)

As shown in **Figure 12-1**, in order to measure total suspended particle (TSP) concentrations in areas surrounding the United Wambo mining areas, one high volume air sampler (HVAS) is in place in the Warkworth village.

High volume air samplers are run on a six-day cycle and are operated for a period of 24 hours. The air is passed through a filter system to determine the amount of TSP dust that is contained in the air. The samples are collected after running for a period of 24 hours, and analysed.

HVAS 01 and HVAS 02 are owned and operated by HVO, with results forwarded to United Wambo monthly.

12.1.3 Continuous Monitoring Units – PM₁₀

United Wambo operate a series of real time continuous Tapered Element Oscillating Microbalance (TEOM) Monitoring Units that are used to assess operations on a real time basis and to provide information that can be used to respond to air quality issues. Each unit records the following data that can be used to assess air quality from the complex:

- real time PM₁₀ concentrations in µg/m³;
- rolling 24 hour average PM₁₀ concentrations in µg/m³ ; and
- wind direction, wind speed and rainfall.

Real time monitors are continuous monitors that can be accessed by site personnel to determine real time air quality conditions, or can be used to perform historical searches to respond to complaints or issues. Data from the monitoring system can be received at pre-set intervals or can be accessed remotely as required. Data is stored on the Sentinex System for a period of one year. However, older data can be retrieved from archived records.

Each real time air quality monitoring unit is fitted with alarming capabilities that can advise mining personnel that air quality at the monitor has reached the trigger levels detailed in **Section 12.2**. Alarms are sent via SMS to relevant United Wambo staff to warn that air quality is reaching the predetermined limit. Action can then be instigated to modify operations where practical as per the **United Wambo Dust TARP**.

12.1.4 Continuous Monitoring Units – PM_{2.5}

The potential effect of the Project on PM_{2.5} levels has been predicted in the **AQIA**. In summary, the assessment indicated that emissions from the Project were unlikely to cause exceedances of the EPAs

PM_{2.5} criteria at any private residential property. It is acknowledged that the prediction of PM_{2.5} has necessarily had to rely on several assumptions which led to a level of increased uncertainty in the PM_{2.5} assessment. These uncertainties have mainly arisen from an absence of relevant monitoring data.

The absence of site specific PM_{2.5} monitoring data meant that background levels that would apply at the nearest sensitive receptors were estimated from PM₁₀ monitoring data and using an assumption on the proportion of PM₁₀, which is PM_{2.5}. It is noted that this is standard practice in the preparation of **AQIA** in NSW and is accepted by the EPA. The absence of PM_{2.5} monitoring data also meant that it was not possible to validate the performance of the model for predicting PM_{2.5} using local monitoring data as was done for PM₁₀.

Further discussion on the use of alternative assumptions for PM_{2.5} is provided in the Project Response to Submissions, Part A Report, although it is suggested that these alternative approaches will not resolve potential PM_{2.5} issues with any more certainty than is presented in the **AQIA**.

As part of the implementation of the Project, United Wambo is, therefore, proposing a campaign of PM_{2.5} monitoring to provide local PM_{2.5} monitoring data to confirm that the predictions of PM_{2.5} in the **AQIA** are accurate. The proposed PM_{2.5} campaign monitoring will include sites at Warkworth and along Redmanvale Road and will include:

- monitoring of PM_{2.5} using a monitor concurrently and co-located with the PM₁₀ TEOM monitors located at AQ01 and AQ03 (refer to **Figure 12-1**);
- campaign monitoring for a period forecast to be three to six months pending a review of whether suitable north-west winds have been observed during that time;
- comparing the PM_{2.5} concentration estimates to the EPAs 25 µg/m³ criterion;
- identifying whether further PM_{2.5} campaign monitoring would be required; and
- if further PM_{2.5} monitoring is required as a result of the campaign monitoring above, then United Wambo would develop an implementation program at this time in consultation with the Department of Planning, Industry and Environment (DPIE).

12.2 Trigger Levels and Response Strategy

The air quality response strategy will be based on a combination of automated daily forecasting, visual monitoring, meteorological monitoring and ambient air quality monitoring to determine air quality risk on a daily basis. **Figure 12-2** provides an overview of the air quality control strategy.

