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Bringelly Brickworks Air Quality Management Plan

GLOSSARY AND ABBREVIATIONS

AQMP	Air Quality Management Plan
BCB	Boral CSR Bricks Pty Ltd, trading as PGH Bricks & Pavers Pty Ltd
BoM	Australian Bureau of Meteorology
Boral	Boral Bricks Pty Limited
CoA	Conditions of Approval for SSD_5684,
CSR	CSR Limited
DP&E	Department of Planning & Environment
EIS	Bringelly Brickworks Quarry Extension Environmental Impact Statement (Hyder Consulting, 5 September 2013)
EMS	Environmental Management Strategy
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	NSW Environment Protection Authority
HVAS	High Volume Air Sampler
OEH	NSW Office of Environment & Heritage
PIRMP	Pollution Incident Response Management Plan
PGH	PGH Bricks PTY LTD
PM _{2.5}	Particulate matter less than 2.5µm in diameter
PM ₁₀	Particulate matter less than 10µm in diameter
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
RTS	Bringelly Brickworks Quarry Extension Response to Submissions
SAP	Sensitive Area Plan
Secretary, the	The Secretary of the DP&E
SSD	State Significant Development
TSP	Total Suspended Particulate Matter
WMS	Work method statements

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1 INTRODUCTION

1.1 Context

This Air Quality Management Plan (AQMP or Plan) forms part of the Environmental Management Strategy (EMS) for the Bringelly Brickworks (the facility). The Plan has been prepared following the approval of the Bringelly Brickworks Extension Project (SSD_5684) on 3 March 2015 and a Section 96(1A) modification application (MOD1), which was determined on 31 October 2016.

This AQMP has been prepared to address the requirements of the CoA as updated following the determination of MOD1, the mitigation measures listed in the Bringelly Brickworks Quarry Extension Environmental Impact Statement (EIS) and all applicable legislation.

On 1 May 2015, CSR Limited (CSR) and Boral Limited (Boral) formally completed the establishment of a joint venture for brick manufacturing operations located in New South Wales, Victoria, Queensland, South Australia, Tasmania and the ACT. Ownership of Bringelly Brickworks (including quarrying activities) was transferred to the joint venture Boral CSR Bricks Pty Ltd (BCB), trading as PGH Bricks & Pavers. PGH Bricks & Pavers (PGH) is the controlling entity of the facility and responsible for implementing the Environmental Management Strategy of the site. On 31 October 2016 CSR agreed to acquire Boral's interest in BCB, therefore resulting in CSR owning 100% of PGH.

1.2 Background

Bringelly Brickworks (the facility) is a clay/shale quarry and brick making facility located at 60 Greendale Road, Bringelly, on Lot 100 in DP 1203966 and comprises an area of approximately 104 hectares in the Camden Local Government Area. The facility has been in operation since 1968, and in its original form it had the capacity to process approximately 51,500 tonnes of bricks per annum.

In 1991, Boral Bricks (NSW) Pty Limited undertook to upgrade the facility with new technology and increase production to ensure the continued economic viability of the site due to the age of the manufacturing plant and machinery. The Council of the Municipality of Camden, as the approving authority at the time, approved the Development Application on 13 September 1991 (Council ref. DA 91/1194). From 1991 until 2013, the Bringelly Brickworks facility operated under this approval, which permitted (among other things) quarry extraction up to 200,000 tonnes per annum, the receipt of up to 96,000 tonnes of supplementary materials and brick production up to 160,000 tonnes per annum.

In 2013, Boral prepared an Environmental Impact Statement (EIS) to assess the environmental impacts of an increase in production at the facility and continued extraction of the quarry to meet the anticipated demand for its brick products ('Bringelly Brickworks Extension Project', Application No. SSD_5684). The project was determined to be State Significant Development (SSD) under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Clause 8 *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP).

An air quality assessment was completed as part of the EIS for the project by specialist air quality consultants, Wilkinson Murray (2013). This assessment provided a quantitative assessment of potential air quality impacts associated with the project, including:

- Construction and operational impacts, with a focus on processing and dust emissions, as well as diesel emissions;
- Reasonable and feasible mitigation measures to minimise processing, dust and diesel emissions; and
- Monitoring and management measures, in particular real-time air quality monitoring.

The assessment modelled predicted emissions from both the quarrying and brick production process, estimated likely levels of air pollutants at nearby sensitive receivers and identified management and mitigation measures that should be implemented to achieve relevant air quality criteria.

The EIS was publicly exhibited from 6 November 2013 to 9 December 2013. The Department of Planning & Environment (DP&E) received 12 submissions during this period, including 11 from public authorities and 1 submission from the general public who objected to the project due to its potential impacts. While none of the government authorities objected to the project, most raised concerns about its potential impacts and/or made recommendations for managing these impacts.

Boral prepared and submitted an initial Response to Submissions (RTS) to the DP&E in February 2014. However, following receipt of the RTS, DP&E received further correspondence from 7 public authorities which necessitated further consultation between Boral, DP&E and the relevant government authorities.

The additional consultation was resolved and in February 2015 DP&E finalised their Environmental Assessment Report and the Bringelly Brickworks Extension Project was approved with conditions on 3 March 2015.

Since Project Approval, the type of bricks demanded by the market have changed and the BCB joint venture was established. These two critical factors necessitated PGH to review its manufacturing requirements to ensure the most efficient use of all the resources available. To manufacture the bricks demanded by the market, the type, composition and quantity of the raw materials to be imported to Bringelly Brickworks was reconsidered because the type of raw materials required could not be solely extracted from the Bringelly quarry. PGH therefore applied to the then DP&E to modify SSD_5684 under Section 96(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to provide for an increased raw material import limit to 321,000 tonnes per annum. MOD1 was approved by DP&E on 31 October 2016.

1.3 Environmental Management Document System

The environmental management document system is described in Section 5.1 of the EMS and this AQMP forms part of that system.

Management measures identified in this AQMP will be addressed in relevant Work Method Statements, environmental procedures and environmental constraint maps.

Work Method Statements (WMS) are approved by the Quarry Manager. Operational personnel are required to undertake works in accordance with the safeguards identified in WMS.

Sensitive Area Plans (SAP) provide detailed site-specific environmental constraints. Prior to works commencing, SAP will be consulted to ensure all environmentally sensitive areas are known and identified.

