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Peppertree Quarry

Boral Resources Pty Limited



Peppertree Quarry Annual Environmental Review 2013



Peppertree Quarry

Peppertree Quarry

Annual Environmental Review

Prepared in accordance with Schedule 5
Condition 4 of Project Approval
06_0074

1 January 2013 to
31 December 2013

Reporting Officer: Sharon Makin

Title: Stakeholder and Environment Advisor

Signature:

A handwritten signature in black ink, appearing to read "S Makin", written over a light blue horizontal line.

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1. Introduction

1.1 Scope

This Annual Environmental Review covers the operations at Peppertree Quarry for the period 1 January 2013 to 31 December 2013 in accordance with Schedule 5 Condition 4 of Project Approval 06_0074. This period covered the bulk of the construction program which commenced in July 2011. Plant commissioning occurred during late 2013 with commercial operations to commence 2014.

This report has been prepared in accordance with Condition 4, Schedule 5 of Project Approval 06_0074 and includes:

- Environmental management procedures during the construction program;
- Environmental initiatives implemented during detailed design;
- Monitoring activities and results during the reporting period and analysis of any trends;
- Current compliance with statutory provisions and identification of any discrepancies between the predicted and actual impacts of the project, and analysis of the potential cause of any significant discrepancies.
- Rehabilitation progress; and
- Proposed operations for the next reporting period including additional measures that will be implemented to improve the environmental performance of the project.

As this is the first Annual Review and mainly covers the construction phase of the project, there is insufficient data to assess any trends in the collected environmental data. The construction phase also has separate compliance criteria which are not relevant for the ongoing operations. Subsequent Annual Reviews will provide a progressive analysis of monitoring data, document compliance with operational commitments and assess the performance of the operation against predictions made in the original Environmental Assessment.

1.2 Background

Peppertree Quarry is owned and operated by Boral Resources Pty Ltd, a fully owned subsidiary of Boral Limited. The Quarry is Boral's newest and largest hard rock quarry development in Australia. The Boral Peppertree Quarry is located 10 kilometres south-east of Marulan in the NSW Southern Tablelands, approximately 175 km south-west of Sydney, as shown on Figures 1 to 3. The specific site lies directly to the north of the Boral Marulan South Lime Works and Mine.

Peppertree Quarry was originally approved in February 2007 under Part 3A of the Environmental Planning and Assessment Act 1979 following the preparation and display of an Environmental Assessment. The project however, was the subject of three separate modifications which were approved in March 2009, November 2011 and November 2012.

The March 2009 approval allowed for blasting and additional drilling to occur with the development of a test pit in order to refine the design of the processing plant and equipment. This work assisted in the design of the crushing and screening plant as it allowed for more detailed analysis of the rock to be processed. The second modification allowed for the construction of separate rail line rather than use the existing rail facilities to the Limestone Mine. The rail loading facilities, tertiary processing plant and stockpiling area were then relocated to the eastern side of the rail line placing them around 250 m further away from the most affected residential receptor.

Civil earthworks for the quarry site commenced in July 2011 however a further modification was lodged in August 2012 to construct a High Voltage power line from an existing substation to the processing plant and to provide a rail siding near the junction with the Main Southern Railway Line. The rail siding was required to enable loaded trains to pass waiting empty trains accessing either the limestone mine or the hardrock quarry.

Construction and commissioning was completed in late 2013 with first production occurring in early 2014.

1.2.1 Product and Market

Peppertree Quarry will supply the greater Sydney area with graniodorite aggregate products and manufactured sand. The quarry replaces the existing quarry at Emu Plains which will be redeveloped and rehabilitated as part of the Penrith Lakes Program.

At full production, Peppertree will produce up to 3.5 million tonnes of quarry products per annum for a period of 30 years. All extractive materials and product will be transported by rail to a new rail terminal which has been established at the Boral Maldon Cement Works, near Picton. From here, trucks will distribute products into the Sydney metropolitan area.

The use of rail allows significantly less dependence on the local and regional road network around Marulan and through the Southern Tablelands and Highlands.

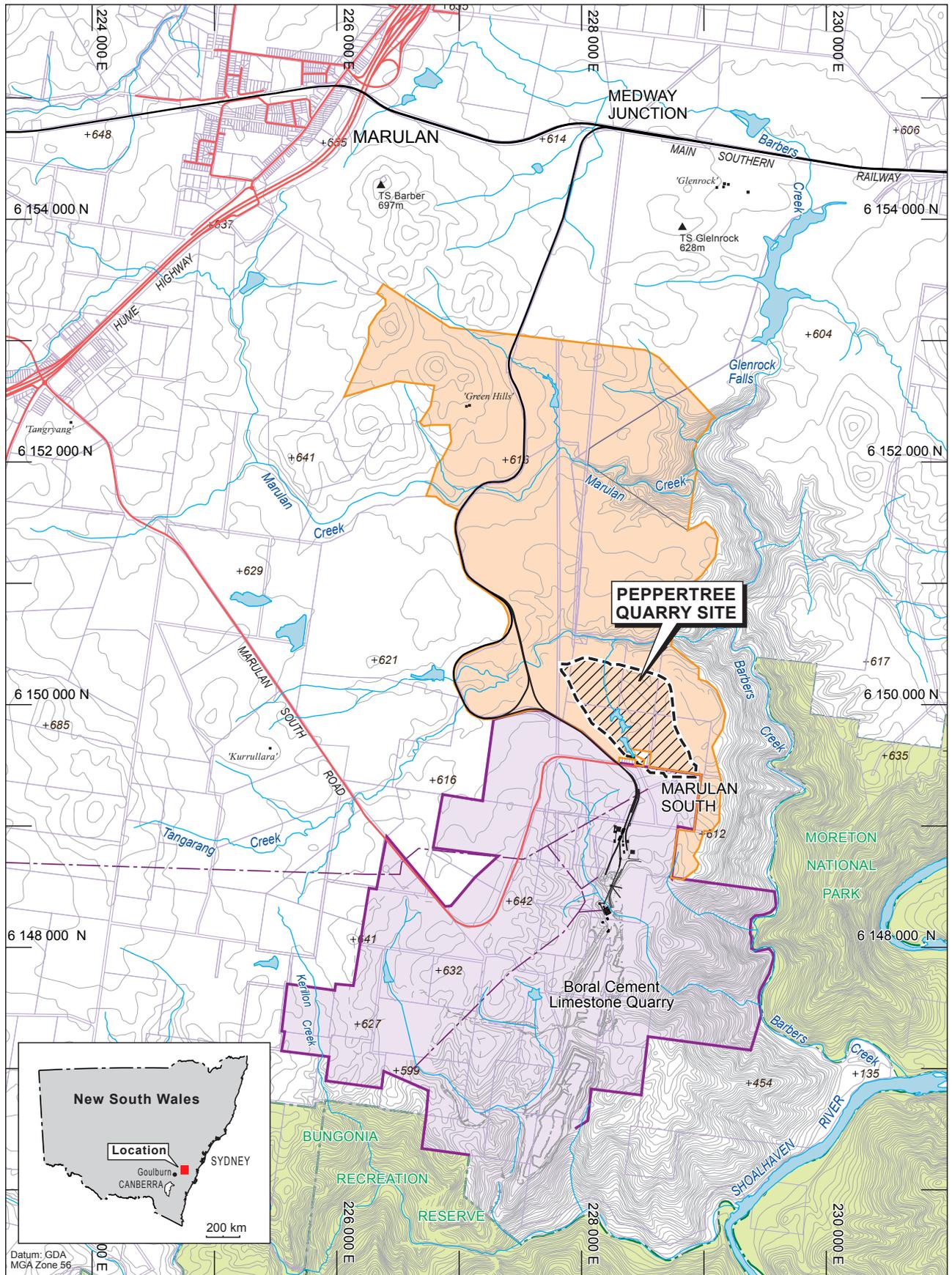
During the reporting period a nominal 3,000 tonnes of aggregate was transported by rail to the Maldon road rail interchange site. From Maldon, the material is transported to various Sydney markets.

1.2.2 Mine Contacts

Contacts details for responsible site personnel are as follows:

Table 1.1: Contacts

Construction Manager	Steve Parsons
Health, Safety and Environment Advisor	Rob Lasker
Stakeholder and Environment Advisor	Sharon Makin



- Boral Peppertree property boundary
- Boral Cement property boundary
- National Park, Reserve
- Dam
- River or creek
- Main road
- Railway

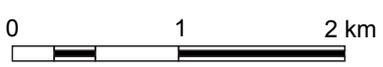


FIGURE 1
Boral Peppertree Quarry
Regional Location

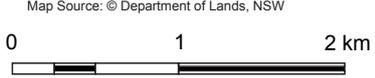
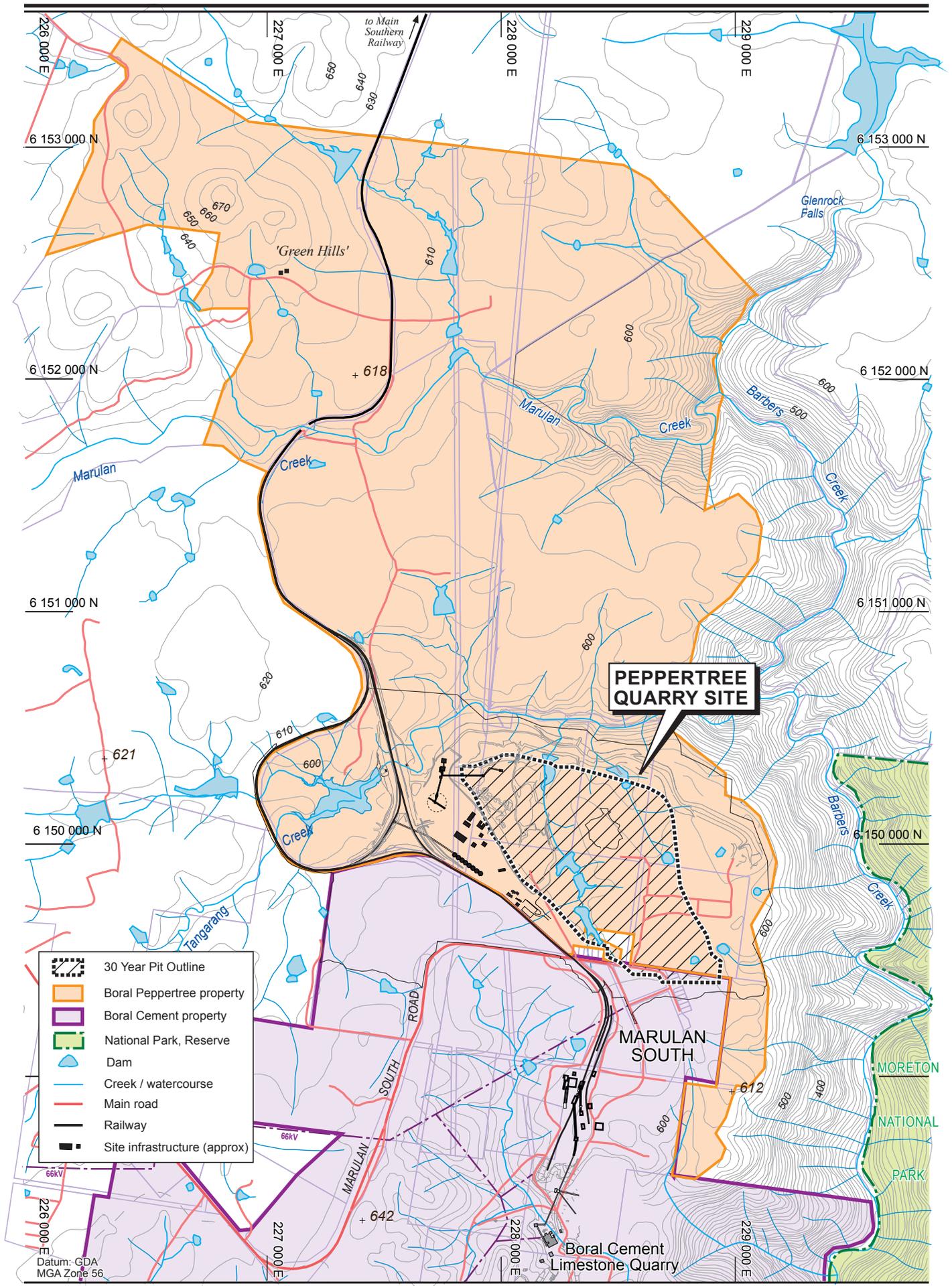


FIGURE 2
Boral Peppertree Quarry Site Location



0 100 200 300 400 500 metres



FIGURE 3
Boral Peppertree Quarry
Airphoto

Boral Resources are the owner and operator of the quarry and is responsible for all aspects of the quarry operation, processing and dispatch as well as health safety and environmental obligations.