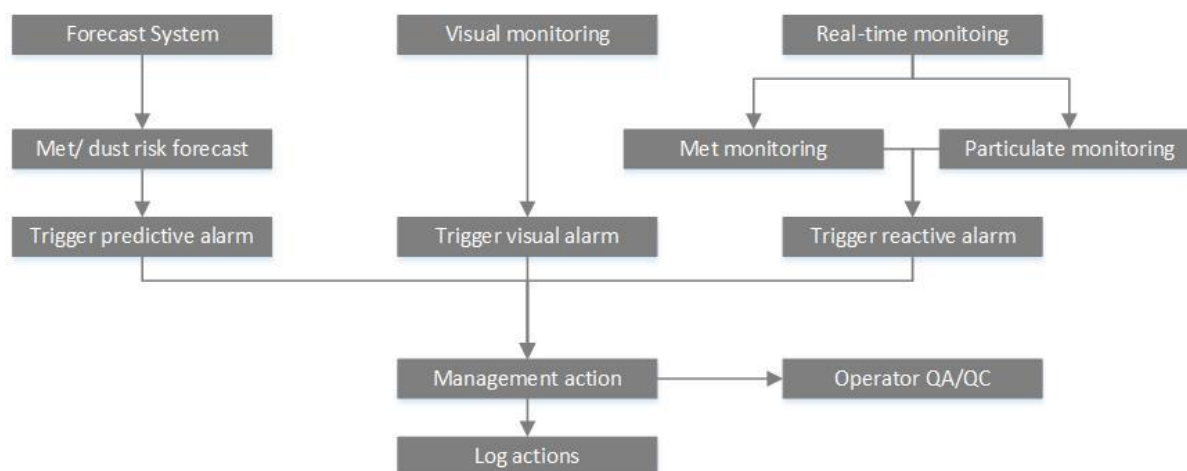


Figure 12-2: Overview of Air Quality Control Strategy

Three types of triggers have been developed for United Wambo:

- real-time monitoring triggers, based on real-time PM₁₀ concentration monitoring at sensitive receptors, and including real-time meteorological monitoring to identify conditions conducive to elevated dust events;
- visual triggers, based on ongoing daily visual monitoring of dust emissions by site personnel; and
- forecast triggers, based on daily automated dispersion modelling of site dust (and air) emissions using forecast meteorological conditions.

Alarms will be sent via SMS to relevant United Wambo staff, including, but not limited to, the Environment & Community Department (Environment & Community Manager (ECM), Environment & Community Coordinator (ECC), Environment & Community Officer (ECO)) and the Production Department (Mining Supervisors).

12.2.1 Meteorological Trigger Action Response Plan

Meteorological triggers and response levels are defined in **Table 12-4** and are applied to wind speed and rainfall data logged at five-minute intervals.

Weather alarms will be sent via SMS to the recipients listed above in **Section 12.2**. In the event an alarm is triggered and operations are required to be modified, the site will record actions taken in response to the alarms in accordance with the site procedures. This includes relocating, modifying or ceasing operations as necessary to minimise dust generation.

Due to the close proximity of neighbouring mining operations, assessment of compliance with criteria will require careful consideration of meteorological conditions and other contributing sources in order to determine the contribution from United Wambo operations. This will include an assessment of the upstream monitoring results against the downstream monitoring results.