The review, auditing and document control processes for this AQMP are described in Sections 8 and Section 9.

1.4 AQMP Approval

This AQMP has been prepared in consultation with the NSW Environment Protection Authority (EPA) who provided comments on 20 September 2016 (refer Section 5).

This AQMP must be endorsed by the Plant Manager and National Workplace Health, Safety and Environmental Manager prior to submission to the Secretary of the Department of Planning & Environment (DP&E).

The AQMP is required to be submitted to the Secretary of the DP&E for approval prior to commencing the development approved in SSD_5684, unless the Secretary agrees otherwise.

2 PURPOSE AND OBJECTIVES

2.1 Purpose

The purpose of this Plan is to describe how PGH proposes to manage potential air quality impacts generated by the facility.

2.2 Objectives

The key objective of the AQMP is to ensure that impacts to the local community and the built environment are minimised.

To achieve this objective, PGH will undertake the following:

- Ensure appropriate environmental controls and procedures are implemented to minimise the potential for adverse air quality impacts to identified sensitive receivers and the local community;
- Manage air quality impacts, if they occur, through a systematic analysis of mitigation strategies;
- Ensure environmental management measures identified in **Table 9** are implemented to address the relevant CoA outlined in **Table 1**; and
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3 of this AQMP.

2.3 Targets

The following targets have been established for the management of air quality impacts during the operational lifetime of the facility:

- Ensure full compliance with the relevant legislative requirements and CoA;
- Minimise and manage potential air quality / dust impacts from the facility;
- Control dust and exhaust emissions of plant and equipment from quarrying activities;
- Dust emissions not be visible beyond the boundary of the site during operation;
- Achieve particulate matter and dust emissions that meet the approved air quality criteria; and
- Complaints from the community and stakeholders are minimised and addressed in a timely manner.

3 ENVIRONMENTAL REQUIREMENTS

3.1 Relevant Legislation and Guidelines

3.1.1 Legislation

Legislation relevant to air quality management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *National Greenhouse and Energy Reporting Act 2007* (NGER Act);
- *Protection of the Environment Operations Act 1997* (POEO Act); and
- *Protection of the Environment Operations (Clean Air) Regulation 2000*.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this AQMP include:

- Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (Department of Environment and Conservation NSW, 2007); and
- AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method (Standards Australia).

3.2 Minister's Conditions of Approval

The CoA relevant to this AQMP are listed in **Table 1**. A cross reference is also included to indicate where the condition is addressed in this AQMP or other environmental management documents.

Table 1 Conditions of Approval relevant to the AQMP

CoA No.	Requirement	Reference															
Schedule 3, Clause 7 Air Quality Criteria	<p>The Applicant must implement all reasonable and feasible avoidance and mitigation measures so that particulate matter emissions generated by the development do not exceed the criteria in Tables 3 to 6 at any residence on privately owned land.</p> <p>Table 3 Long-term Criteria for Particulate Matter</p> <table border="1"> <thead> <tr> <th>Pollutant</th> <th>Averaging Period</th> <th>Criterion</th> </tr> </thead> <tbody> <tr> <td>Total suspended particulates (TSP)</td> <td>Annual</td> <td>^a 90 µg/m³</td> </tr> <tr> <td>Particulate matter < 10µm (PM10)</td> <td>Annual</td> <td>^a 30 µg/m³</td> </tr> </tbody> </table> <p>Table 4 Short-term Criteria for Particulate Matter</p> <table border="1"> <thead> <tr> <th>Pollutant</th> <th>Averaging Period</th> <th>^d Criterion</th> </tr> </thead> <tbody> <tr> <td>Particulate matter < 10µm (PM10)</td> <td>24 hour</td> <td>^a 50 µg/m³</td> </tr> </tbody> </table>	Pollutant	Averaging Period	Criterion	Total suspended particulates (TSP)	Annual	^a 90 µg/m ³	Particulate matter < 10µm (PM10)	Annual	^a 30 µg/m ³	Pollutant	Averaging Period	^d Criterion	Particulate matter < 10µm (PM10)	24 hour	^a 50 µg/m ³	Section 4.6
Pollutant	Averaging Period	Criterion															
Total suspended particulates (TSP)	Annual	^a 90 µg/m ³															
Particulate matter < 10µm (PM10)	Annual	^a 30 µg/m ³															
Pollutant	Averaging Period	^d Criterion															
Particulate matter < 10µm (PM10)	24 hour	^a 50 µg/m ³															

CoA No.	Requirement	Reference
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Table 5 Long-term Criteria for Deposited Dust

Pollutant	Averaging Period	Maximum increase	Maximum total
		in deposited dust level	deposited dust level
^c Deposited dust	Annual	^b 2 g/m ² /month	^a 4 g/m ² /month

Table 6 Long and Short-Term Stack Emissions

Pollutant	Averaging Period	^d Criterion
Sulphur Dioxide	10minute	712µg/m ³
	1hour	570µg/m ³
	24hour	228µg/m ³
	Annual	60µg/m ³
Nitrogen Dioxide	1hour	246µg/m ³
	Annual	62µg/m ³
HydrogenChloride	1hour	0.14µg/m ³

Notes to Tables 3-6:

- ^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 Deposited dust is to be assessed as insoluble solids as defined by *Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method*.
- ^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Secretary in consultation with EPA.

Schedule 3,	The Applicant must:	
Clause 8	a) Implement all reasonable and feasible mitigation measures to minimise the stack and dust emissions of the development;	Section 6
Operating Conditions	b) Minimise surface disturbance and maximise progressive rehabilitation;	Rehabilitation Management Plan
	c) Minimise the air quality impacts of the development during meteorological conditions and extraordinary events (see Note (d) to Tables 3-6 above); and	Section 7
	d) Monitor and report on compliance with the relevant air quality conditions in this consent, to the satisfaction of the Secretary.	Section 8 Section 9
Schedule 3,	The Applicant must prepare and implement an Air Quality Management Plan for the development to the satisfaction of the Secretary. This plan must:	This Plan
Condition 9		