1.2.3 Corporate Environmental Goals

Boral embraces the principle of sustainable development, ie development which meets the needs of the present without compromising the ability of future generations to meet their own needs. Boral is committed to pursuing industry specific best practice in environmental performance

Specifically Boral is committed to:

- Conducting our operations to minimise environmental risk and, wherever practicable, eliminate adverse environmental impacts.
- Continual improvement of our environmental performance including regular review and the setting of rigorous environmental objectives and quantified targets – particularly with regards to:
 - efficient use of energy (including appropriate use of alternative fuels);
 - conservation of water; - minimisation and recycling of wastes;
 - prevention of pollution; and - effective use of virgin and recovered resources and supplemental materials.
- Open, constructive engagement with communities surrounding our operations.
- Reducing the greenhouse gas emissions from our processes, operations and facilities.
- Protecting and, where possible, enhancing biodiversity values at and around our facilities.
- Complying with environmental legislation, regulations, standards and codes of practice relevant to the particular business as the absolute minimum requirement in each of the communities in which we operate.
- Conducting business with suppliers and contractors who have a commitment to the values and objectives contained in this Environmental Policy.
- Remediating our contaminated sites to standards internationally acceptable for the site purpose.

Through communication and training, our employees will be encouraged and assisted to enhance Boral's environmental awareness and performance. The Policy has been endorsed by the Company's Managing Director and therefore commits the Company to achieving its objectives of environmental excellence.

1.3 Status of Licences and Approvals

Peppertree Quarry holds Project Approval 06_0074 which was granted by the Minister for Planning to Boral Resources (NSW) Pty Ltd (Boral) under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act) on 28 February 2007 and which expires on 31 December 2038. The Project Approval is subject to three modifications and the combined approval document is attached as Appendix A.

The first modification was approved in 2009 which allowed for a pre-construction exploratory test pit in order to verify the design of the processing plant. The second modification occurred in 2011, which related to:

- the construction of a new rail loop off the existing privately owned Boral Cement rail line;
- the relocation of the loading facilities and processing plant within the site;
- a new overburden emplacement to the west of the quarry pit;
- the reduction in the size of the water storage dam; and
- a new residential receptor.

The third modification was approved in November 2012 which allowed for the installation and operation of a High Voltage Power line and an extension to an existing rail siding near the junction of the private rail spur and the main Southern Railway Line, referred to as the Medway Junction. This modification enabled the shunting of a full train adjacent to the private rail line which improved the logistics of train paths to the site. This modification also enabled a general update and revision to the Project Approval, which consolidated relevant aspects of March 2009, November 2011 and the November 2012 modifications.

The quarry also holds Environment Protection Licence 13088 administered by the Environment Protection Authority. The Licence anniversary date is 23rd July and the licence was reviewed in March 2011 when Variation Notice 1125628 was approved allowing for full operation of the quarry. The licence allows for Crushing, Grinding, Separation and Extractive activities for tonnages greater than 2 Million per annum.

Peppertree Quarry also holds Water Licence (10SL056926) granted by the NSW Office of Water for the period 31/3/2011 to 31/3/2016 for the construction and use of a 110ML dam and also holds a water bore water licence (10BL159860) allowing an annual extraction of 15 ML. All current water licences are required for the ongoing operation and will be renewed as they fall due.

1.4 Consent Requirements

Table 1.2 also references the Condition of Consent and its discussion in the AER.

Table 1.2: Compliance Table

Approval Conditions	Condition Number	Section of Environmental Review
Schedule 3 – Environmental Performance Conditions	1: Identification of boundaries	Section 2.1
	2 to 11: Noise	Section 3.4
	12 to 16: Blasting and Vibration	Section 3.4
	17 to 20: Air Quality	Section 3.3
	21 Meteorological Monitoring	Section 3.2
	22 to 30: Surface and Groundwater	Sections 3.5, 3.6, and 3.7
	31: Traffic and Transport	Section 2.1
	32: Aboriginal Heritage	Section 3.11

Approval Conditions	Condition Number	Section of Environmental Review
	33 to 36: Flora and Fauna	Section 5.4
	37 to 39: Visual Impact	Section 3.10
	40: Advertising	Section 3.10
	41 to 42: Waste Management	Section 3.8
	43 to 45: Emergency and Hazards Management	Sections 3.9 and 5.3, Chapter 6
	46: Production Data	Section 1.2.1
	47: Quarry Exit Strategy	Section 5.1
Schedule 4 - Additional Procedures	1: Notification of landholders	Section 7.12
	2 to 5: Independent Review	Section 4.8
	6 to 9: Land Acquisition	Sections 4.8 and 4.9
Schedule 5 – Environmental Management and Monitoring conditions	1. Environmental Management Strategy	Section 7.3
	2. Environmental Monitoring Program	Chapter 3
	3. Incident Reporting	Section 3.12
	4. Annual Review.	This Report
	(a) describe the development that was carried out in the previous calendar year. describe the development that is proposed to be carried out over the coming year.	Chapter 2 Chapter 7
	(b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year and measure these results against the <ul style="list-style-type: none"> • relevant statutory requirements, limits or performance measures/criteria • the monitoring results from previous years; and • the relevant predictions in the EA. 	Chapter 3 Section 4.6
	(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance	Chapter 3
	(d) identify any trends in the monitoring	Chapter 3

Approval Conditions	Condition Number	Section of Environmental Review
	data over the life of the project	
	(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies	Chapter 3
	(f) describe what measures will be implemented over the next year to improve the environmental performance of the project.	Chapter 7
	5.-6. Independent Environmental Audit	Section 4.10
	7. Revision of strategies, plans and programs	Section 3.1
	8.-9. Community Consultative Committee	Section 4.2
	10. Access to Information	Section 4.7

Pursuant to the Development Consent, copies of this report will be submitted to:

- NSW Department of Planning and Environment (DoP&E);
- NSW Department of Trade and Investment (T&I NSW);
- NSW Environment Protection Authority (EPA);
- NSW Office of Water (NOW);
- Goulburn Mulwaree Shire Council (MWSC); and
- The Peppertree Quarry Community Consultative Committee (CCC)
- Aboriginal Heritage Management Committee (AHMC)

The report will also be available at the Boral website www.boral.com.au/marulan

2. Operations During the Reporting Period

This section describes the construction and operational activities at Peppertree Quarry during the reporting period.

2.1 Construction

The focus during the reporting period has been on the construction of the project. The construction program began during July 2011 and was finished in late 2013. Commercial operations commenced early in 2014. Construction commenced with establishing a contractors compound and installation of erosion and sedimentation controls prior to site clearing and topsoil removal. The construction phase included earthworks to establish the pad area for the processing plant and infrastructure as well as noise control bunding, dams and roadways. Overburden produced from the initial quarry extraction was used to build the bund walls and railway embankment while the initial hard rock extracted was used to develop hardstand areas.



Plate 1 - Initial Construction Area

The limits of the extraction area were surveyed and identified using orange star-pickets and tagging to ensure compliance with the approved limits of extraction (Schedule 3, Condition 1). The above photo shows the contractors compound and initial overburden removal to establish the noise control bund. To the top right of the photograph is the initial borrow pit with the process plant hardstand area to the left.

Earthworks continued through to early 2013, with construction of rail and processing infrastructure occurring during 2012. A total of 8 sediment control dams were constructed to contain runoff from disturbed areas while silt fencing was erected downslope of the main

sediment sources. Topsoil was separately stripped and stockpiled for later use on completed batter slopes.

The civil works included:

- Erection of the primary in-pit mobile crusher, power supply and conveyor system
- Primary Screen and building enclosure;
- Secondary crushing plant and building enclosure;
- Secondary Screen and building enclosure;
- Final product silos; and
- Train loading facility.

Each component of the process requires separate material handling infrastructure including conveyors, drives, loop take-ups, feeders and dust controls. The design has minimised the use of mobile plant which are a normal feature of hard rock quarries. The primary in-pit crusher, shown on Plate 2 below, was purpose built for the Peppertree Quarry based on findings from a Safety in Design and process planning.



Plate 2 - In-Pit Crusher under construction

The crushing and screening buildings were purpose built to reduce noise and dust emissions with material being fed by fully enclosed conveyors into and out of each building ultimately delivering final product sizes to the enclosed silos.



Plate 3 - Construction of Processing and Material Handling Infrastructure

The train loading system allows for loading of multiple products and blends from the silos. The photo above shows the commencement of the silo construction (background) while the foreground shows the construction works associated with the building of the crushers.

The train loading system is fully automated with product being delivered by conveyor from the silos to the loading bin.

A new section of rail line was constructed which utilised the existing bend in the line leading to the Marulan South Limestone Mine. This new section created a rail loop which enables trains to travel separately to either the limestone mine or the Peppertree Quarry maximising the use of the existing line. The project also involved the extension of an existing siding near the junction with the main railway line which enabled the parking of 1,200 m trains off the siding. This allows for a greater use of the rail siding without impact on normal train movements on the public railway network.

As part of the construction program a Construction Traffic Management Plan was prepared in accordance with Schedule 3, Condition 31 of the Project Approval. This plan covered traffic generated during the construction program and initial product dispatch via rail. The plan also covered the construction of the new rail loop designed to transport all product by rail and interactions with the existing rail spur.



Plate 4 - Construction of the Rail Loading Facility and New Rail Line

By the end of the reporting period, the plant had entered the commissioning phase and the first train loads of product had been dispatched. Plate 5 below shows the status of the site at the end of 2013.



Plate 5 - Layout at the end of Construction

2.2 Land Preparation

Prior to extraction of the rock, the topsoil is first stripped and stockpiled for later use in rehabilitation work. Although the target resource is a high quality granodiorite, the quarry operation needs to extract some overlying sedimentary and volcanic rock as well as weathered granodiorite in order reach the target resource. This overlying material, referred to as overburden, is separately stripped and used for bund construction and ultimately out of pit emplacement. The areas used for external bunding and overburden emplacement, however, do not undergo the same stripping process. Overburden is placed directly on the undisturbed ground surface to minimise any impacts to heritage and to minimise the amount of topsoil to be rehandled. Fauna and heritage reviews were undertaken prior to disturbance of the new areas.

In the reporting period, 58.1 ha of land was disturbed as shown in the table below.

Table 2.1 - Area of Disturbance During the Reporting Period.

Disturbed areas	As of end Dec 2013 (ha)
Infrastructure area – Rail, Primary , STQ and TLO	25
Quarry extraction area	20.41
Active overburden emplacement	8.08
Test pit / west pad	1.41
Overburden emplacement / Noise bund (revegetated)	9.89
Total area rehabilitated	9.89

2.3 Quarry Extraction and Processing

Extraction involves four main stages:

- topsoil and overburden removal and emplacement;
- blasting and crushing of raw feed in-pit;
- final crushing, screening and stockpiling out-of-pit; and
- loading, transport and distribution.

The layer of soil and overburden is stripped in progressive stages and hauled to emplacement areas. After overburden stripping, rock is drilled, blasted and loaded directly into the in-pit primary crushing plant. Twelve (12) blasts occurred in the reporting period. Boral has implemented an innovative in-pit crushing solution at its new Peppertree Quarry. The use of a mobile primary crushing plant in-pit avoids the need to haul rock from the pit to a fixed primary crusher, in turn assisting in the abatement of noise and dust.

The in-pit primary crusher weighs 285 tonnes and measures 12m high by 25m in length. It can process 1150 tonnes of rock per hour. It is capable of moving as the extraction area progresses and is joined by a unique Lokolink mobile conveyor system.



Plate 6 – In-Pit Crusher in Operation

From here, the crushed rock is conveyed to the out-of-pit processing plant for final crushing, screening, blending and stockpiling. The processing plant has been fully enclosed to control noise and dust.

From the primary crusher, rock is delivered to the fixed processing infrastructure. Depending on the product specification, rock is further crushed and screened prior to delivering into the eight product silos. These silos can feed the train loading bin by conveyor in a fully automated and centrally controlled system from the main control room.

An integrated control system covers the entire material handling and processing infrastructure. This system monitors the feed and delivery conveyors, crushing and screening plants. Faults are quickly detected and diagnosed and if required sections of the processing system can be shut down. This system allows production to be maximised in an inherently safe environment.