Table 12-4: Meteorological Trigger Action Response Plan

Level	Level 1 Weather Alert	Level 2 Weather Alarm	Level 3 Weather Alarm
Trigger	5-minute average wind speed exceeds 8 m/s (for 4 or more consecutive 5-minute periods) AND 24-hour rolling total rainfall is less than 2mm	5-minute average wind speed exceeds 10 m/s (for 4 or more consecutive 5-minute periods) AND 24-hour rolling total rainfall is less than 2mm	5-minute average wind speed exceeds 12 m/s (for 4 or more consecutive 5-minute periods) AND 24-hour rolling total rainfall is less than 2mm
Action	Weather conditions changed from normal, indicating an adverse weather event and a potential risk of dust-related impacts occurring Requires monitoring to detect evidence of elevated dust from operations Mining Supervisor to note status of Level 1 in Shift Inspection Report and monitor operations for signs of elevated dust Advise all operators of Level 1 weather alert to ensure close attention to visual monitoring of work area Review planned operations and make provision for modification of activities if elevated dust is noted from operations Monitor dust activity via camera surveillance and/or pit inspections	Weather conditions changed indicating a serious adverse weather event with a moderate risk of dust-related impacts occurring Adverse weather event triggered requires remedial action to be planned and executed to reduce the potential of elevated dust Note status of Level 2 in Mining Supervisor Shift Report and monitor operations for signs of elevated dust Advise all operators of Level 2 weather alert to ensure close attention to visual monitoring of work area Review planned operations and make provision for modification of activities at exposed/elevated areas or apply additional dust suppression as necessary	Weather conditions changed indicating an extremely serious adverse weather event with a high risk of dust-related impacts occurring Adverse weather event triggered. A situation has occurred that poses an immediate dust risk. Stop activities generating dust in consultation with Mine Manager Note status of Level 3 in Mining Supervisor Shift Report and contact Mine Manager Stop activities generating elevated dust in consultation with the Mine Manager until conditions return to a lower TARP level
Response	Record actions taken in Mining Supervisor Shift Inspection Report Log details into the Sentinex repository.	Record actions taken in Mining Supervisor Shift Inspection Report Log details into the Sentinex repository.	Record actions taken in Mining Supervisor Shift Inspection Report Log details into the Sentinex repository.

12.2.2 Dust Trigger Action Response Plan

12.2.2.1 Wind Direction Ranges

The real-time dust monitoring data is filtered for wind direction to identify the potential for United Wambo activities being the source of the alarm. Wind direction ranges have been calculated based on the position of each monitor relative to United Wambo Operations to ensure the alarms are

representative of impacts from United Wambo. The wind direction ranges are provided in **Table 12-5** below and are reviewed annually to ensure they remain consistent with the progressing mining operations. Alarm triggers for the 24 hours rolling averages do not have wind direction triggers.

Table 12-5: Wind Direction Ranges for Dust Alarms

Station	Location	Alarm trigger directions ¹
AQ01	Warkworth	250° - 350°
AQ02	North Bulga	315° - 20°
AQ03	Redmanvale Rd	85° - 135°
AQ04	Moses Crossing	105° - 170°

12.2.3 Trigger Response Process

A trigger action response plan detailing the mines operational responses to varying levels of risk results from meteorological and dust conditions has been prepared for the Project (**Table 12-6**). The response plan provides specific trigger levels ranging in severity and the corresponding consequence or response relating to the risk of the trigger level being reached.

Table 12-6: Dust Trigger Action Response Plan

Level	Level 1 Dust Alert	Level 2 Dust Alarm	Level 3 Dust Alarm
Trigger	1-hour rolling average greater than 80 µg/m ³ (PM10MC1>=80) OR difference between upwind and downwind monitors is greater than 50 µg/m ³ OR 24-hour rolling average greater than 40 µg/m ³ (PM10MC24 >40)	1-hour rolling average greater than 100 µg/m ³ (PM10MC1>=100) OR difference between upwind and downwind monitors is greater than 80 µg/m ³ OR 24-hour rolling average greater than 45 µg/m ³ (PM10MC24 >45)	1-hour rolling average greater than 200 µg/m ³ (PM10MC1>=200) OR 24-hour rolling average greater than 50 µg/m ³ (PM10MC24 >50)

Action	Mining Supervisors to assess meteorological conditions and undertake inspection to identify potential source of emissions. Confirm all proactive mitigation measures are being implemented on site. Mining Supervisor to continue to monitor operating conditions and prepare to modify operations as needed.	Mining Supervisors to assess meteorological conditions and undertake inspection to identify potential source of emissions. Confirm all proactive mitigation measures are being implemented on site. Mining Supervisors to modify operations as required, such as reducing speed limits, additional dust suppression/haul road watering, relocation of fleet, review of blasting schedule.	Mining Supervisors to assess meteorological conditions and undertake inspection to identify potential source of emissions. Confirm all proactive mitigation measures are being implemented on site. Mining Supervisors to make further modifications of mining operations, such as reduced speed, additional dust suppression/haul road watering, relocation of fleet, and ceasing of operations.
Response	Mining Supervisor to log details of any actions taken into the Sentinex repository.	Mining Supervisor to log details of any actions taken into the Sentinex repository.	Mining Supervisor to log details of any actions taken into the Sentinex repository.