CoA No.	Requirement	Reference
Air Quality Management Plan	a) Be prepared in consultation with the EPA;	Section 5
	b) Be submitted to the Secretary for approval prior to the commencement of development under this consent, unless the Secretary agrees otherwise;	Section 1.4
	c) Describe the measures that would be implemented to ensure: <ul style="list-style-type: none"> • Compliance with the relevant air quality criteria and operating conditions under this consent; • Best management practice is being employed; and • The air quality impacts of the development are minimised during adverse meteorological conditions. 	Section 7
	d) Describe the air quality management system; and	This Plan
	e) Include an air quality monitoring program that: <ul style="list-style-type: none"> • Evaluates and reports on: <ul style="list-style-type: none"> - The effectiveness of the air quality management system; and - Compliance with the air quality criteria and operating conditions; and • Defines what constitutes an air quality incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any air quality incidents. 	Section 8 Section 9
	The Applicant must implement the approved management plan as approved from time to time by the Secretary.	
Schedule 3, Clause 10 Meteorological Monitoring	For the life of the development, the Applicant must ensure that there is a suitable meteorological station operating within the vicinity of the site that: <ul style="list-style-type: none"> a) Complies with the requirements in the <i>Approved Methods for Sampling of Air Pollutants in New South Wales</i> guideline; and; b) Is capable of continuous measurement of stability class, in accordance with the <i>NSW Industrial Noise Policy</i>, or as otherwise approved by the EPA. 	Section 8.2.1

3.3 Licenses and permits

EPL No. 1808 is currently in force for the scheduled activities undertaken by the facility and prescribes the permitted air quality load and concentration limits. Prior to the commencement of construction or the extension of the quarry, a variation to EPL No. 1808 would be sought by PGH to reflect the changed and extended operations of the quarry, air quality criteria stipulated within the CoA and any additional licenced monitoring points to be established.

4 EXISTING ENVIRONMENT

4.1 Site Overview

The local terrain consists of gently undulating low hills with vegetation comprising scattered bushland with trees up to 10m high, interspersed with fields cleared for pasture. The land usage is a mixture of agricultural and residential. The Bringelly Public School and village is located approximately 500m to the northeast of the facility. There are several rural residential properties distributed around the area surrounding the facility. There are 38 sensitive receivers located primarily to the north and east of the facility and these are presented in **Figure 2**.

The project site is currently used for quarrying, brick production and associated activities. The brickmaking facility along with various administration buildings, a finished bricks storage yard, staff car park and internal road network is generally contained within the northern part of the project site, and is set back approximately 200 metres from Greendale Road. The southern portion of the project site, adjacent to Thompsons Creek, is leased for the agistment of stock and grazing.

4.2 Climate

The Badgerys Creek AWS (Site Number 067108) is the closest Bureau of Meteorology (BoM) weather station to the facility. The site commenced operation in 1995, is located approximately 4.5 kilometres due north of the facility (33° 54' S 150° 43' 48" E) and records monthly climatic statistics. A summary of climate statistics from the Badgerys Creek AWS station is presented in **Table 2**.

Table 2 Monthly Climate Statistics Summary – Badgerys Creek AWS (BoM 2016)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean max. temperature (°C)	29.8	28.6	26.7	23.8	20.6	17.8	17.3	19.2	22.6	24.9	26.3	28.2
Mean min. temperature (°C)	17	17.1	15	11.3	7.7	5.4	4.1	4.7	7.7	10.4	13.5	15.3
Mean rainfall (mm)	84.4	100	74.1	54.2	40.8	52.6	23.7	36.5	32.7	53	74.1	60.6
Mean number of days of rain >= 1 mm	7.3	7.4	7	5.9	4	5.4	4	3.5	4.7	5.5	7.1	6.7
Mean number of days of rain >= 10 mm	2.5	2.6	2.6	1.4	1.3	1.5	0.6	0.9	1	1.8	2.5	1.8
Mean 9am relative humidity (%)	73	80	83	76	80	84	81	72	66	62	69	69
Mean 9am wind speed (km/h)	9.4	8.7	8.4	9.8	9.6	9.1	9.6	10.6	11.7	11.8	11	9.8
Mean 3pm relative humidity (%)	49	55	55	52	53	56	50	44	44	45	50	48
Mean 3pm wind speed (km/h)	17.9	15.9	14.5	14.4	13.9	13.7	15.4	17.8	19.2	19.9	18.9	18.5

A review of the climatic data presented in **Table 2** indicates the following trends:

- On average, January is the hottest month of the year and July is the coldest month of the year, with mean maximum and minimum temperatures being 29.7 °C and 4.1 °C respectively.
- Rainfall data indicates that February is the wettest month of the year and July is the driest month of the year, with average falls of 107.0mm and 25.5mm respectively.
- Mean 9am humidity levels range from 62% in October to 84% in June. Whilst mean 3pm humidity levels range from 44% in August and September to 56% in June.

- Mean 9am wind speeds range from 8.4 km/h in March to 11.8 km/h in October. Mean 3pm wind speeds range from 13.7km/h in June to 19.9km/h in October.

On an annual basis, winds are most dominant from the south-southwest, with a lesser frequency of winds from the southwest. In spring and summer, the wind distribution is similar to the annual distribution with a higher frequency of easterly winds occurring. During autumn and winter, winds from the south-southwest are most predominate. The annual average wind speed is 1.6m/s and the annual percentage of calms is 24.2%.

4.3 Hours of Operation

The hours of operation of the facility are as follows:


- Quarrying operations, deliveries and dispatch of finished bricks
 - Monday to Friday, 6AM to 6PM;
 - Saturdays, 6AM to 1PM; and
 - No activity on Sundays or Public Holidays.
- Brick manufacturing (except dispatch of finished bricks)
 - 24-hours per day, 7-days per week.
- Construction activities
 - Monday to Friday, 7AM to 6PM;
 - Saturdays, 8AM to 1PM; and
 - No construction to be undertaken on Sundays or Public Holidays.

4.4 Identified Sensitive Receivers

The CoA identify 38 sensitive receivers associated with the facility. The location of the 38 sensitive receivers are shown in **Figure 2** and their respective street addresses are reproduced in **Table 3**.