During the reporting period, extraction had commenced in conjunction with commissioning of the completed processing and material handling infrastructure. The extraction commenced in the north-western corner of the 30 year quarry footprint and will progressively move in an easterly direction over the next 5 years. After approximately 5 years, the quarry will then progress to the south until the limit of the approved area.

The anticipated production levels are provided in the table below, however actual production rates will be dependent on market demand and production levels at other Boral hardrock quarries.

Table 2.2 - Extraction Rates (Mtpa)

Material	Year 1	Year 2	Years 3-5	Years 6-10	Years 11-30
Quarry Product	0.9	1	1.5	2.5	3.5
Weathered Material	0.9	0.5	0.5	0.6	0.4
Overburden	1.2	0.6	0.5	0.5	0.5

For the period ending December 2013, production levels were incidental. Approximately 80,000 tonnes of material was processed through the primary crusher during the reporting period as part of commissioning and initial rock for testing. The 2014 reporting period would correspond to the Year 1 production scenario.

2.4 Train Loading

All product from the quarry is transported by rail unless in the case of emergencies. At full production the Quarry will operate up to four trains per day which will transport product north to the Sydney market and other customers. This is in addition to the Limestone Mine which currently operates up to six trains per day transporting product north to Berrima, Maldon and east to Port Kembla. The rail line and train loading operation can occur 24 hours per day, 7 days per week.

Product is conveyed directly from the product bins to the train loading facility by conveyor. Each bin contains different products and depending on the shipment, it can consist of the same or different products. The processing plant can produce blended products as well in order to maintain complete flexibility in response to market demand. The train loading system has been designed to be fully automated and controlled by a central control room in the administration building. Once loaded, trains return to the main line via a rail loop.

The first train to leave the site occurred in October 2013 as the site moved into commissioning phase at the end of the reporting period.

2.5 Hours of Operation

As stipulated in Schedule 3 Condition 11, the Quarry activities are limited to designated working hours. The operation of machinery and/or blast activity is strictly monitored according to the stipulations of the approval with the operating times logged automatically in the computer management systems. Construction hours were logged through sign on registers and approved timesheets.

Table 2.3 – Hours of Operation

Activity	Day	Time
Construction Works	Monday-Friday	7:00 AM to 6:00 PM
	Saturday	8:00 AM to 1:00 PM
	Sunday and public holidays	None
Topsoil/overburden removal/emplacement	Any day	7:00 AM to 7:00 PM

Activity	Day	Time
Blasting	Monday-Saturday	9:00 AM to 5:00 PM
	Sunday and public holidays	None
In-pit (including drilling, extraction, processing, and transfer of material out of the pit)	Monday - Saturday	7:00 AM to 7:00 PM
Out-of-pit activities (including processing, stockpiling, train loading and distribution, and maintenance)	Any Day	24 hours

2.6 Employment

The main employment during the reporting period was associated with contractors engaged in the construction program. The main contractors were Metso, Sandvik, Transfield, Gordon and Palmer and Select Civil. These companies used both internal staff and external contractors as required. The full time equivalent (FTE) on-site employees averaged 20 FTE during the construction program. The majority of the work consisted of design work, fabrication and construction. At the end of the construction period, it was estimated that upwards of 600,000 hours were worked in relation to the project. This represents the equivalent of 100 FTE people for a period of 3 years.

As the quarry enters its production phase, it is anticipated that up to 30 FTE employees will be required. At the end of the reporting period, there was a total of 12 staff consisting of key management and operating positions.

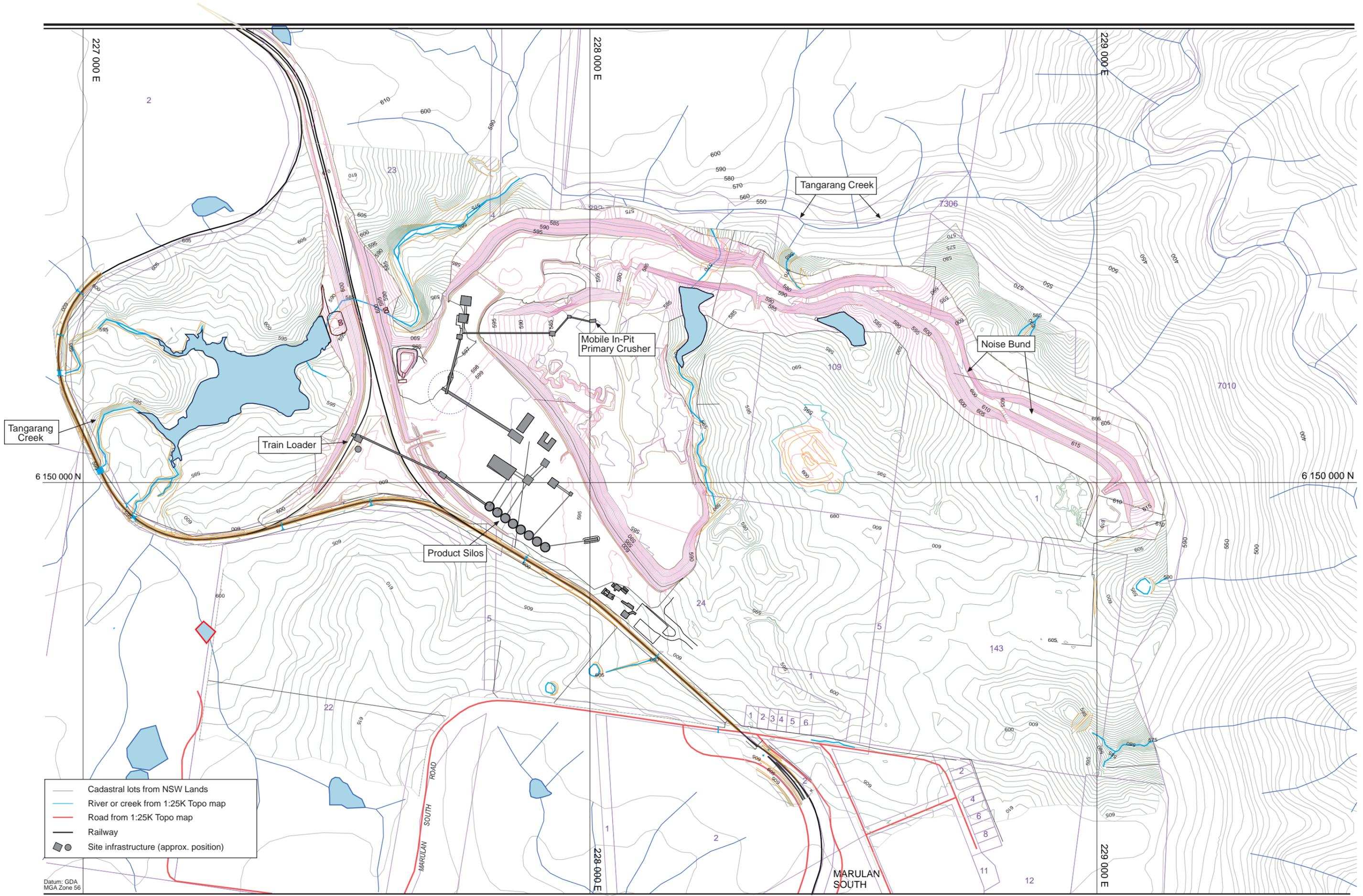


FIGURE 4
 Boral Peppertree Quarry
 Survey Plan 2013

3. Environmental Management and Monitoring

This section identifies the main environmental issues and outlines the principle elements of the existing pollution control system. Background environmental data is also provided.

3.1 Environmental Risk Identification

Prior to and throughout the construction phase, Boral undertook regular risk assessments and environmental reviews. This work resulted in a number of changes made to the design and implementation process leading up to the commissioning phase. Key environmental risks identified during this processes included:

- Managing noise issues from the plant and equipment resulting in the implementation of acoustic controls and the design of the northern bund.
- Managing blasting including ground vibration and overpressure resulting in the development of a Blasting Protocol coupled with feedback mechanisms from monitoring data.
- Managing water during construction and operation which included the implementation of effective erosion and sedimentation controls, rehabilitation of completed batter slopes as soon as practicable and the construction of suitable pollution control systems.
- Managing dust emissions during construction and operation which saw the implementation of specific engineering controls such as enclosures and water sprays as well as dust extraction systems.
- Managing Archaeological and Heritage impacts of both known and potentially unknown sites within the quarry development footprint. This issue required the implementation of a comprehensive site assessment process involving the local Aboriginal community and other stakeholders.
- Managing community issues during the construction and operational phases resulting in an extensive and ongoing consultation process including regular newsletters, individual meetings and the establishment of a Community Consultative Committee.

A number of low risk issues were also investigated including waste management, rehabilitation, groundwater, traffic and transportation, flora and fauna, bushfire and visual impacts. Although considered low risk they are still included in the overall Environmental Management Strategy for the operation and addressed in ongoing monitoring and reporting systems.

The identification and assessment of environmental risks has allowed management plans and procedures to be developed to minimise the potential risk on the environment. Management controls are required for all items which have been assessed as either high or medium risk. Such environmental management controls are described in the following management plans which have been prepared in accordance with Schedule 2, Condition 1 and Schedule 5, Conditions 2, 3, 4 and 7 of the Project Approval. These plans were

submitted for initial approval in January 2011 while a revision of the plans occurred in August 2012, and include:

- Air Quality Monitoring Plan
- Noise and Blast Monitoring Program
- Construction Noise Management Plan
- Construction Traffic Management Plan
- Landscape and Rehabilitation Management Plan
- Water Management Plan
- Aboriginal Heritage Management Plan
- Environmental Monitoring plan

3.2 Meteorological Monitoring

Meteorological data is obtained from the on site weather station. The weather station measures wind speed and direction, rainfall, relative humidity, temperature at 2 m and 10 m, as well as solar radiation and barometric pressure. Data is uploaded to a secure web page on a weekly basis. Data however can be obtained on a daily basis if required.

3.2.1 Rainfall

The total monthly rainfall and number of rainy days recorded is shown in Table 3.1. The monthly rainfall fluctuated throughout the year, with heavy rain experienced in February and June, and very little rainfall occurring in August.

Table 3.1 – Total Monthly Rainfall (mm) (2013)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
107.8	149.0	45.0	30.6	27.8	234.2	39.6	6.8	50.8	23.6	55.8	28.8	799.8
Number of Rain Days (≥ 1 mm)												
6	12	6	6	4	12	6	3	3	3	8	8	77

Rainfall for 2013 was slightly higher than the average annual rainfall reported in the EA being 691.3mm.

3.2.2 Temperature

Monthly temperatures recorded are shown in Table 3.2 below. Maximum and minimum temperatures were typically higher in the summer months, from December to January, while much cooler temperatures were recorded from May to August.

Table 3.2 - Minimum and Maximum Monthly Temperatures ($^{\circ}$ C) (2013)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	8.5	8.7	5.3	2.1	-2.5	-1.9	-2.7	-1.3	0.9	0.4	3.1	3.9
Max	40.7	34.1	28.8	26.46	21.0	19.4	18.3	19.0	24.7	31.0	32.0	37.0

3.2.3 Wind Speed and Direction

Maximum and mean maximum wind gusts are shown in Table 3.3 below. Generally the greatest average maximum wind gusts occur during late winter and early spring, with strong gusts observed in September and October. Gentler winds were observed for the autumn months of April and May. The predominant wind direction during the summer months is from the east, while during late autumn and winter the predominant direction is from the north west.

Table 3.3 – Mean Maximum Wind Speed (m/s) (2013)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
11	10	10	9	9	9	10	13	12	13	11	11
Maximum Wind Speed (m/s)											
20	21	17	15	16	17	19	20	24	24	19	21

3.3 Air Quality Management

The main area of concern relating to air quality is dust. Excessive generation of dust can result in nuisance to local neighbours and environmental prosecutions. The main sources of dust associated with operation of Peppertree Quarry are:

- drilling and blasting of rock;
- vehicles and mobile plant travelling on unpaved surfaces;
- loading and unloading of material to crushers, stockpiles, trains and trucks;
- crushing and screening of rock; and
- wind erosion from stockpiles and unpaved exposed areas.

In accordance with Condition 19, Schedule 3 of the Project Approval, Peppertree Quarry is developing a comprehensive air quality management system that uses a combination of predictive meteorological forecasting and air quality monitoring data to guide the day to day planning of quarrying operations and the implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the air quality conditions of the approval. The key to this system is the controls available to shut down or change specific operations from a central point in the control room.