12.2.4 Dust Risk Forecast System

Glencore's Air Quality Control System (AQCS) comprises meteorological forecasting and dust dispersion modelling for United Wambo. This system provides early warning of adverse meteorological conditions and potential dust risks, thus facilitating proactive management of mining activities to reduce dust generation potentials.

Meteorological and dust risk forecasts from the AQCS are automatically sent via email to the Environment and Community Department and key personnel from the Mine Production Department. Forecasts can also be accessed via the website (<http://envforecasting.com>) and include two-day forecasts of dust risk index, dust transport, and meteorological conditions.

Mining Supervisors are to review the daily forecast prior to beginning of each shift. Based on the dust transport contour plots, dust risks are assigned as Level 1, Level 2 and Level 3, depending on the risk of dust transmission offsite.

In the event that high dust risks are forecast, the Mining Supervisor and/or Mining Superintendent will plan for contingency measures to ensure that dust generation potentials are reduced. The Environment and Community Department is responsible for providing additional environmental information. This information will be used to inform the production personnel's actions.

Further review of dust risk, weather conditions and the performance of control measures will also be discussed during the Daily Production Meeting.

12.3 Record Keeping

All air quality monitoring data are maintained in accordance with the *EM Strategy* and maintained on the premise for a period of four years.

13. Reporting

Environmental monitoring result including summaries and compliance with Consent & Licence Conditions and any required modifications to the air quality monitoring program will be reported in the Annual Review. The Annual Review and monthly air quality monitoring results will also be made available to the public via the United Wambo Project website (www.unitedproject.com.au) in accordance with the EPA requirements for publishing monitoring data to.

Air quality monitoring results will also be presented at Community Consultative Committee (CCC) meetings and co

In accordance with Condition B27 (d), monitoring data representative of mine-owned residences will be presented in a suitable format in accordance with the NSW EPA Criterion and National Environment Protection (ambient Air Quality) Measure and available to tenants upon request.

13.1 Incident Reporting and Compliance Evaluation

If monitoring results identify an exceedance of the criteria outlined in, except where predicted in the relevant EIS, and except where a negotiated agreement has entered into in relation to the impact, United Wambo will notify regulators (DPIE and EPA) immediately. Affected Landowners will be notified as soon as practicable (no longer than seven days) as per **Section 13.1.1**.

A report will be produced and provided to the DPIE and other relevant agencies. The report will include:

- a description of the date, time, and nature of the exceedance/incident;
- identification of the cause (or likely cause) of the exceedance/incident;
- a description of what action has been taken to date; and
- details of the proposed measures to address the exceedance/incident.

Air quality monitoring results and compliance with Consent and Licence conditions will be reported in the Annual Return to the EPA and in the Annual Review. A summary of air quality monitoring results will be presented at CCC Meetings and will also be made available to the public via the United Wambo Project Website. These results will be updated monthly.

Compliance evaluation will be undertaken for private residences on the basis of the outcomes of assessing results from nearby monitors. Compliance with the impact assessment criteria and land acquisition criteria requires a direct or indirect assessment of measured results, depending on the averaging period and requirements of the criteria in **Section 10.2**.

Compliance with the criteria in **Table 10-1** will be demonstrated where the measured level is below the criteria. Measured levels above the criteria do not necessarily constitute non-compliance. In these circumstances, additional investigations will be carried out to determine compliance. The specific investigations to be carried out are outlined in **Table 13-1** below.

Table 13-1: Methods for Determining Compliance Against Impact Assessment Criteria