Plan of:	Bringelly Clay Mine Air Quality Management Plan - Site Location	Location:	Bringelly Clay Mine Off Greendale Road, Bringelly, NSW	Source:	nearmap - Image Date 12/01/2019 & Google Maps 2019	Our Ref:	8006_BR_AQMP_C001_V0_F1.cdr
Figure:	ONE	Council:	Camden Council	Survey:	N/A	Plan By:	JD
Sheet:	1 of 1	Tenure:	ML 1731	Projection:	N/A	Project Manager:	TO
Version/Date:	V0 11/09/2019	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	N/A	Office:	Thornton

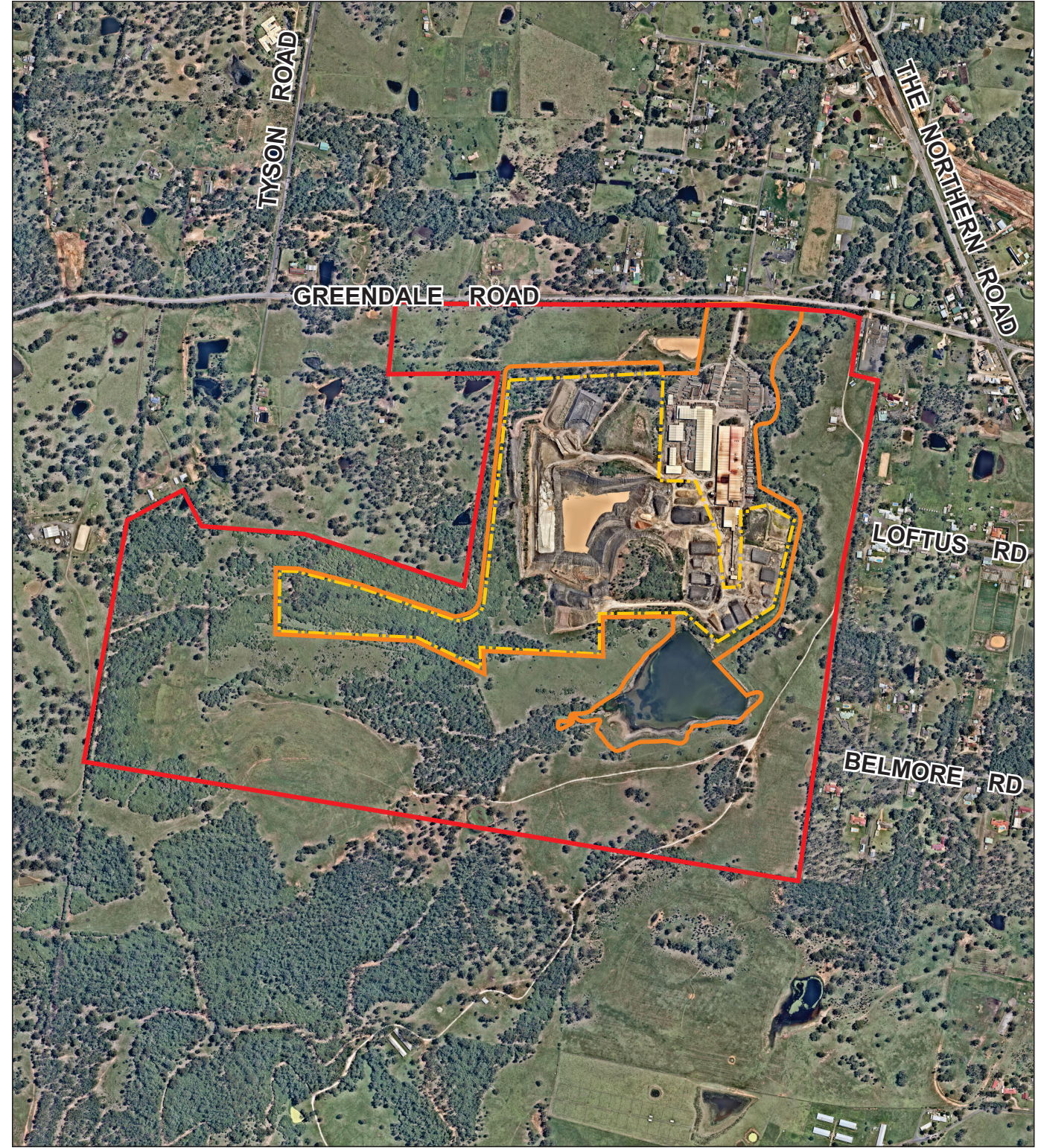
This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Environmental Compliance Solutions Pty Ltd



Approx Scale: 0 5 10km



Approx Scale: 0 250m

- Legend**
- Cadastral Boundary
 - Project Approval Boundary
 - Authority Boundary (ML 1731)

Plan of:	Bringelly Clay Mine Air Quality Management Plan - Sensitive Receiver Locations Surrounding The Site & Monitoring Locations	Location:	Bringelly Clay Mine Off Greendale Road, Bringelly, NSW	Source:	Photomapping 2015, nearmap - Image Date 12/01/2019 & Hyder Consulting Pty Ltd_031090_AQMP_F1_160720_v02	Our Ref:	8006_BR_AQMP_C002_V0_F2.cdr
Figure:	TWO	Council:	Camden Council	Survey:	Photomapping 2015	Plan By:	TO/SK/JD
Sheet:	1 of 1	Tenure:	ML 1731	Projection:	MGA	Project Manager:	TO
Version/Date:	V0 11/09/2019	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	1m	Office:	Thornton

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LEGEND	
	Cadastral Boundary
	Authority Boundary (ML 1731)
	Project Approval Boundary
	Water Management
	Road
	Contour
	Sensitive Receiver
	Dust Deposition Gauge
	Weather Station
	Weather Station Console
	High Volume Air Sampler

Table 3 Sensitive Receivers

Receiver ID	Street Address
R1	55 Loftus Road, Bringelly, NSW 2556
R2	54 Loftus Road, Bringelly, NSW 2556
R3	20 Greendale Road, Bringelly, NSW 2556
R4	9 Greendale Road, Bringelly, NSW 2556
R5	5 Greendale Road, Bringelly, NSW 2556 (Bringelly Community Centre)
R6	46 Loftus Road, Bringelly, NSW 2556
R7	36 Loftus Road, Bringelly, NSW 2556
R8	47 Loftus Road, Bringelly, NSW 2556
R9	37 Loftus Road, Bringelly, NSW 2556
R10	27 Loftus Road, Bringelly, NSW 2556
R11	26 Loftus Road, Bringelly, NSW 2556
R12	15 Loftus Road, Bringelly, NSW 2556
R13	5 Loftus Road, Bringelly, NSW 2556
R14	23 Greendale Road, Bringelly, NSW 2556
R15	27 Greendale Road, Bringelly, NSW 2556
R16	29 Greendale Road, Bringelly, NSW 2556
R17	25 Greendale Road, Bringelly, NSW 2556
R18	31 Greendale Road, Bringelly, NSW 2556
R19	35 Greendale Road, Bringelly, NSW 2556
R20	170 Tyson Road, Bringelly, NSW 2556
R21	196 Greendale Road, Bringelly, NSW 2556
R22	46 Belmore Road, Bringelly, NSW 2556
R23	55 Belmore Road, Bringelly, NSW 2556
R24	63 Belmore Road, Bringelly, NSW 2556
R25	67 Belmore Road, Bringelly, NSW 2556
R26	73 Belmore Road, Bringelly, NSW 2556
R27	83-85 Belmore Road, Bringelly, NSW 2556
R28	76 Belmore Road, Bringelly, NSW 2556
R29	86 Belmore Road, Bringelly, NSW 2556