There are also specific management and engineering controls which form part of the design and management of the site, these include:

- covering of conveyors and transfer points with dust extraction system fitted;
- enclosure of crushing and screening plant;
- fitting of scrapers for cleaning conveyor belts;
- dust suppression sprays on the primary crusher and surge stockpile;

- use of a mobile primary crusher in-pit which eliminates truck haulage of raw material to the primary crusher;
- moveable conveyors instead of truck haulage of aggregate from the main pit;
- fitting drills with either water sprays and/or dry dust collection devices;
- enclosure of train loading facilities;
- haul roads and processing areas are compacted and lined with aggregate;
- containment of aggregate materials within silos limiting the need to stockpile materials;
- The suspension of civil works is implemented where winds are in excess of 30km/hr;
- use of water tankers to dampen haul roads and bunds under construction;
- controlling stockpiles of fine material with water sprays; and
- embankments are hydromulched on completion.

3.3.1 Air Quality Assessment Criteria and Predictions

Condition 18, Schedule 3 of the Project Approval establishes the following air quality assessment criteria for the project.

Table 3.4 Long term Land Acquisition Criteria for Particulate Matter

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

Table 3.5 Short term Land Acquisition Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion ^{d a}
Particulate matter < 10 µm (PM ₁₀)	24 hour	^a 150 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	24 hour	^b 50 µg/m ³

Table 3.6 Long term Land Acquisition Criteria for Deposited Dust

Pollutant	Average Period	Maximum increase in deposited dust level	Maximum total deposited dust level ^{d a}
^c Deposited Dust	Annual	2 g/m ² /month	^a 4 g/m ² /month

Notes:

^a Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

^b Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

^c 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 or any other activity agreed by the Director-General.

Predicted dust levels were assessed in the 2006 Environmental Assessment which also modelled dust emissions from the adjacent Limestone Mine. The predicted dust levels

showed compliance with the criteria provided in the Project Approval at all residences not owned by Boral.

3.3.2 Air Quality Monitoring Program

Peppertree Quarry has implemented an air quality monitoring program to sample air quality within the vicinity of the quarry operations. The program includes monitoring of coarse dust, particulate matter <10 microns (PM10) and Total Suspended Particulates (TSP) at nominated locations on neighbouring properties.

Management of dust levels during construction was considered a priority to ensure that neighbours were not affected by dust which may have been caused during the establishment of the quarry. As stipulated by Schedule 3 Condition 20 Boral has prepared and implemented an Air Quality Management Plan.

High volume air sampling, for Particulate Matter less than 10 microns (PM10) and Total Suspended Particulates (TSP) is undertaken over a 24 hour period every 6 days. The monitors are located at 683 Marulan South Road. The details of the operation and location of the monitors is available in the Air Quality Management Plan.

The standard operational procedure for the monitors requires calibration on a 2 monthly period for the key parameter of flow. Other parameters such as the time meter and the program of the clock are required on an annual basis. Calibration of the monitor is undertaken by Thomson Environmental Services every 2 months.

Dust deposition gauges measure the rate at which dust settles onto a surface. To provide an indication of dust deposited in the environment, each month, three dust deposition gauges are operated in the local area. Details of the gauges, their operation and location are available in the Air Quality Management Plan. Monitoring is undertaken over a 30 day period plus or minus 2 days as per the Australian standard.

3.3.3 Dust Monitoring Results

Deposited Dust

The Peppertree Dust Deposition Gauge 1 is an onsite monitoring point located near to the processing plant and the rail line. It provides guidance on the operations so that the necessary control can be implemented to minimise dust impacts off site. Site 2 is located at 683 Marulan South Road while site 3 is located at 432 Long Point Road Tallong. These two monitoring locations are for compliance with the Development Consent. Results from monitoring are shown in Table 3.7 and in figures 5 to 7. It can be seen that although concentration for sites 2 and 3 have increased slightly over the previous reporting period, the annual averages are below the background levels reported in the EA for the nearest sensitive receptors.

Concentrations for Site 1 have decreased from the previous year and the annual average is just in exceedance of the annual average criteria. This was as a result of a high reading in October 2013. The source of the high reading was not able to be identified however due to prevailing winds it is not believed that it was due to quarry operations.

Table 3.7 Annual Average Deposited Dust Concentration – Insoluble Solids (g/m²/month)

	2012	2013	Background Levels in EA	Annual Average Criteria
Site 1	6.78	4.25	3	4
Site 2	1.92	2.21	3	4
Site 3	2.29	2.78	3	4

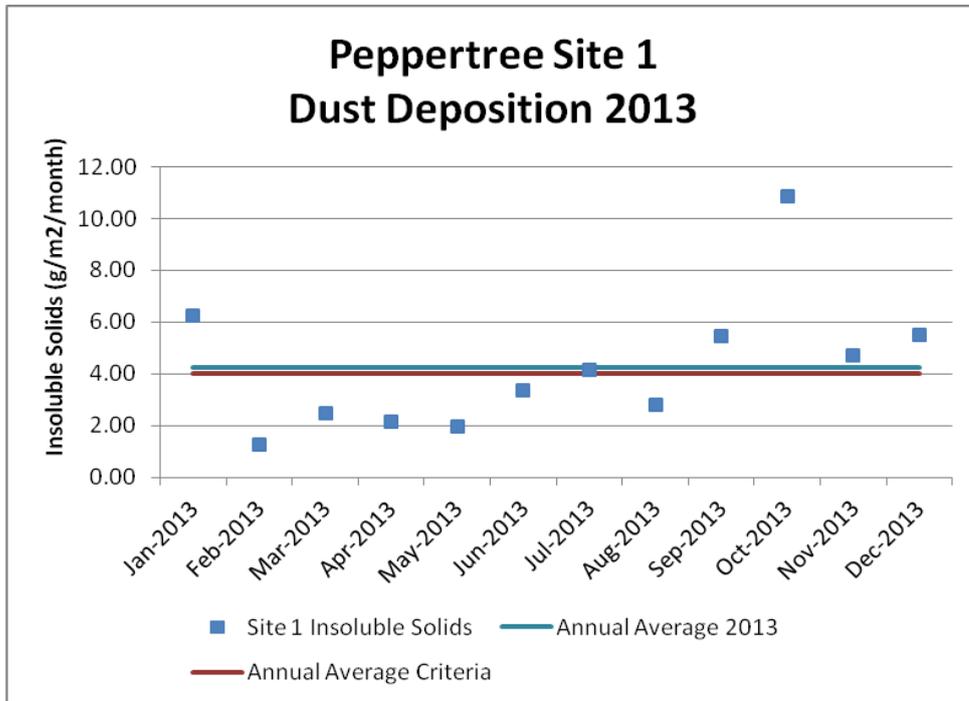


Figure 5 Deposited Dust: Site 1

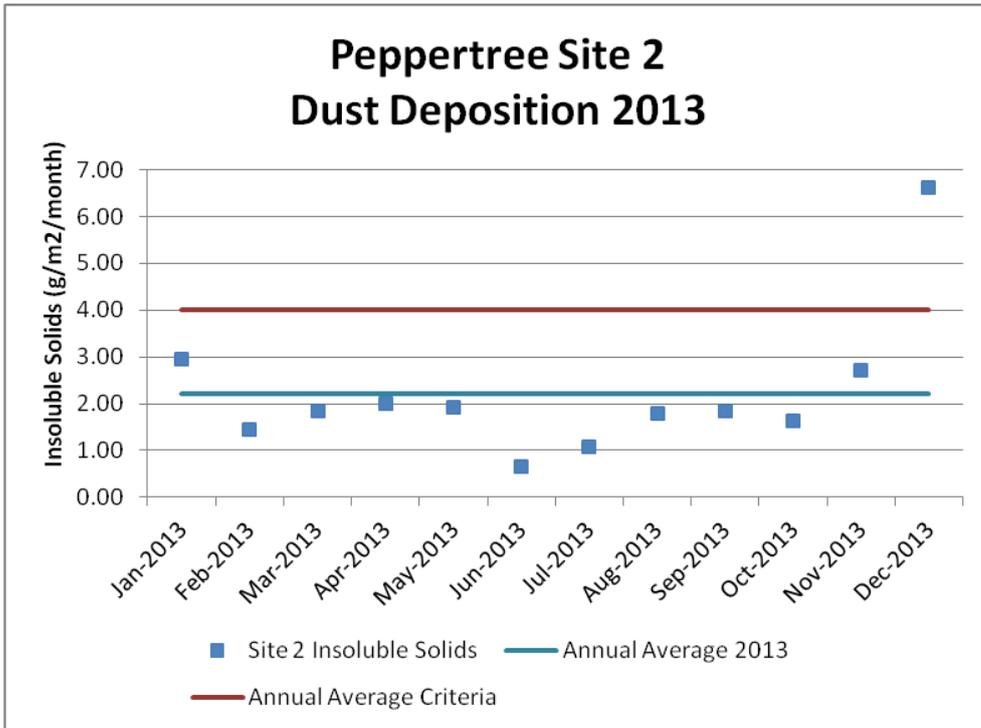


Figure 6 Deposited Dust: Site 2

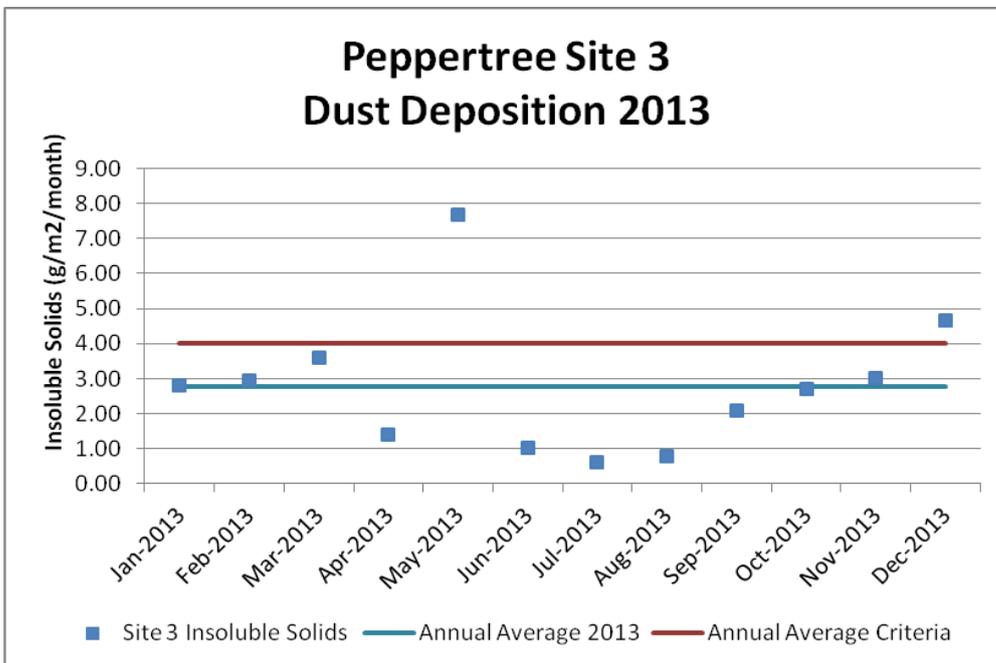


Figure 7 Deposited Dust: Site 3

Ambient Air Quality Monitoring

Results from the PM₁₀ and TSP monitoring are shown in Table 3.8 and graphically in Figures 8 and 9.

Table 3.8 Annual Average PM10 and TSP (ug/m³)

	2012	2013	Background Levels in EA	Annual Average Criteria
TSP	33.34	26.5	25	90
PM10	16.46	13.32	16	30

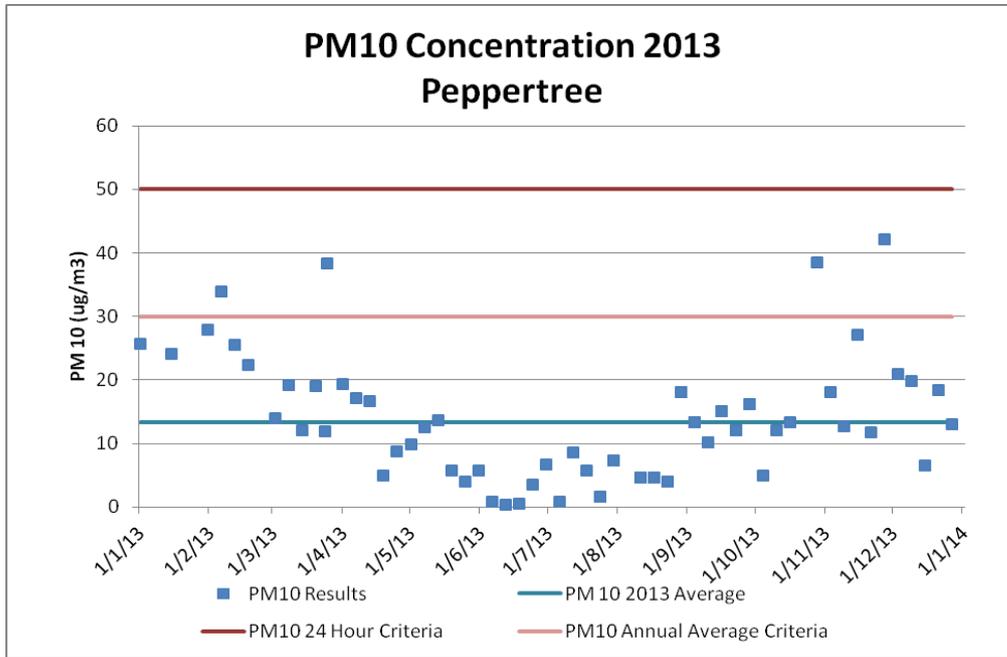


Figure 8 PM 10 Concentration

Figure 8 shows that all PM10 24 hour results were below the criteria of 50ug/m³, and that the annual average was below the criteria of 30ug/m³.