Pollutant	Averaging Period	Methods for determining compliance
Long Term Impact Assessment Criteria for Particulate Matter		
Total Suspended Particulate (TSP) matter	Annual	Assessed annually. Compliance will be determined by direct comparison of the measured annual average (calendar year) against the relevant criterion. Results will be reported in the Annual Review. Non-compliances will be accompanied by actions for improvement and, in these circumstances, this AQGHGMP will be updated, as appropriate, in accordance with Section 13.1 .
Particulate Matter < 10 µm (PM₁₀) and < 2.5 µm (PM_{2.5})	Annual	Assessed annually. Compliance will be determined by direct comparison of the measured annual average (calendar year) against the relevant criterion. Results will be reported in the Annual Review. Non-compliances will be accompanied by actions for improvement and, in these circumstances, this AQGHGMP will be updated, as appropriate, in accordance with Section 13.1 .
Short Term Impact Assessment Criteria for Particulate Matter		
Particulate Matter < 10 µm (PM₁₀) and < 2.5 µm (PM_{2.5})	24-hour	Assessed in the event of an exceedance of the 24-hour average criterion at any of the TEOM PM₁₀ monitors. Compliance will be determined by calculating the contribution of United Wambo to the measured 24-hour average result at the monitor where the exceedance was recorded. The 24-hour average contribution of the United Wambo will be calculated by an upwind/downwind approach, using hourly PM₁₀ and < 2.5 µm (PM_{2.5}) and wind speed and wind direction measurements. A calculated United Wambo contribution of greater than 50 µg/m³ (PM₁₀) and/or 25 µg/m³ (PM_{2.5}) will be reported to the Department within two weeks of the event. Results will also be reported in the Annual Review. Non-compliances will be accompanied by actions for improvement and, in these circumstances, this AQGHGMP will be updated, as appropriate, in accordance with Section 13.1.

Where the AQGHGMP is updated, it will be resubmitted to the DPIE for approval.

13.1.1 Notification of Landowners/Tenants

In accordance with Condition D4 of **SSD 7142**, and to the satisfaction of the Planning Secretary, within one month of the approval of **SSD 7142**, United Wambo has:

- notified the tenants of any mine-owned land of their rights under the **SSD 7142** consent; and

- sent a copy of the ***Mine Dust and You (NSW Health, 2017)*** factsheet to the owners/tenants of any land where the predictions in the EIS identified that dust emissions generated by the development are likely to be greater than the relevant air quality criteria in.

As soon as practicable, and no longer than seven days after obtaining monitoring results as showing an exceedance of the criteria outlined in, United Wambo will:

- provide the details of the exceedance to any affected landowners and tenants; and
- provide to any affected land owners and tenants a copy of the ***NSW Health Fact Sheet Mine Dust and You (NSW Health, 2017)***.

13.1.2 Corrective Action

Table 13-2 summarises the potential air quality issues that may arise and the appropriate corrective action(s) that will be taken.

Table 13-2: Corrective Actions

Issue	Action(s)
Visible dust emissions leaving the site	Notify Mining Supervisor and Mining Personnel of the issue so it can be investigated and remediated. In the event excessive dust is being generated from a neighbouring mine, the Environment and Community (E&C) Team will contact the mine and advise them of the issue.
Potential to exceed air quality criteria based on a trigger (alarm) and interpretation of trends in monitoring data	Investigation of trends, undertaking mitigating measures where applicable. Report potential exceedance to Senior Management. In the event the investigation reveals a particular event at a neighbouring mine site has been determined to be the predominant impact, notification to the other site shall be undertaken by the ECM.
Exceedance of air quality criteria	Investigation of exceedance, undertaking mitigating measures where applicable. Report exceedance to regulatory agencies, senior management and notify impacted residents as required. Update this AQGHGMP with results and recommendations from the exceedance investigations, in accordance with Section 10.1 . Where the AQGHGMP is updated, it will be resubmitted to DPIE for approval.
Community complaints	Investigation of complaint, taking mitigating measures into account where applicable and provide feedback to complainant. Report complaint to senior management. Provide feedback to mine planning and production personnel, where relevant. If the complaint relates to another site, the ECM will contact the other site and advise of the nature and results of the investigation.

13.2 Complaint Resolution

All complaints received by United Wambo and Wambo are managed in accordance with the Social Impact Management Plan and the ***United Wambo EMS*** that details the process to ensure complaints are properly documented and handled in accordance with licence requirements and company policy.

United Wambo maintains a dedicated free-call community response line that is advertised at least quarterly in the local newspapers, provided in each edition of the Community Newsletter and displayed on the United Wambo Website (www.unitedproject.com.au).

Complaints and enquiries do not have to be received on the Hotline and may be received in any other form. Any complaint or enquiry relating to environmental management or performance is to be relayed to the Environment and Community Manager (ECM) as soon as practicable. All employees are responsible for ensuring the prompt relaying of complaints.

The ECM or their delegate is responsible for ensuring that all complaints are appropriately investigated, actioned and that information is fed back to the complainant, unless requested to the contrary as described in the *Social Impact Management Plan*.