Receiver ID	Street Address
R30	87 Belmore Road, Bringelly, NSW 2556
R31	93 Belmore Road, Bringelly, NSW 2556
R32	95-97 Belmore Road, Bringelly, NSW 2556
R33	107 Belmore Road, Bringelly, NSW 2556
R34	96 Belmore Road, Bringelly, NSW 2556
R35	108 Belmore Road, Bringelly, NSW 2556
R36	1037 Northern Road, Bringelly, NSW 2556
R37	10 Greendale Road, Bringelly, NSW 2556
R38	1205 The Northern Road, Bringelly, NSW 2556 (Bringelly Public School)

4.5 Ambient Air Quality

The ambient air quality environment in the vicinity of the project site was characterised in the EIS using ambient background monitoring data obtained from an OEH air quality monitoring station in Bringelly for the year 2011. The OEH air quality monitoring station at Bringelly is situated in Ramsay Road, approximately 4.2 kilometres north east from the facility (33° 55' 10" S and 150° 45' 40" E).

The air pollutants monitored at the meteorological station include:

- Particulate Matter (PM₁₀);
- Oxides of Nitrogen (NO, NO₂ and NO_x); and
- Sulphur dioxide (SO₂).

The background concentrations for each of these air pollutants, as well as the ambient Total Suspended Particulates (TSP) and dust deposition as reported in the EIS, are summarised in **Table 4**.

Firing of bricks in kilns leads to emissions of Hydrogen Fluoride (HF), Hydrogen Chloride (HCl), Oxides of Nitrogen and Sulphur, Carbon Monoxide (CO), Particulate Matter, some Volatile Organic Compounds and metals. It was noted in the EIS that there was no existing ambient monitoring data available for HF, HCl and CO. Therefore, it was assumed in the EIS that, given the semi-rural location of the facility, the background concentrations of these pollutants were negligible.

Table 4 Background Pollutant Concentrations at the EPA Bringelly Meteorological Station

Pollutant	Averaging Period	Background Concentration
Particulate matter < 10µm (PM ¹⁰)	Annual	16 µg/m ³
	24 hour (maximum)	83.8 µg/m ³
Nitrogen Dioxide (NO ₂)	Annual	9.7 µg/m ³
	Monthly (maximum)	41 µg/m ³
Sulphur Dioxide (SO ₂)	Annual	3.5 µg/m ³
	Monthly (maximum)	4.5 µg/m ³

Total Suspended Particulates (TSP)	Annual	40 µg/m ³
Dust Deposition	Annual	1.8 g/m ² /month

The monitoring data assessed in the EIS showed that the annual average PM₁₀ concentrations were below the prescribed 30µg/m³ criterion. The EIS noted that there were occasions in the year where the maximum measured 24-hour average exceeded the National Environment Protection Measures (NEPMs) goal of 50 µg/m³, most likely due to bush fire events or other localised sources.

The maximum monthly 1-hour average and annual average concentration of NO² recorded was significantly below the impact assessment criterion of 246 µg/m³.

The maximum monthly 1-hour average and annual average concentration of SO² recorded was also significantly below the impact assessment criterion of 228 µg/m³.

The EIS estimated annual average background TSP concentrations of 40 µg/m³ based on measured PM¹⁰ concentrations, assuming that 40 percent of the TSP is PM₁₀. Estimated annual average background TSP concentrations are significantly below the impact assessment criterion of 90 µg/m³.

Site specific dust deposition monitoring occurred at four locations between March 2010 and July 2012 in the vicinity of the facility. The monitoring results ranged from 0.52 to 4 g/m²/month, which the EIS noted as typical for this type of environment.

Annual dust deposition levels (independent of the facility) were estimated using a similar method to the one used to estimate TSP concentrations. This approach assumed that a TSP concentration of 90 µg/m³ has an equivalent dust deposition value of 4 g/m²/month, and that the background annual average dust deposition for the area surrounding the project site is 1.8 g/m²/month.

4.6 Air Quality Criteria

The following section identifies the air quality criteria applicable to the facility as determined by the CoA.

4.6.1 Particulate Matter

The monitoring of the particulate matter criteria stipulated in **Table 5** and **Table 6** is to take into consideration incremental increase in concentrations of the development and background concentrations due to all pollutant sources (i.e. total impact).

Table 5 Long-term Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Total suspended particulates (TSP)	Annual	90 µg/m ³
Particulate matter < 10µm (PM ₁₀)	Annual	30 µg/m ³

Table 6 Short-term Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Particulate matter < 10µm (PM ₁₀)	24 hour	50 µg/m ³

4.6.2 Deposited Dust

Deposited dust is to be assessed as “insoluble solids” as defined in *Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method* (Standards

Australia, AS/NZS 3580.10.1:2003). The long-term criteria for both incremental and total deposited dust levels for the development are outlined in **Table 7**.

Table 7 Long-term Criteria for Deposited Dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m ² /month	4 g/m ² /month

Measurement of the maximum increase in deposited dust level is to consider incremental increases in concentrations due to the development on its own (i.e. incremental impact). The measurement of maximum total deposited dust is to consider incremental increases in concentrations due to the development and background concentrations (i.e. total impact).

4.6.3 Stack Emissions

The monitoring criteria for stack emissions are stipulated in **Table 8**.