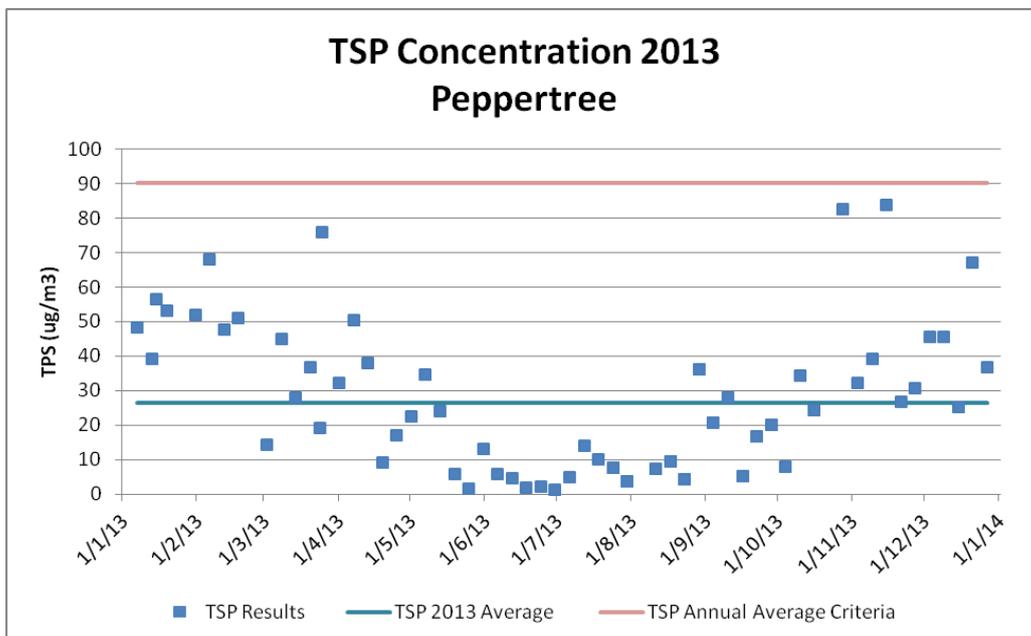


Figure 9 TSP Concentration

Figure 9 shows that all TSP levels were below the annual average criteria. Dust levels have decreased for both TSP and PM10 compared to 2012. Although there has been a slight increase in TSP compared to the background levels calculated in the EA, the concentrations are still well below the limit of 90 ug/m³.

3.4 Noise and Blasting

The construction phase of the Peppertree Quarry development occurred in accordance with a Construction Noise Management Plan (CNMP) while the ongoing operation is controlled by a Noise and Blasting Management Plan (NBMP). The CNMP was prepared in accordance with the requirements of Condition 3, Schedule 3 while the NBMP was prepared in accordance with the requirements of Condition 10, Schedule 3 of the Project Approval.

The CNMP allowed for construction noise during the first three months of works with operations then needing to comply with the operational noise criteria outlined in the Approval and as per the NBMP. Therefore, even though Construction works were still occurring, for the period of 2013 the NBMP applies. The noise emissions during construction were audited which provided feedback to the construction team on measures to improve noise management. A total of 4 Noise Audits were conducted during the reporting period which are attached as Appendix D.

Specific noise management initiatives include:

- Combination of predictive meteorological forecasting and noise monitoring data to guide the day to day planning of quarrying operations.
- Identification of temporary or infrequent noise-generating activities and/or sources and consider mitigation if required.
- Presentation of applicable noise criteria to contractors via tool box instructions.
- Ensuring all covers are in place and closed at all times when fixed and mobile plant is in operation.
- Inform all potentially impacted residents of the nature of potentially high noise generating works to be carried out, the expected noise levels and duration, as well as contact details.
- Brief contractors / employees on the noise operational requirements to minimise noise via and regular inspection and maintenance of equipment to ensure optimum working order.
- Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes).
- Diesel locomotives are split on the trains ie one on either end rather paired together.
- Enclosed processing operations.
- Noise cladding on the major crushing building.
- The Quarry operates within the working hours stipulated in Schedule 3 Condition 11..

- Plant and equipment is regularly inspected both in terms of noise management and as required by Schedule 2, Condition 11 to ensure proper maintenance and operation. Any defects are to be remedied immediately and equipment involved in incidents to be processed according to the WH&S Incident reporting protocols.

Weather conditions have the potential to increase noise levels at the residential receptors in the vicinity of the quarry. Routine monitoring of meteorological conditions is conducted through the Bureau of Meteorology as well as with reference to the on-site meteorological station.

As required by Condition 3 of Schedule 6, Peppertree takes all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other extractive industries such as the neighbouring Marulan South Limestone Mine does not exceed the following amenity criteria on any privately owned land, to the satisfaction of the Department of Planning and Environment:

- LAeq(11 hour) 50 dB(A) during the day;
- LAeq(4 hour) 45 dB in the evening; and
- LAeq(9 hour) 40 dB during the night.

3.4.1 Noise and Blasting Assessment Criteria and Predictions

The criteria established in Conditions 4 and 5, Schedule 3 are provided in the following tables.

Table 3.9 Operational Noise Impact Assessment Criteria

Receiver Location	Description	Noise Impact Assessment Criteria, dB(A)		
		Daytime 7:00am to 7:00pm	Evening and Night 7:00pm to 7:00am	
		LAeq, 15min	LAeq, 15min	LA1, 1min
1	Montgomery	35	35	45
2	Ordasi	39	35	45
4	Armitt	37	35	46
5	Cooper	35	35	45
6	Bartolo	35	35	45
16	Pace	41	35	45
Any other noise sensitive location		35	35	45

1. the identified 'Daytime' noise criteria apply throughout the period of the site's Day Shift (i.e. 7.00am to 7.00pm) on all days, despite the general definitions of 'Evening' and 'Night time' otherwise applying to the approval. The identified 'Evening' and 'Night time' criteria apply only during the period of the site's Night Shift (i.e. 7.00pm to 7.00am); and
2. noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW INP.

The Receiver Location numbers refers to the original identification scheme provided in the EA and subsequent modifications.

Table 3.10 Land Acquisition Noise Assessment Criteria

Receiver Location	Description	Land Acquisition Criteria, dB(A) LAeq, 15min	
		Day 7:00am to 7:00pm	Evening/ Night 7:00pm to 7:00am
2	Ordasi	44	44
5	Cooper	40	40
6	Bartolo	40	40
16	Pace	44	44

1. refer notes presented for *Table 2.1*.

The Project Approval allowed for a separate construction phase noise criteria in accordance with the Environmental Noise Control Manual for the first three months of construction. This period corresponded to the construction of the noise control bund, prior to this reporting period, after which the normal operating noise criteria applies.

Table 3.11 Airblast Overpressure Criteria

Airblast Overpressure Level (dB(Lin Peak))	Allowable Exceedance
115	5 % of the total number of blasts over a period of 12 months
120	0%

Table 3.12 Ground Vibration Criteria

Peak Particle Velocity (mm/s)	Allowable Exceedance
5	5 % of the total number of blasts over a period of 12 months
10	0%

3.4.2 Noise and Blasting Monitoring Program

Noise measurements are conducted at six locations to quantify any noise impacts associated with the quarry operations. Both operator-attended measurements and unattended continuous noise monitoring is undertaken to quantify overall ambient noise levels resulting from quarry operations as well as other industrial noise sources in the area. Details of the equipment and methodology are detailed in the Noise and Blast Management Plan. Monitoring is undertaken by independent consultants on a quarterly basis.

Blast monitoring is undertaken at four locations with monitors being installed prior to each blast.

3.4.3 Noise and Blasting Monitoring Results

During the reporting period, noise monitoring at each nominated noise receptor was undertaken. The monitoring included static noise loggers and attended noise monitoring in January 2013, April 2013, July 2013 and October 2013.

Each survey found that the operation complied with the operational site impact assessment criteria at all receiver locations. In most cases the predicted site noise level was significantly below the assessment criteria at each receiver location. The results showed that the site noise contributions are generally below 25 dB(A) and do not extend to influence any other known community receptors.

Blast monitoring is undertaken at four locations and recorded in Tables 3.13 and 3.14. All zero records are no trigger.

Table 3.13 – Airblast Overpressure Level (dB(Lin Peak))

Blast Date	Northwest Boundary	Northeast Boundary	683 Marulan South Road	Pace	Criteria 1 (dbL)	Criteria 2 (dbL)
20/4/13	95.1	102.8	0	0	115	120
3/5/13	<88	104.9	0	0	115	120
31/5/13	0	101	0	0	115	120
21/6/13	0	95.9	no monitor	95.7	115	120
5/7/13	96.2	0	0	100.7	115	120
16/8/13	0	0	0	0	115	120
13/9/13	0	102.8	0	104.2	115	120
4/10/13	105.5	106.5	0	104.2	115	120
17/10/13	<88	<88	0	0	115	120
23/10/13	<88	113.5	0	101.7	115	120
17/12/13	104.9	0	0	103.1	115	120
18/12/13	97.5	100	0	101.2	115	120

Table 3.14 – Vibration - Peak Particle Velocity (mm/s)

Blast Date	Northwest Boundary	Northeast Boundary	683 Marulan South Road	Pace	Criteria 1 (mm/s)	Criteria 2 (mm/s)
20/4/13	0.95	2.18	0	0	5	10
3/5/13	0.823	0.582	0	0	5	10
31/5/13	0	0.741	0	0	5	10
21/6/13	0	0.68	no monitor	0.63	5	10
5/7/13	1.92	0	0	0.96	5	10
16/8/13	0	0	0	0	5	10
13/9/13	0	0.582	0	1.09	5	10
4/10/13	1.51	0.684	0	0.2	5	10
17/10/13	1.81	0.925	0	0	5	10
23/10/13	1.44	0.95	0	0.12	5	10
17/12/13	1.2	0	0	0.55	5	10
18/12/13	0.976	0.568	0	0.1	5	10

There were no exceedances of the criteria outlined in Tables 3.11 and 3.12.

3.5 Surface Water Management

Peppertree Quarry has been developed with a sustainable water management system, with the operations aiming to be 100% self sufficient in water. The water management system has been developed based upon capturing stormwater run-off for use in the quarry processes, dust suppression and environmental controls.

The system has been based around obtaining the sites water supply from the construction of the Dam No. 1 located on Tangarang Creek. The water supply dam captures water prior to being re-used on the site or released to Tangarang Creek catchment as environmental flows.

A site water balance was prepared as part of the Environmental Assessment and the Water Management Plan to define the size of the dam and needed supplies, as per Schedule 3, Condition 27.

Runoff from undisturbed and rehabilitated areas outside of the noise bund is diverted to sediment dams located around the boundary of the operations. These ponds prevent sediment from leaving the site.

All other water within the current quarry footprint is directed to a series of sediment dams located within the pit and around the site to prevent sediment laden or contaminated runoff leaving the site. Sediment traps and settling ponds form part of the site water management system which improves water quality at various points along both clean and dirty water drainage networks.

Treated water from site sediment dams is primarily used directly onsite. Excess water is drained or pumped to an internal storage dam before being discharged back into Dam No. 1.

There is no potable water supply on site so office needs are met with the water being transported to the site as required. Sewage treatment for the offices and amenities comprise package treatment unit with minimal demand for top-up water. The treated effluent is pumped to an absorption trench located to the south of the processing plant.