A summary of complaints received and actions taken is presented in the Annual Review and to the United Wambo CCC as part of the operational performance review. A complaints register is to be updated monthly on the United Wambo website located at www.unitedproject.com.au.

13.3 Independent Review

If a landowner considers the operation to be in exceedance of the impact assessment criteria, they may request an independent review of the effects of the operation on their land. Such a request must be made in writing to the Secretary of the DPIE. If the Secretary determines that an independent review is to be undertaken, United Wambo will follow the procedures outlined in Condition D8 to D10 of **SSD 7142**.

14. Review and Improvement

14.1 Plan Review

This AQGHG and associated documents will be reviewed in accordance with **SSD 7142** and the United Wambo EMS that states that this must occur within three months of:

- the submission of an Annual Review under Condition E11 of **SSD 7142**;
- the submission of an environmental incident report under Condition E9 of **SSD 7142**;
- the submission of an Independent Environmental Audit under Condition E12 of **SSD 7142**; or
- the approval of any modification of the conditions of **SSD 7142**.

The review process is also to reflect changes in environmental legislation and guidelines and changes in technology or operational procedures. If any significant modifications to the AQGHGMP are required as an outcome of the review, relevant government agencies will be consulted regarding the changes and the revised Plan will be submitted to DPIE for approval by the Secretary within 4 weeks.

14.2 Audits

In accordance with condition E12 of **SSD 7142**, within 12 months of commencement of operations, and every three years thereafter, United Wambo will commission an Independent Environmental Audit to the satisfaction of DPIE. The Audit will include an assessment of the adequacy of the AQGHGMP. Where necessary following the audit, the Program will be updated and action taken to improve performance and management practices.

15. Document Information

Relevant legislation, standards and other reference information must be regularly reviewed and monitored for updates and should be included in the site management system. Related documents and reference information in this section provides the linkage and source to develop and maintain site compliance information.

15.1 Related Documents

Related documents, listed in **Table 15-2** below, are *documents* directly related to or referenced from within this document.

Table 15-1: Related Documents

Number	Title
HSEC POL 0005	<i>Glencore Environmental Policy</i>
HSEC POL 0006	<i>Glencore Community and Stakeholder Engagement Policy</i>
GCAA-625378177-10324	<i>GCAA 11.10 Air Quality Management Protocol</i>
GCAA-625378177-10245	<i>GCAA 11.10 Mobile Crushing Unit Dust Management</i>
GCAA-625378177-10246	<i>GCAA 11.10 Drill Dust Management</i>
GCAA-625378177-14786	<i>11.01 Real Time Monitoring</i>
UWOC-1689771511-360	<i>United Wambo Environmental Management Strategy</i>

15.2 Reference Information

Reference information, listed in **Table 15-2** below, is *information* that is directly referred to for the development of this document.

Table 15-2: Reference Information

Reference	Title
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000 (NSW)</i>
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
POELA Act	<i>Protection of the Environment Legislation Amendment Act 2011</i>
EPA, 2007	<i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, December 2007</i>
EPA, 2005	<i>Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, August 2005</i>

Reference	Title
AS/NZS 3580.1.1:2007	<i>AS/NZS 3580.1.1:2007 Guide to siting air monitoring equipment</i>
AS 3580.10.1-2003	<i>AS 3580.10.1-2003 Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method</i>
AS/NZS 3580.9.3-2003	<i>AS/NZS 3580.9.3-2003 Methods for the Sampling and Analysis of Ambient Air – Determination of Suspended Particulate Matter – Total Suspended Particulate Matter (TSP) – High Volume Air Sampler Gravimetric Method</i>
AS 3580.9.6-2003	<i>AS 3580.9.6-2003 Particulate Matter - PM₁₀ - high volume sampler with size-selective inlet</i>
AS 3580.9.8-2008	<i>AS 3580.9.8-2008 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser</i>
Donnelly et al, 2011	<i>NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and / or Minimise Emissions of Particulate Matter from Coal Mining, Katestone Environmental Pty Ltd for NSW Office of Environment and Heritage, Donnelly S-J, Balch A, Wiebe A, Shaw N, Welchman S, Schloss A, Castillo E, Henville K, Vernon A and Planner J (2010), December 2010</i>
EPA, 2012	<i>EPA (2012) “Air Emissions Inventory for the Greater Metropolitan Region in New South Wales, 2008 Calendar Year, Off-Road Mobile Emissions”. Technical Report No. 6. Prepared by the Environment Protection Authority. EPA 2012/0050. August 2012</i>
Jacobs, 2016	<i>United Wambo Project Air Quality Impact Assessment</i>
Umwelt, 2016	<i>United and Wambo Open Cut Coal Mine Project Environmental Impact Statement, Umwelt, August 2016</i>
Jacobs, 2018a	<i>United Wambo Project Response to Submission Part A Report, Umwelt & Jacobs 2018</i>
Jacobs, 2018b	<i>United Wambo Air Quality Impact Assessment for Independent Planning Commission, Jacobs July 2018</i>