Table 8 Long and Short-term Criteria for Stack Emissions

Pollutant	Averaging Period	Criterion
Sulphur Dioxide	10 minute	712 µg/m ³
	1 hour	570 µg/m ³
	24 hour	228 µg/m ³
	Annual	60 µg/m ³
Nitrogen Dioxide	1 hour	246 µg/m ³
	Annual	62 µg/m ³
Hydrogen Chloride	1 hour	0.14 µg/m ³

4.6.4 Extraordinary events

The monitoring of particulate matter against the criterion stipulated in **Table 5** and **Table 6** as well as deposited dust and stack emissions outlined in **Table 7** and **Table 8**, are to exclude samples where the impact of extraordinary events listed below are likely to have influenced the monitoring results:

- Bushfires;
- Prescribed burning;
- Dust storms;
- Sea fog;
- Fire incidents;
- Illegal activities; or
- Any other activity agreed to by the Secretary of DP&E, in consultation with the EPA.

5 CONSULTATION

As outlined in the CoA (refer **Table 1**), this Plan has been prepared in consultation with the EPA (refer to **Appendix A**). A version of this Plan was provided to the EPA on 23 August 2016 for comment. The EPA responded on 20 September 2016 acknowledging receipt of this Plan.

In summary, the EPA stated in their correspondence that they do not approve or endorse the Plan as the EPA's role is to set environmental objectives for environmental management, not to be directly involved in the development of strategies to achieve those objectives. The EPA did note that PGH were considering installing either a High-Volume Air Sampler (HVAS) or a Tapered Element Oscillating Microbalance (TEOM) with a PM₁₀ collection head at Location 5 shown in **Figure 2** to monitor ambient air quality conditions. The EPA considers continuous real-time monitoring to be the preferred management tool to help PGH manage potential air emissions and also recommended that the EPL be varied to account for the increased brick production and land-based extraction.

6 ENVIRONMENTAL ASPECTS AND IMPACTS

6.1 Development Activities

Activities undertaken at the facility, which will generate dust emissions, are identified below:

- Vegetation clearing;
- Earthworks and drainage;
- Crushing and screening;
- Load and haul; and
- Stockpiling.

Air emissions other than dust, which will be generated include:

- Gaseous emissions from stacks associated with the kiln and driers; and
- Vehicle and plant emissions.

6.2 Impacts

6.2.1 Particulate Matter & Dust

The Air Quality Impact Assessment undertaken as part of the EIS modelled dust generation impacts from quarrying activities, transportation of raw material to stockpiles and subsequent processing. Modelling was based on three operational scenarios, which correlate to the following three quarrying development stages:

- Stage 1 - Operation in Cells A, B and C;
- Stage 2 - Operation in Cells D, E and F; and
- Stage 3 - Operation in Cells G, H and I.

The modelling results predicted minimal incremental impacts from the facility's operations at nearby sensitive receivers. Therefore, it was concluded that the existing PM₁₀, TSP or dust deposition levels at any sensitive receiver identified in **Section 4.1** were unlikely to change significantly.

6.2.2 Other Air Pollutants

The Air Quality Impact Assessment used the computer-based dispersion model AUSPLUME to predict ground level concentrations of the flue gases HF, HCl, Oxides of Sulphur, Oxides of Nitrogen, CO, VOC's and metals emitted from the stack associated with the kiln and dryers.

The dispersion modelling results indicated that all sensitive receivers would be below the relevant criterion for all pollutants assessed.

7 ENVIRONMENTAL MANAGEMENT MEASURES

Specific air quality management measures identified in the EIS and CoA have been interpreted and generally reproduced in **Table 9**. The management measures identified in this table are to be implemented to mitigate or manage impacts identified in Section 6.2. Where additional resources will be required to implement a management measure, these have been identified in the last column.

Table 9 Environmental management measures

ID	Measure / Requirement	Reference	When to implement	Responsibility	Additional Resources Needed
AQ1.	Restrict ground disturbance to the minimum area practically possible, in accordance with the staging plan.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	
AQ2.	Progressively rehabilitate exhausted quarry pits.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	Rehabilitation Management Plan
AQ3.	Stockpiles are to be restricted to the designated raw material stockpile area to the south of the brick making facility.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	
AQ4.	Temporary topsoil stockpiles are to be located in previously disturbed areas (devoid of vegetation). The management of topsoil stockpiles is to be in accordance with the Rehabilitation Management Plan.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	Rehabilitation Management Plan
AQ5.	Unsealed haul roads and manoeuvring areas are to be appropriately watered/dampened to minimise dust.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	
AQ6.	Inform employees and contractors of internal vehicle speed limits.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	Site Induction
AQ7.	Retain a 5 m strip of existing native vegetation along the northern boundary of quarry Cell D.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	Rehabilitation Management Plan

ID	Measure / Requirement	Reference	When to implement	Responsibility	Additional Resources Needed
AQ8.	Establish dense vegetation cover on the 4.5 m high noise bunds to be established along the northern boundary of quarry Cell D and to the east of the realigned site access road.	Section 7.5.4 EIS Volume 1	All stages	Plant Manager	Rehabilitation Management Plan
AQ9.	All internal paved/sealed roadways shall be maintained in a clean and dust free state to minimise dust from vehicle movement.		All stages	Plant Manager	
AQ10.	Roadways immediately beyond the site entrance shall be regularly inspected and swept to prevent build-up of material.		Construction	Plant Manager	
AQ11.	During adverse weather conditions (e.g. wind speeds greater than 40 km/h), activities which generate dust emissions are to cease temporarily and dampening frequency of haul roads, stockpiles and other disturbed areas are to be increased until weather conditions improve.		All stages	Plant manager	

8 COMPLIANCE MANAGEMENT

8.1 Inspections

Weekly inspections and daily visual observations by the Plant Manager (or delegate) of air quality conditions and air quality controls will occur throughout the operational lifetime of the facility.

8.2 Monitoring

Monitoring equipment will be installed in accordance with:

- AS/NZS 3580.10.1:2003: *Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method* (Standards Australia); and
- *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (Department of Environment and Conservation NSW, 2007).

Monitoring station locations, equipment to be installed, pollutants to be monitored and frequency of monitoring are identified in **Table 10** and shown in **Figure 2**. The siting of the monitoring equipment is consistent with the prevailing and dominant winds of the site.