3.5.1 Water Quality Assessment Criteria and Predictions

Conditions 24 to 29 of Project Approval relate to water management and quality. Discharge of water from the quarry operations is limited to overflows via Dam No. 1 during large rainfall events. At this time, water has entered the Dam from approximately 753 ha of catchment upstream of the site. For this reason there are no limit conditions specified on the Environment Protection Authority Licence, however the overall criteria is that the operation must comply with Section 120 of the Protection of the Environment Operations Act 1997, meaning that operation should not pollute waters.

The 2006 Environmental Assessment and subsequent Peppertree Water Management Plan specified the design of the water management system. As such the 2006 Environmental Assessment predicted that with the implementation of the proposed water management system, including installation of the required pollution control storages

and erosion and sedimentation controls, that the operation would protect off site waterways by not discharging contaminated water.

Condition 24, Schedule 3 of the Project Approval also specifies that environmental flows to Tangarang Creek, from Dam No.1, should be equivalent to 10% of the average daily flows.

3.5.2 Tangarang Creek Environmental Flow

The Main Dam No 1 has three inflow creeks which provide water during large rainfall events only. The dam also receives storm water from the various pollution control ponds around the site. To assist in achieving the required environmental flow below the dam into Tangarang Creek, the dam was designed with a “chimney” drainage blanket which provides both stability within the wall as well as a continual flow downstream. A monitoring system has been established which estimates inflow and monitors outflow of the dam. The following photo shows Tangarang Creek before the installation of the dam.



Plate 7 - Tangarang Creek Before Dam Installation

The photo below shows the construction of the drainage material within the dam wall during construction. The dam wall itself also formed part of the new railway line and loop arrangement.



Plate 8 - Drainage Blanket During Construction

The use of chimney structures and drainage blankets is standard within the construction of dam walls to manage seepage and hence the stability of the embankments. However, this particular design catered for the required environmental flows to the downstream creek.



Plate 9 - Tangarang Creek after Dam Installation

The results exceeded expectations as the downstream section of Tangarang Creek now has a more consistent and natural flow. The work also included rehabilitation of the creek banks.



Plate 10 - Water flow measurement in Tangarang Creek

In order to confirm compliance with the Project Approval, an automatic flow monitor was installed downstream of the dam as shown in the photo above. This data is then compared with the water level in the dam. This system is still being calibrated and issues with leakage and overflow at the V notch weir still require management so reliable data can be obtained.

3.5.3 Surface Water Quality

Surface water quality monitoring is undertaken quarterly from Tangarang Creek, the Dam, culverts 1 to 3, and any overflow from sediment ponds T, U, V1, V, W, W1, W2, X and K.

In June 2013, a large rain event caused overflow through the main dam culverts. This is reflected in the 234.2 mm of rainfall over the month of June. Other significant rain events occurred in January and February.

The results from monitoring Tangarang Creek and the Dam are shown in Table 3.15. At the time of the quarterly monitoring there were no flows into the dam from above the site therefore there are no results for the rail culverts upstream of the dam. Additional samples were taken following the rain events of January, February and June. These are shown in Tables 3.16 to 3.18.

Table 3.15 Peppertree Surface Water Quality

Parameter	Tangarang Ck				Dam			
	5/4/13	5/6/13	25/9/13	5/12/13	5/4/13	5/6/13	25/9/13	5/12/13
pH	8.1	8.2	7.98	8	7	7.3	8.3	7.8
Total Suspended solids (mg/l)	8	2.4	<5	<5	24	8.4	<5	18
Total Dissolved solids (mg/l)	529	440	488	514	96	94	162	197

Parameter	Tangarang Ck				Dam			
	5/4/13	5/6/13	25/9/13	5/12/13	5/4/13	5/6/13	25/9/13	5/12/13
Ammonia -N (mg/l)	0.08	0.07	0.08	0.02	0.5	0.2	0.06	0.05
Nitrate-N (mg/l)	0.08	0.5	0.3	0.14	0.05	0.3	0.01	0.04
Nitrite-N (mg/l)	0.09	0.05	<0.01	<0.01	0.01	0.03	0.25	<0.01
Sulphate (mg/l)	9.88	10.7	8	8	25.93	4.53	3	<1
Chloride (mg/l)	190.99	166.51	133	149	13.33	13.91	40	44
Turbidity (NTU)	45	1.6	3.1	2	85	11	3.7	8.9
Calcium (mg/l)	69	68.88	61	61	17.79	19.53	22	27
Potassium (mg/l)	2.5	4.4	3	3	4.25	6.57	4	4
Magnesium (mg/l)	4.2	46.35	39	42	4.13	5.43	9	8
Sodium (mg/l)	62.55	71.99	52	66	21.06	32.91	21	22
Total phosphorus (mg/l)	<0.01	<0.01	0.03	<0.01	0.03	0.05	0.02	0.02
Hardness (CaCo3) (mg/l)	429.35	383.15	221	240	78.85	93.02	69	87
TKN (mg/l)	<0.5	<0.5	0.4	0.2	<0.5	<0.5	1.3	0.8
Faecal Coliform (cfu/100ml)	10	10	8	41	<10	<10	34	76
TPH C10-C14 (ug/l)	<50	<50	<50	<50	<50	<50	<50	<50
TPH C15-C28 (ug/l)	<100	<100	<100	<100	<100	<100	<100	<100
TPH C29-C36 (ug/l)	<100	<100	<50	<50	<100	<100	<50	<50
TPH C10-C16 (ug/l)	<50				<50	<50		
TPH C16-C34 (ug/l)	<100				<100	<100		
TPH C34-C40 (ug/l)	<100				<100	<100		
naphthalene	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthene	<1	<1	<1	<1	<1	<1	<1	<1
Flourene	<1	<1	<1	<1	<1	<1	<1	<1
Phenanthrene	<1	<1	<1	<1	<1	<1	<1	<1
Anthracene	<1	<1	<1	<1	<1	<1	<1	<1
Fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1
Pyrene	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)anthracene	<1	<1	<1	<1	<1	<1	<1	<1
Chrysene	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(b+k)fluoranthene	<2	<2	<1	<1	<2	<2	<1	<1
Benzo(a)pyrene	<1	<1	<0.5	<0.5	<1	<1	<0.5	<0.5
Indeno(1,2,3-cd)pyrene	<1	<1	<1	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	<5	<5	<0.5	<0.5	<5	<5	<0.5	<0.5

Table 3.16 Peppertree Surface Water Quality – Storm Event Database January

Date	29/01/2013				
Weather	Following rain (75mm) on 26 & 27th Jan				
Inspector/s	Sharon Makin				
	T1 (Tangarang Ck)	Armit (upstream flow)	Pace (upstream flow)	Armit (upstream)	Main Dam
pH	8.1	7.3	7.8	8	7.6
Total Suspended solids (mg/l)	83	118	315	3508	39
Total Dissolved solids (mg/l)	343	294	181	155	185
Ammonia -N (mg/l)	0.25	0.2	0.32	0.4	0.3
Nitrate-N (mg/l)	0.3	0.56	0.48	0.84	0.62
Nitrite-N (mg/l)	0.02	0.03	0.04	0.04	0.04
Sulphate (mg/l)	20.17	107.91	44.45	30.05	20.17
Chloride (mg/l)	163.5	176.56	61.87	13.54	32.16
Turbidity (NTU)	60	90	310	2300	26
Calcium (mg/l)	37.73	58.05	33.78	50.34	22.92
Potassium (mg/l)	3.11	0.91	5.31	5.74	4.64
Magnesium (mg/l)	31.57	41.54	8.11	12.15	10.16
Sodium (mg/l)	5	9.28	6.82	33.25	11.16
Total phosphorus (mg/l)	0.01	0.02	0.02	0.11	0.01
Hardness (CaCo3) (mg/l)	73.92	135.52	49.3	129.36	61.6
TKN (mg/l)	<0.05	<0.05	0.05	<0.05	<0.05
Faecal Coliform (cfu/100ml)	<10		<10	10	90

Table 3.17 Peppertree Surface Water Quality – Storm Event Database February

Date	25/02/2013			
Weather	Following rainfall 24th February			
Inspector/s	Sharon Makin			
	T1 (Tangarang Ck)	Armit (upstream flow)	Pace (upstream flow)	Main Dam
pH	7.5	7.5	7.7	7.1
Total Suspended solids (mg/l)	243	11	23	32
Total Dissolved solids (mg/l)	120	85	160	80
Ammonia -N (mg/l)	0.05	0.03	0.02	0.03
Nitrate-N (mg/l)	0.03	0.02	0.05	0.5
Nitrite-N (mg/l)	0.02	0.03	0.03	0.04
Sulphate (mg/l)	14.41	2.47	4.53	4.94
Chloride (mg/l)	32.26	7	31.88	16.76
Turbidity (NTU)	330	19	16	40
Calcium (mg/l)	16.01	19.06	7.47	14.78
Potassium (mg/l)	5.05	2.99	4.6	5.84
Magnesium (mg/l)	7.42	3.28	3.53	3.17
Sodium (mg/l)	19.77	12.92	20.52	16.99
Total phosphorus (mg/l)	0.05	0.01	0.04	0.04
Hardness (CaCo3) (mg/l)	93.02	106.57	67.14	62.22
TKN (mg/l)	<0.05	<0.05	<0.05	<0.05
Faecal Coliform (cfu/100ml)	<10	<10	10	90
TRH C15-C28 (ug/l)	<100	<100	<100	<100
TRH C29-C36 (ug/l)	<100	<100	<100	<100
naphthalene	<1	<1	<1	<1
Acenaphthylene	<1	<1	<1	<1
Acenaphthere	<1	<1	<1	<1
Flourene	<1	<1	<1	<1
Phenanthrene	<1	<1	<1	<1
Anthracence	<1	<1	<1	<1
Fluoranthene	<1	<1	<1	<1
Pyrene	<1	<1	<1	<1
Benzo(a)anthracene	<1	<1	<1	<1
Chrysene	<1	<1	<1	<1
Benzo(b+k)fluoranthene	<2	<2	<2	<2
Benzo(a)pyrene	<1	<1	<1	<1
Indeno(1,2,3-cd)pyrene	<1	<1	<1	<1
Dibenzo(a,h)anthracene	<1	<1	<1	<1
Benzo(g,h,i)perylene	<5	<5	<5	<5

Table 3.18 Peppertree Surface Water Quality – Storm Event Database June

Date	25/06/2013							
Inspector/s	Sharon Makin							
	Main Dam	T1 (Tangarang Ck)	Upstream	Dam V	Dam V1	Dam W	Dam W2	Dam X
pH	7.2	7.2	6.9	7.5	7.7	7.2	7.1	7.2
Total Suspended solids (mg/l)	86	471	99.6	112	116	116	104	120
Total Dissolved solids (mg/l)	33	39	34	70	278	178	37	39
Nitrate-N (mg/l)	0.30	0.50	0.48					
Nitrite-N (mg/l)	0.03	0.03	0.05					
Sulphate (mg/l)	14.82	16.88	6.17					
Chloride (mg/l)	5.91	8.63	6.18					
Turbidity (NTU)	95	170	40	230	85	130	400	230
Calcium (mg/l)	92.84	20.87	11.11					
Potassium (mg/l)	6.64	5.29	4.02					
Magnesium (mg/l)	35.13	12.81	6.91					
Sodium (mg/l)	84.23	53.87	38.48					
Total phosphorus (mg/l)	0.01	0.03	0.03					

Date	25/06/2013							
Inspector/s	Sharon Makin							
	Main Dam	T1 (Tangarang Ck)	Upstream	Dam V	Dam V1	Dam W	Dam W2	Dam X
Hardness (CaCo3) (mg/l)	28.31	27.69	27.69					
TKN (mg/l)	<0.05	<0.05	<0.05					

There is currently insufficient data to undertake an ANZECC assessment to determine site specific trigger values for receiving waters. As the monitoring database increases over the coming reporting periods site specific trigger values may be developed.

3.6 Erosion and Sediment Management

A key environmental risk identified during the construction phase was the management of erosion and sedimentation impacts.

In order to protect Dam 1, Tangarang Creek and further downstream Barbers Creek and the Shoalhaven River from sediment and erosion impacts, Peppertree operates in accordance with a Water Management Plan which includes erosion and sedimentation controls that were implemented during the construction phase of the project. Specifically, the Water Management Plan includes:

- Implementation of the requirements set out in the publication "Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition, 2004 (Landcom, 2004)", referred to as the '*Blue Book*' and Volume 2E Mines and Quarries (DECC, 2008);
- detailing practices that have potential to cause erosion and generate sediment and what control measures will be adopted to minimise the impact of these practices; and
- detailing the location function and capacity of erosion and sediment control structures and how they will be maintained.