15.3 Change Information

Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in **Table 15-3**.

Table 15-3: Change Information

Version	Date	Change Details
D.1	September 2019	New document (Prepared by United Wambo reviewed by Jacobs)
D.2	November 2019	Updated to address comments received from Department of Planning, Industry and Environment
1.0	April 2020	Updated Environmental Protection Licence requirements in Table 15-4
1.1	June 2020	Updated to address comments received from NSW Department of Planning, Industry and Environment prior to commencement of Phase 1B
1.2	July / November 2020	Updated to address comments received from NSW Department of Planning, Industry and Environment prior to commencement of Phase 2
1.3	June 2021	Updated following Independent Environmental Audit Report and Annual Review Updates made to: - Corrected formatting errors - Meteorological Trigger Action Response Plan - Dust Trigger Action Response Plan

16. Accountabilities

Table 16-1: Accountabilities

Role	Responsibilities
Operations Manager	• Approve appropriate resources for the implementation of this Plan • Ensure the effective implementation of strategies designed to reduce air quality impacts from the operation. • Ensure any potential or actual air quality is reported in accordance with legal requirements and the corporate standard. • Authorise internal and external reporting requirements of this plan • Approve subsequent revisions of this plan
Mine/Maintenance Manager	• Implement this plan via site procedures for mining operations to ensure compliance with project approval requirements • Implement the air quality management controls as per this plan • Inform personnel of air quality management obligations
Environment & Community Manager (ECM)	• Provide resourcing and support to allow effective implementation of this AQGHGMP • Coordinate training to communicate requirements of this AQGHGMP to relevant personnel • Coordinate, advise and assist with the implementation of air quality monitoring in accordance with the AQGHGMP • Ensure that air quality considerations are undertaken in the installation of all new infrastructure and purchase of equipment for the operation. • Identify air quality management risks and impacts to the environment and assess resources required to mitigate identified risks and impacts within the site. • Ensure that the air quality controls are implemented in accordance with this Plan • Ensure that the results of monitoring are evaluated and reported to senior management and to relevant personnel for consideration as part of ongoing mine planning • Ensure any potential or actual air quality issue is reported in accordance with legal requirements and the corporate standard • Provide visible and proactive leadership in relation to the air quality management • Ensure that operational changes consider the potential air quality impacts to adjacent private landowners • Ensure all internal and external reporting requirements are met, including incident reporting in accordance with EM Strategy

Role	Responsibilities
	• Ensure all reporting complies with internal and external monitoring standards, protocols and regulations • Proactively engage government and community as required • Coordinate the ongoing review of this Plan • Review and approve external reports, e.g. Annual Review, prior to final approval by the Operations Manager • Coordinate progressive rehabilitation to minimise disturbed areas • Notify regulatory authorities and affected landholders of any air quality related exceedance and undertake associated reporting • Coordinate incident investigation processes including associated reporting requirements and the implementation of corrective actions and evaluate their effectiveness • Coordinate complaints recording and investigation processes including associated reporting requirements • Review air quality monitoring data against criteria as per the specified frequency of management plans
Environment & Community Coordinator	• Manage and maintain the air quality monitoring programs in accordance with this plan • Ensure monitoring equipment is operated in accordance with relevant industry standards and protocols • Ensure that all monitoring records are effectively maintained on site in accordance with the EM Strategy • Coordinate the collation and evaluation of monitoring data • Coordinate regular inspections to check air quality monitoring units are operating effectively to assess dust emissions • Coordinate maintenance, replacement and repair of monitoring equipment as required in a regular and/or timely manner • Conduct periodic environmental inspections in accordance with the EM Strategy • Coordinate incident investigation processes including associated reporting requirements, in accordance with the EM Strategy • Coordinate the implementation of any corrective actions and evaluate their effectiveness • Provide visible and proactive leadership in relation to air quality • Participate in the ongoing review of this Plan • Conduct periodic environmental inspections of United Wambo buffer lands to identify any air quality management issues • Manage access and lease agreements for ongoing management of air quality monitoring equipment