Table 10 Location and frequency of monitoring

Monitoring Location	Equipment	Pollutant	Sampling Frequency
Location 1	Dust Gauge	Deposited Dust	Monthly
Location 2	Dust Gauge	Deposited Dust	Monthly
Location 3	Dust Gauge	Deposited Dust	Monthly
Location 4	Dust Gauge	Deposited Dust	Monthly
Location HV	High-Volume Air Sampler (HVAS)	PM ₁₀	Weekly

8.2.1 Meteorological Conditions

Condition 10 of Schedule 3 of the CoA requires meteorological data to be sourced for the lifetime of the development from a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline.

A weather station was installed in early 2017 on the Bringelly site as per the above requirements. The location of the weather station is shown on **Figure 2**.

8.2.2 Monitoring Particulate Matter

PGH will install a High-Volume Air Sampler (HVAS) with a PM₁₀ collection head at Location 5 shown in **Figure 2**. Location 5 has been selected based on the following justifications:

- Annual winds are most dominant from the south-southwest, with a lesser frequency of winds from the southwest;
- Location 5 is situated near sensitive receptors with the greatest likelihood of dust impact; and
- Location 5 is therefore downwind from the facility during the most prevalent winds and will minimise the influence of other known dust sources in the area.

PGH has chosen to monitor PM₁₀ as estimates of the annual average TSP concentrations can be determined from a documented relationship between measured PM₁₀ concentrations. This relationship between TSP and PM₁₀ assumes that 40% of the TSP is PM₁₀ and was established as part of a review of ambient monitoring data collected by co-located TSP and PM₁₀ monitors operated for reasonably long periods of time in the Hunter Valley (NSW Minerals Council, 2000). Applying this relationship with an annual average PM₁₀ concentration of 15.8µg/m³ taken from the OEH air quality monitoring station in Bringelly for 2015, the relationship estimates an annual average TSP concentration of approximately 39.5µg/m³, well below the TSP criteria of the facility. On this understanding PGH propose to apply this relationship for TSP monitoring.

PM₁₀ monitoring data will be collected weekly and reviewed against the long-term and short-term criteria as stipulated in Section 4.6.1.

If a non-compliance for exceeding consented particulate matter, complaints or an incident arises throughout the duration of the Project, a real-time monitor will be positioned on site to correctly identify the source of the increased dust i.e. quarrying activities or brickmaking activities.

8.2.3 Monitoring Dust Deposition

Four dust deposition gauges will be placed at the locations shown in **Figure 2**. Dust deposition data will be monitored at monthly sample intervals and results will be analysed with consideration of the criteria stipulated in Section 4.6.2.

8.2.4 Monitoring Stack Emissions

Stack emissions will be monitored annually by a suitably qualified professional, in accordance with the long-term and short-term criteria stipulated in Section 4.6.3 and the applicable sampling method specified in *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline or as outlined in the EPL.

8.2.5 Evaluation of Monitoring Results

The Plant Manager will review monitoring results against the air quality criteria stipulated in Section 4.6 and the revised EPL (refer to Section 5). If the monitoring results exceed the air quality criteria, the Plant Manager (or delegate) will review:

- Meteorological data;
- The occurrence of any extraordinary events during the sampling period;
- The location and duration of activities on site during the sampling period; and
- Any other activities within the immediate region of Bringelly.

Following this review, should it be concluded that the facility is likely to be the source of elevated pollutant levels, the continuous improvement process outlined in Section 10 of the EMS is to be implemented and corrective actions identified.

8.3 Reactive Dust Management Programs

The reactive dust management system involves a combination of instantaneous dust monitors and an on-site meteorological station. A real-time dust monitor will be located **adjacent** to the High Volume Air Sampler (HVAS) during quarrying campaigns or to investigate non-compliances, incidents and complaints. This site is the best available with reliable power to the instrument, allows comparison between the real-time monitor and the EPA Approved Method for PM₁₀ measurement (HVAS) to ensure compliance, and as a worse-case scenario than measurement at the boundary, thereby minimising off-site impacts. Weather is monitored using an on-site meteorological station located in the same area.

Since the preparation of the EIS in 2013 where instruments such as TEOM's were suggested as a possible solution to instantaneous monitoring, technologies have improved. The TEOM is static (i.e. place on a concrete slab) and cannot be moved. Now the portable instantaneous monitors are solar and battery powered e.g. Guardian 2 which monitors:

- Particulate (Simultaneous PM10, PM2.5 and PM1.0);
- Noise (Compliant with IEC 61672 Class 1);
- Vibration (Triaxial ground vibration, measuring PPV); and
- Wind Speed and Direction (Ultrasonic with no deadband).

This data is sent to the onsite manager's phone and they can act on this data immediately. PGH propose to use this technology around the site and place it between the quarrying operations and the nearest receivers when required.

Warning alerts will be sent to the Environment Manager, Site Manager and Raw Materials Supervisor when winds are blowing from the south to south-west quadrant at speeds of greater than 10 m/s (36 km/hr) and/or when 24-hour average PM₁₀ concentrations reach 48 µg/m³. Actions will then be taken to investigate the cause of the alerts.

Once the dust concentrations return below the warning level, the additional mitigation measures can cease and quarrying operations return to normal.

PGH management and HSE Personnel will inspect potential dust sources and arrange for rehabilitation where any significant fugitive emissions are detected. Rehabilitation may include stabilisation or mechanical sweeping to remove residual particulates. The Rehabilitation management plan provides further details on progressive rehabilitation measures.

8.4 Training

All employees and contractors working on site will undergo site induction training, which will cover issues relating to air quality management, including:

- Existence and requirements of this Plan;
- Relevant legislation;
- Bringelly Brickworks operational hours;
- Internal speed limits;
- All other air quality management measures that need to be implemented to minimise air emissions;
- Location of sensitive receivers; and
- Complaints reporting.

8.5 Greenhouse Gas

In accordance with obligations under the *National Greenhouse & Energy Reporting Act 2007*, PGH collects information annually to record the extent of greenhouse gas production of its operations. PGH keeps record of the following:

- Diesel usage of plant and equipment;
- Electricity consumption;
- Fuel usage by PGH light vehicles; and
- Transport distance and fuel usage for product deliveries.

PGH will continuously review operations at the facility and, where feasible and reasonable, implement energy reduction initiatives.

8.6 Complaints & Enquiries Procedure

All community inquiries and complaints related to the facility's activities will be referred to a community information line (02 4774 8751). A postal address (Attn: Debbie Cook, PGH Bricks, Locked Bag 1345, North Ryde BC NSW 1670) and email address (decook@pghbricks.com.au) has been provided for receipt of complaints and enquiries.