The design of the quarry has included the construction of sediment traps and settling ponds to contain dirty water. These sediment dams were constructed prior to work commencing. The sediment dams and scour protection were also constructed within the clean water system which pass through the site in order to reduce erosion from high intensity storms. This work has included rock protection and lining of pipe outlets and adequate design of culverts as shown on Plate 11.



Plate 11 - Rock Protection in Tangarang Creek Downstream of the Railway Embankment



Plate 12 - Rock Protection During High Flow Event

Sediment fencing has also been installed around any disturbed areas to contain sediment at the source and minimise off site migration. Prior to any area of land being disturbed, the area is identified and contractors informed that works cannot extend outside the boundary of this area. In order to reduce sediment loss, revegetation works has occurred as soon as

practicable following completion of final batters. Additional revegetation has occurred along natural streams, particularly Tangarang Creek as it passes through the railway embankment.

3.7 Groundwater

The groundwater monitoring program involves the monitoring of water levels and quality at various locations up and down gradient of the site. Monitoring will be required on a quarterly basis at 10 sites. Details of the ground water monitoring locations and methodology is contained in the Water Management Plan.

No ground water monitoring has been undertaken to date as it is planned to install the bores following construction so that they are not damaged. Background samples were undertaken prior to the commencement of the construction of the quarry. These were reported as part of the approval application.

3.8 Waste Management

During the reporting period, the waste produced from site consisted of normal domestic garbage, sewage from the offices and contractors compound, and construction packaging. This was predominantly pallets, timber crates, steel scrap and wrapping materials. These wastes were managed by external contractors during the construction program. Towards the end of the reporting period, the packaged sewage treatment plant was installed for the offices and amenities buildings and the contractor's compound was decommissioned.

Recyclables such as paper, glass, metals, timber and oils continues to be managed by an external contractor. These materials are stored in separate bins or scrap metal yards for disposal as required.

Waste is monitored via invoicing and docketing systems as stipulated in Condition 41 Schedule 3, and managed in accordance with Condition 42 which requires the classification, assessment and management of waste products according to the OEH's Environmental Guidelines; Assessment, classification and Management of Liquid and non-liquid Waste.

An asbestos assessment was undertaken on the site in April 2013. Asbestos sheeting was identified in the old farmhouse, still on the site. The asbestos sheeting has been sealed and signposted. An asbestos management plan is in place for the site.

3.9 Hazardous and Explosives Materials Management

Boral has a MSDS system in place via Chem Alert. During the construction period, only limited chemicals and dangerous goods were located onsite. Minor quantities of diesel, oils were stored and the use of mobile refuelling systems were used by the contractors.

Service workshops and sheds are properly located and adequately fenced.

A Hazardous and Dangerous Goods Register is in place which identifies each chemical kept onsite. The register is physically kept in the "contacts" cupboard within the site office.

Any dangerous goods or chemicals are handled and transported in accordance with the AS1940 and AS25956 and the Dangerous Goods Code. This fulfils the obligation stipulated at Schedule 3 Condition 43.

3.10 Visual Management and Lighting

Condition 37 of the Project Approval requires minimisation of all visual impacts. A Visual Impact Assessment formed part of the Environmental Assessment Modification issued in May 2011. Findings noted that impacts are minimised due to the location's topography.

Given the isolated nature of the site, visual impact at ground level is minimal. Some overburden placement is visible to trucks entering and exiting the Limestone Plant. Views of the quarry are extremely limited from public vantage points and neighbouring properties.

As rehabilitation progresses, particular of the outer bunding and batter slopes, visual access to the quarry will further reduce.

In accordance with Schedule 3, Condition 40, Boral do not provide for or allow advertising signage on any exterior property boundaries facing public roads with the exception of business identification, traffic management, and environmental and safety signage.

3.11 Heritage Conservation

An Aboriginal Heritage Management Plan was developed with the aim to identify, protect, conserve, present and communicate the Aboriginal heritage values associated with the land, on which Boral's Peppertree quarry will be excavated. The management plan satisfies the requirements of Condition 32 of the Project Approval.

Since the initial EA, it has been identified that the Peppertree Quarry site is significant in the number of artefacts that are being identified across the site.

The Aboriginal Heritage Management Plan (AHMP) was completed in January 2011 and has since been reviewed during the reporting period (24th October 2013).

During the reporting period and prior, members of the Aboriginal Management committee (AMC) have undertaken topsoil monitoring across a large area of the site including salvaging of artefacts during topsoil spreading.

Figure 10 outlines the area salvaged during 2012 and 2013. Over 30,000 artefacts have been collected as of the end of the reporting period.



Figure 10- Aboriginal Heritage Salvage Area

3.12 Summary of Reportable Incidents

No reportable incidents occurred during the reporting period.

There was one reportable incident, however, at the Quarry prior to the reporting period which was in relation to an extreme storm event. The EPA and Department of Planning and Environment were notified of the event. The extreme storm occurred during the construction phase and did not involve runoff from the quarry but rather erosion of structures within Tangarang Creek.

The EPA issued a formal notice on 29 March 2012 requiring further investigation and the preparation of a rehabilitation report. An investigation report was submitted to the EPA on 4 April 2012 while a Rehabilitation Report was completed in August 2012. The recommendations of the Rehabilitation Report have been completed which included removal of sediment where accessible, stabilisation and rehabilitation of the bed and banks of a section of the creek, management of Aboriginal heritage items and ongoing monitoring.

A Pollution Incident Response Management Plan (PIRMP) was developed, implemented and tested during the reporting period as required by Part 5.7A of the *Protection of the Environment Operations Act 1997* (POEO Act).

4. Community Relations

4.1 Community Engagement

Boral has actively engaged with the local community since the commencement of the 2006 Environmental Assessment for the project. The program has included:

- the establishment of a Community Consultation Committee;
- regular community newsletters;
- active participation in local events;
- arranging site inspections and one on one consultation;
- active engagement with key government and non-government organisations;
- maintenance of an environmental and community complaints register and actively managing and resolving community issues as they arise.

4.2 Community Consultative Committee

A Community Consultative Committee was established in 2011 in accordance with Condition 8 of Schedule 5 of the Project Approval. The committee comprises:

- Two representatives from Peppertree Quarry including the Environment and Community Adviser;
- One representative from Goulburn Mulwaree Council (the Mayor); and
- Three Local Community Representatives

Independently chaired from JBA Planning, the role of the CCC is to offer Boral input from the community perspective on matters of environmental performance and community relations. Meetings include the review of environmental data and any feedback provided to the site from local community members. Issues of concern can be raised with the site by the CCC representatives.

Meetings prior to the reporting period were held during 2009, 2010, 2011 and 2012. Meeting during the reporting period were held on:

- 13th February 2013;
- 1st May 2013;
- 7th August 2013; and
- 28th November 2013.

The timing of the meetings are determined by the committee and are currently being undertaken at least 6 monthly.

4.3 Community Newsletters

Community Newsletters are produced on a regular basis in order to inform local residents of progress with the project's construction and operation as well as detailing Boral's involvement in community events. These are distributed via the Focus on Marulan newsletter issued to the

community of Marulan. The newsletter is also posted on the website. The first newsletter was circulated in August 2011 and a total of 8 have been produced up to the end of the reporting period. These are attached as Appendix C.

4.4 Blast Liaison

In accordance with Condition 15, landowners/occupiers of residences within 2 kilometres of the quarry pit are encouraged to register interest in order to be advised of any future blasts at the pit. During the reporting period, all residents were issued a formal letter notifying them of the process to register to be placed on a notification register. Three local residents have asked to be advised of blasting.

4.5 Community Events

Peppertree Quarry staff are actively engaged with community events in the Marulan and Goulburn area.

In July 2012 a Stakeholder Engagement plan was developed. This plan outlines Boral's commitment to the community in which it operates in the Marulan South area.

Activities for the reporting period included:

- Tallong Apple Festival – key sponsor, May 2013;
- Marulan Kite Festival – key sponsor and organiser of a school's Design a Kite Competition, October 2013;
- Mayoral Charity Golf Day – sponsor and participant – November 2013
- Management of a community workshop resulting in the formation of HASP – Heritage and Sustainable Parks Project;
- Support and membership of the Marulan Chamber of Commerce;
- Construction of Marulan entrance walls; and
- Participation in the Marulan Historic Mining Photographic display.

4.6 Community Complaints

The quarry maintains a community complaints register that identifies actions required to resolve community issues. A 24 hour telephone complaints line has been established and advertised. The public have also been advised of this contact number via signage located at the site access point on Marulan South Road. The complaints register records the following details:

- Complainant name and contact details
- Nature of the complaint (noise, dust, traffic etc)
- Date of the complaint
- Specifics of the complaint
- Outcome of the investigation of the complaint

The complaints register is published on line but with names, addresses and other identifying remarks removed for privacy reasons. The current complaints register is provided in Table 4.1 below.

Table 4.1 Complaints Register

Date	Complaint received from	Nature of complaint	Outcome of investigation
22 nd August 2011	EPA	Dust and noise from Boral operations	Dust and noise data provided to EPA to show levels of potential impact
4 th November 2011	Resident	Dust during October 2011 and noise on 2 nd November	Air monitoring data provided to the resident. There was a higher than usual level of dust in October predominantly due to westerly winds. Source of the dust not determined but due to the location of Peppertree to the residence the source was not likely to be Peppertree operations. Noise was found to be associated with a reversing beeper. No reversing alarms were on site at the time.
19 th March 2012	EPA	Dust and noise from Boral operations	Dust and noise data provided to EPA to show levels of potential impact
26 th March 2012	EPA/Resident	Dust on car	Sample taken from the vehicle however there was insufficient volume to analyse. Wind direction at the time of the fallout was westerly.

A noise complaint was received in November 2013 regarding a low frequency noise. The source is unknown and monitoring is to be undertaken to determine if either of the quarries are the cause. All of the other complaints received to date have been satisfactorily resolved.

4.7 Access to Information

Boral has a number of websites for each corporate division. Peppertree Quarry has its own site at http://www.boral.com.au/Article/ACM_Marulan_Welcome.asp. The site contains all public information in relation to the quarry's approval and development including:

- About the Boral Peppertree Quarry and Sydney Aggregates Project;
- Planning and Approvals;
- Resource and Products;
- Operations;
- Work Health and Safety;
- Our Environment;
- Our Community (includes Latest News);
- Employment Opportunities at the Boral Peppertree Quarry; and
- Contact.

4.8 Independent Review

Conditions 2 to 5 of Schedule 4 of the Project Approval covers procedures available to the community should the impacts of the quarry be demonstrated to exceed the impact assessment criteria established for the quarry. These procedures involve the Department of Planning and Environment and potentially an independent reviewer to assess and verify the environmental performance of the quarry. The outcomes of this process could involve the Peppertree Quarry implementing additional environmental initiatives to control or mitigate the environmental impacts, or developing a negotiated agreement with the affected landholder, to the satisfaction of the Department of Planning and Environment. Ultimately, outright land acquisition may be required as described in the following section.

There were no requests or requirements for an Independent Review during the reporting period.

4.9 Land Acquisition

Conditions 6 to 9 of Schedule 4 outline the procedures for land acquisition should the impacts of the quarry be confirmed to exceed the acquisition criteria outlined in the Project Approval. The land acquisition process is initiated by a landholder following the review process outlined above. This process of land acquisition was not initiated or required to be initiated during the reporting period.

4.10 Independent Environmental Audit

As per Schedule 5, Condition 5, Boral will commission and pay the full cost of an independent audit of the Project within 3 years of the date of the commencement of construction, and every 5 years thereafter, unless the Director-General directs otherwise. This audit must:

- be conducted by a suitably qualified, experienced, and independent person(s) whose appointment has been approved by the Director-General;
- include consultation with the relevant agencies;
- assess the environmental performance of the project, and its effects on the surrounding environment;
- assess whether the project is complying with the relevant standards, performance measures and statutory requirements;
- review the adequacy of any strategy/plan/program required under this approval; and, if necessary,
- recommend measures or actions to improve the environmental performance of the project, and/or any strategy/plan/program required under this approval.

An independent audit was not due to be undertaken during the reporting period.

5. Rehabilitation and Land Management

This section describes land management within the Peppertree Quarry area and includes land use objectives, landscaping operations, and a review of the rehabilitation activities.