Role	Responsibilities
	Proactively engage government and community as required
Environment & Community Officer	- Upload copies of updated management plans to the United Wambo website - Update monitoring data on the United Wambo internet site - Ensure any potential or actual air quality management issue, including incidents and non-conformances is reported to the ECM/ECC - Regularly report environmental performance to ECM/ECC - Prepare internal and external reports for review by ECM/ECC - Coordinate the collation and evaluation of monitoring data - Ensure that all monitoring records are effectively maintained on site in accordance with the EM Strategy - Ensure all reporting complies with internal and external monitoring standards, protocols and regulations
All Employees and Contractors	Undertake all activities in accordance with this AQGHGMP

Appendix A - Correspondence from Jacobs



Level 4, 12 Stewart Avenue
Newcastle West NSW 2302 Australia
PO Box 2147 Dangar NSW 2309
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T +61 2 4979 2600
F +61 2 4979 2666
www.jacobs.com

23 July 2020

Attention: Aislinn Farnon
United Wambo JV Project
134 Jerrys Plains Road, Warkworth, NSW

Project Name: United Wambo JV
Project Number: IA084400

Dear Aislinn

Air Quality and Greenhouse Gas Management Plan

This letter confirms that the *United Wambo Air Quality and Greenhouse Gas Management Plan* (version 1.1, July 2020) was prepared by:

- Sean Pigott, Approvals Coordinator, United Wambo JV, Glencore
- Brent Frondall, Environment & Community Officer, United Wambo JV, Glencore and
- Shane Lakmaker, Principal (Air Quality), Jacobs Group (Australia) Pty Ltd

The technical content of the *United Wambo Air Quality and Greenhouse Gas Management Plan* was supplied to United Wambo JV by Jacobs. United Wambo JV compiled the technical content into the standard Glencore format and incorporated the necessary business requirements and regulatory information. Jacobs reviewed and updated version 1.1 of the document and confirmed satisfaction of this document for finalisation.

Yours sincerely

A handwritten signature in blue ink, appearing to read "Shane Lakmaker".

Shane Lakmaker
Principal (Air Quality)
(02) 4979 2663
shane.lakmaker@jacobs.com

Jacobs Group (Australia) Pty Limited ABN 37 001 024 095

Appendix B - DPIE Consultation Records

Section	Comment	Response/Change
Section 13	include a comment on informing tenants/landowner (ie another mining company) of the air quality monitoring and what an appropriate format to provide monitoring data in for a medical practitioner	Reports containing air quality monitoring results are available to tenant/landowners and the general online via www.unitedproject.com.au. Section 13 has been updated to clarify that the air quality monitoring data is monitored in accordance to NSW EPA Criterion and National Environment Protection (ambient Air Quality) Measure and available to tenants upon request.

Appendix C - Stakeholder Consultation



DOC20/654998-1

United Wambo Joint Venture
134 Jerrys Plains Road
WARKWORTH NSW 2330

Returned via email: Aislinn.Farnon@glencore.com.au

13 August 2020

Attention: Aislinn Farnon

Dear Ms Farnon,

United Wambo Open Cut Coal Mine Project (SSD-7142)

Reference is made to your email on 5 August 2020 requesting the Environment Protection Authority (EPA) to review and comment on the United Wambo Open Cut Coal Mine Air Quality & Greenhouse Gas Management Plan.

The EPA encourages the development of such plans to ensure that licensees have determined how they will meet their statutory obligations and designated environmental objectives.

Being a regulatory authority, the EPA's role is to set environmental management objectives rather than being directly involved in the development of strategies to achieve those objectives. Accordingly, the EPA has not reviewed this management plan.

If you have any questions about this matter, please contact Jenny Rushton on 02 6883 5301 or by email to hunter.region@epa.nsw.gov.au

Yours sincerely

A handwritten signature in black ink, appearing to read 'Jenny Lange'.

JENNY LANGE
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