Information to be recorded will include location of complainant, time of occurrence of alleged dust complaint, perceived source, prevailing weather conditions and similar details that could be utilised to assist in the investigation of the complaint.

An initial response acknowledging a complaint will be provided within 24 hours of a complaint being received. A further detailed response, including steps taken to resolve the issue(s) that led to the complaint, will be provided within 10 days. All reasonable endeavours will be made to resolve and close off complaints. The complainants will be kept informed of when they will receive a response.

Information on all complaints received, including how they were addressed, whether resolution was reached and whether mediation was required or used, will be included in a complaint register.

Complaints and the subsequent action(s) taken by PGH will be reported at each subsequent Community Consultative Committee meeting.

8.7 Incident Management

Any recorded exceedance will be reported in accordance with the incident reporting procedure in condition 7 of Schedule 5, regardless of whether it is “definitively attributable” to PGH. Subsequent investigation will then determine the cause of the exceedance and confirm whether a non-compliance has occurred.

All incidents and emergencies will be managed in accordance with Section 8 of the EMS. PGH will immediately notify the Secretary and any relevant agencies when an incident (Air Quality exceedance) has been declared.

Within seven days of the declaration of an air quality incident, a report documenting the facts of the incident must be submitted to the Secretary. This report is to document the findings of the incident investigation, attempt to identify the cause and nature of the exceedance.

8.8 Audit and Reporting

Specific mechanisms for evaluating and reporting on the effectiveness of the air quality management system and the best practice air quality management measures will include;

- Weekly environmental inspections;
- Monthly Air Quality exceedance reporting (Detailed in Environmental reporting);
- Quarterly air quality monitoring (or adhoc should an Air quality related complaint be received);
- Annual internal environmental audit; and
- Tri-annual PGH external environmental audit.

Any recorded exceedances, corrective actions or non-conformances raised during the above mechanisms relating to air quality, will be reported in accordance with the incident reporting procedure in condition 7 of Schedule 5 and internal reporting requirements.

Audits (both internal and external) and reporting will be undertaken to assess the effectiveness of environmental controls, compliance with this AQMP, CoA and other relevant approvals, licenses and guidelines. Audit requirements are detailed in Section 9.3 of the EMS.

9 REVIEW AND IMPROVEMENT

9.1 Continuous Improvement

Continuous improvement of this AQMP will be achieved through the ongoing evaluation of environmental management performance against environmental policies, objectives and targets.

The continuous improvement process is designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement; and
- Make comparisons with objectives and targets.

9.2 AQMP Update and Amendment

Inspections, monitoring, auditing and management reviews may result in the need to update or revise this AQMP. The approval of updates or revisions to the AQMP will need to be considered in accordance with Section 11.2 of the EMS.

APPENDIX A CONSULTATION CORRESPONDENCE



23 August 2016

Tenille Lawrence
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Dear Tenille

**BRINGELLY BRICKWORKS (SSD_5684) – ENVIRONMENTAL MANAGEMENT PLAN
PREPARATION AND CONSULTATION**

Following the commencement of a State Significant Development application (SSD_5684) in December 2012 for a proposed expansion to Bringelly Brickworks at 60 Greendale Road, Bringelly, Development Consent was issued on 3 March 2015 by the Department of Planning and Environment (DP&E).

In accordance with this Development Consent (refer Attachment 1), several conditions require Boral CSR Bricks, the owner of Bringelly Brickworks, to consult with the EPA in the preparation of the development's management plans. More specifically, Conditions 6 and 9 of Schedule 3 of the Development Consent require Boral CSR Bricks to prepare a Noise Management Plan and Air Quality Management Plan in consultation with the EPA.

On behalf of Boral CSR Bricks, please find attached a draft Noise Management Plan (Attachment 2) and draft Air Quality Management Plan (Attachment 3) for the EPA's review and comment.

For the EPA's comments to be considered, please provide your response to myself by no later than **7 September 2016**. My contact details are below.

Darren Green
Senior Environmental Consultant
Email: darren@elementenvironment.com.au
Phone: 0418 969 624
PO Box 1563, Warriewood, NSW, 2102

Please do not hesitate to contact me should you have any questions or queries in the interim.


Kind regards,

Darren Green
Senior Environmental Consultant
Element Environment Pty Ltd

Our reference: EF15/7744:DOC16/426662-05:CK
Contact: Chris Kelly (02) 4224 4100

Mr Darren Green
Element Environment
PO Box 1563
WARRIEWOOD NSW 2102

Dear Mr Green

**BRINGELLY BRICKWORKS (SSD_5684)- ENVIRONMENT MANAGEMENT PLANS
ENVIRONMENT PROTECTION LICENCE 1808**

I refer to your correspondence of 23 August 2016, on behalf of Boral CSR Bricks Pty Ltd (BCB), to the Environment Protection Authority (EPA) regarding the proposed expansion to the Bringelly Brickworks, Greendale Road Bringelly, Environment Protection Licence (EPL) 1808.

In accordance with Conditions 6 and 9 of Schedule 3 of Development Consent SSD_5684 issued by the Department of Planning and Environment, BCB has provided copies of its Noise Management Plan and Air Quality Management Plan (AQMP) to the EPA for review.

The EPA acknowledges receipt of these plans in accordance with SSD_5684, which will be retained for our records. The EPA encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/conservation management, not to be directly involved in the development of strategies to achieve those objectives.

The EPA notes however that the AQMP makes reference to monitoring particulate matter at Location 5 using either a High Volume Air Sampler (HVAS) or a Tapered Element Oscillating Microbalance (TEOM). The EPA considers the optimal ambient air monitoring would be based on continuous real time monitoring. This could be used as a management tool to help BCB control air emissions, and inform 'Trigger Action Response Plans' (TARP) when dust levels are above pre-determined levels. Any such ambient air monitor must be *'fit for purpose'*.

Additionally, the EPA proposes to vary EPL 1808, with regards to the increased brick production and land based extraction including changes to noise and air conditions. The EPA will discuss these measures directly with BCB.

If you wish to discuss this matter further please phone Mr Chris Kelly on (02) 4224 4100.

Yours sincerely

William Dove 30/08/2016

WILLIAM DOVE
Head Regional Operations
Metropolitan Illawarra
Environment Protection Authority