5.1 Rehabilitation of Disturbed Land

Peppertree Quarry operates in accordance with a Landscape and Rehabilitation Plan prepared in accordance with Condition 33, Schedule 3 of the Project Approval. The key objectives of this plan are:

- Rehabilitation of disturbed areas (bunds / overburden emplacements);
- Management of identified habitat management areas and effective management of remnant vegetation on site; and
- Final rehabilitation and closure (Quarry Exit Strategy as defined in Schedule 3, Condition 47).

Activities required to be conducted as per the management plan have been detailed in tables attached as Appendix E of this report. These tables identify the status of the activities undertaken during the reporting period.

Rehabilitation activities during the reporting period has included hydromulching of embankments and batter slopes of the main dam, noise bund and railway embankment, as well as the planting of over 100,000 plants in accordance with the Project Approval.

Appendix 3 'Habitat Management Area' of the Project Approval requires the planting of an offset area and 20m of either side of a nominated section of Tangarang creek and Dam No1. A revised plant species list was prepared at the end of 2011, seed collected and propagated during 2012 and detailed drawings prepared for the planting arrangements. Planting was then conducted at the end of 2013 with an ongoing maintenance plan established.



Plate 14 - Initial Preparation for Rehabilitation

As shown on Plate 15 below, the next stage usually involves hydroseeding with a mixture of seed, fertiliser and binder.



Plate 15 - Hydromulching of Completed Batter Slopes



Plate 16 - Completed Revegetation

The ultimate aim of the rehabilitation program is to provide:

- a net improvement in ecological value and connectivity within the site and within the locality;
- an increase in the area of viable Box-Gum Grassy Woodland;
- management, maintenance and enhancement of habitats for threatened species; and
- the creation of long-term management and protection measures.

To date, Peppertree has met its stated objectives and the requirements of the 2007 Environmental Assessment.

5.2 Weeds and Feral Animals

Since Peppertree is surrounded by a number of rural and farming properties, stock proof fencing has been employed to define boundaries and restrain cattle from venturing on the property.

External professional contractors have been commissioned to control noxious weeds and pests such as thistle, blackberry and serrated tussock as required. Work is reviewed on a monthly basis and managed accordingly.

5.3 Bushfire Management

Peppertree has engaged with the rural fire authorities and provided location details of the site in the event their services are required. Representatives of the Marulan Rural Fire Service

attended site during the reporting period to assess Bushfire risk and possible mitigation procedures. The RFS provided a number of recommendations which have been addressed including fire fighting equipment, maintaining Asset Protection Zones around site buildings and establishing a Land Management Zone on the western side of the existing office buildings to mitigate against the spread of fire.

Additional mitigation measures include grazing of pastures to reduce fire load and provide firebreaks, and slashing of grass around infrastructure.

5.4 Flora and Fauna Management

The Landscape and Rehabilitation Plan outlines the treatment and consideration of Fauna and Flora on the site. Two designated Habitat Management Areas have been created and fenced as required in Schedule 3, Condition 33A. These areas protect the identified Endangered Ecological Community and *Solanum celatum* habitats. Pre-clearance checks have been completed by an external consultant to ensure that flora and fauna are protected and in particular that no native vegetation marked for retention was damaged during the clearing process.

Trees that were discovered to have fauna associated with them were identified. On-ground habitat was also inspected and any fauna found prior to land clearance relocated. Tree felling was done gradually to provide an opportunity for fauna to relocate and all habitat hollows were thoroughly inspected by the ecologist with a torch and fibroscope. A number of habitat boxes were positioned on the perimeter of the site prior to clearance to provide refuge for displaced fauna.

Compliance tables are contained in Appendix E.

6. Work Health and Safety

6.1 Safety Management

Boral operates within its Safety Management Plan to ensure the occupational health and safety of staff, contractors and visitors. Weekly monitoring, and where necessary reporting, of incidents, hazards and observations are reported on the Boral "Site Safe" system.

WH&S training for staff is implemented through the iCARE program, which is an internally developed behaviourally based work health and safety improvement program and the "One Boral" Safety Management system which standardises safety management into a single whole of business system.

All Boral and contractors and staff are inducted to the site in order to raise their awareness of features unique to the site and construction hazards. Authority to Work and Safe Work Method Statements are developed, reviewed and approved prior to work being undertaken.

The reporting period saw the development of Mine Safety Management Plans, Safe Work Method Statements and Hazard Management Plans for implementation with the contractors during construction

During the reporting period SWMS and Project Management Plans for Burtons (Major Earthworks Contractors), Coopers (Minor Earthworks Contractors), Sandvik (Fixed Processing Plant Contractors) and Metso (Mobile Processing Plant Contractors) were reviewed and implemented.

Audits were scheduled to ensure all activities are being undertaken correctly and safely. Boral is intent on providing a safe and injury-free work environment for the Peppertree site

In accordance with Schedule 3, Condition 44, members of the public are not permitted on site without first having undergone a visitor's induction and provisioning with PPE safety gear. Members of the public are escorted by Boral WH&S Staff during visits and required to sign in and out.

6.2 Safety in Design (Schedule 3 Condition 2)

Safety commences at the very preliminary stages of any project. Safety in Design workshops were facilitated by Jim Knowles Consulting for all contractors prior to the completion of final drawings to ensure that best practice design is implemented in all aspects of equipment and facility design. Risk assessments were completed for each package of work and any risks related to design mitigated via communication with contractors and developers. Workshops in 2011 were held with: Sandvik on 29th November 2011 and 12th December 2011 Risk Assessments for both electrical installation and the Metso Mobile Crushing Plant on 20th December.

6.3 Emergency Management (Schedule 3, Condition 44)

As part of the Peppertree quarry EMS and Safety Management Plan and in compliance with Schedule 3, Condition 44, an Emergency Response procedure was prepared to address emergencies that occur on site. All site employees, contractors and visitors are educated on the emergency via induction and regular Toolbox Talks with contractors. Key emergency controllers have been trained in their specific role and emergency drills are carried out at least once per year.

7. Activities Proposed Next 12 Months

7.1 Quarry Development

The coming 2014 reporting period will see the commissioning phase completed and the quarry entering production. Only minor civil works will be undertaken and the primary construction contractors will demobilise from the site.

Production will gradually ramp up during the year in line with market demand. The quarry extraction area will remain largely unchanged however overburden removal will continue in order to expose sufficient target rock to meet production levels. This will see the completion of the bund wall and progressive development of the out of pit overburden emplacement.

7.2 Production, Sales and Transport

Production is anticipated to reach in the order of 1 Million tonnes for the 2014 reporting period however this will be entirely dependent on market conditions and demand. Transport off site will continue to be via rail unless there are unexpected and significant interruptions on the rail network.

7.3 Environmental Management and Monitoring

The Quarry will continue to operate in accordance with the following Environmental Management Plans:

- Environmental Management Strategy;
- Aboriginal Heritage Management Plan;
- Air Quality Monitoring Plan;
- Landscape and Rehabilitation Management Plan;
- Noise and Blast Monitoring Program;
- Water Management Plan; and
- Environmental Monitoring Plan.

The Environmental Management Strategy for the Peppertree Quarry provides an overarching management system whereby the component management plans are continually reviewed and updated in light of environmental performance. The EMS commits the site, as with all Boral operations, to continual improvement in environmental performance, and in particular:

- efficient use of energy (including appropriate use of alternative fuels);
- conservation of water;
- minimisation and recycling of wastes;
- prevention of pollution; and
- effective use of virgin and recovered resources and supplemental materials.

Specific activities for the next 12 months are described in the following sections.

7.4 Air Quality

Air quality will continue to be monitored as described in Section 3.3.2. The data will be reviewed on a monthly basis to assess the adequacy of current dust management controls.

No additional controls are anticipated above those listed in Section 3.3.

7.5 Noise and Blasting

The quarterly noise audits will continue over the coming reporting period. As the results to date have demonstrated compliance, it is not anticipated that additional noise controls will be required. The current noise mitigation strategy detailed in Section 3.4 will be reviewed as necessary in light of ongoing noise monitoring data.

A review of blast monitoring will be undertaken and the potential of installing remote on line monitors will be investigated.

7.6 Water Management

The current water monitoring program will continue however it is proposed to monitor water volumes more closely in order to remodel the Water Balance. The environmental flow monitoring system will continue to be developed to ensure reliable data.

Groundwater has yet to be intercepted in the quarry void however groundwater monitoring is anticipated to commence in the coming reporting period. Groundwater data is collected at several monitoring bores around the Limestone Mine to the south and this data will be combined to provide an overall groundwater database for the area.

Erosion and sedimentation controls will continue to be constructed as required and all existing structures and pollution control ponds will be maintained. Ponds will be desilted as required to maintain the required live storage. Revegetation works will be inspected following heavy rain and continue to be maintained as necessary.

7.7 Meteorological Monitoring

The weather station installed at Peppertree will also continue to be maintained and meteorological events recorded in an effort to forecast weather events and minimise the impact of particularly flooding and high dust generating winds.

7.8 Waste Management

The management of wastes will continue through the use of external contractors, both for disposal and recycling. An emphasis on minimising wastes and maximising recycling will however continue. The monitoring of wastes will continue via the invoicing and docketing system as outlined in Section 3.8.

A review of waste generation and disposal is to be undertaken as "new" wastes from the operations are identified.

7.9 Hazardous and Explosives Materials Management

The current system as outlined in Section 3.9 will continue over the next 12 months. This system forms part of the normal Boral procedures for managing hazardous materials. Explosives are not stored on site.

In the next 12 months it is proposed to construct a 100,000L diesel refuelling facility for the rail locomotives to be owned and operated by Pacific National, which will require licensing under Workcover.

7.10 Visual Management and Lighting

No additional activities are considered necessary to manage visual impacts of the quarry. The revegetation work will progressively develop and once mature will provide effective screening of the project area from surrounding properties.

7.11 Heritage Conservation

Members of AMC will continue to inspect topsoil removal in sensitive areas and retrieve any artefacts. These will be redistributed in protected areas once excavation is complete. Access will be granted to those who wish to visit the site providing their application to do so is in line with the Aboriginal Heritage Management Plan. Tool box talks will also continue to ensure that contractors understand the significance of the site and its heritage to its indigenous owners.

7.12 Community Relations

As documented in Chapter 4, Boral has implemented a comprehensive community and stakeholder engagement process that conforms to the current Boral corporate plan. The forms of communication, as outlined in Section 4.1 will continue during the coming reporting period. It should be noted however that as the quarry development matures, the form of communication may vary in response to community needs.

7.12.1 Community Engagement

Formal consultation will continue with the community through the CCC and regular newsletters, reporting, stakeholder briefings and community based activities will continue through the next reporting period. Newsletters will be prepared and published on the Peppertree Quarry Website, as well as released in the Focus on Marulan publication to update the local community on progress.

Participation in the Tallong Apple Festival and the Marulan Kite Festival will see Boral representatives operate a stall, sponsorship and give-aways to the local Community and provide information and education on the progress of Peppertree Quarry construction and operation.

The Peppertree Website will be reviewed and updated on a regular basis and interested members of the community pointed to the site as a valuable source of information.

7.12.2 Blast Liaison

Blast liaison will continue as currently established.

7.12.3 Community Consultative Committee

The Community Consultative Committee will continue to meet during 2014.

7.12.4 Community Complaints Management

The community complaints management system will be maintained during the coming reporting period.

7.12.5 Access to Information

Access to information as currently provided will be maintained

7.13 Rehabilitation and Land Management

As the quarry moves into production, rehabilitation activity will be confined to new areas of disturbance final batters of the overburden emplacement and maintenance of the rehabilitated Habitat Management Area.

The principals of the rehabilitation program as outlined in Chapter 5 will remain but will be limited over time to just represent completed batters of the out of pit emplacement area. Previous rehabilitation however will be maintained and inspected in accordance with the management initiatives described in Tables 5.1 to 5.10.

An audit of fencing will be undertaken to ensure that preserved areas remain isolated from operations.

Weed management will be undertaken to control noxious plants emerging on the site and where necessary planting of natives will be implemented to prevent erosion and as a rehabilitation measure after any disturbance works.

Appendix A - EPA Licence

Environment Protection Licence



Licence - 13088

Licence Details

Number:	13088
Anniversary Date:	23-July

Licensee

BORAL RESOURCES (NSW) PTY LTD

PO BOX 42

WENTWORTHVILLE NSW 2145

Premises

PEPPERTREE QUARRY

MARULAN SOUTH ROAD

MARULAN SOUTH NSW 2579

Scheduled Activity

Extractive Activities

Fee Based Activity

Scale

Land-based extractive activity

> 2000000 T extracted, processed or stored

Region

South East - Queanbeyan

11 Farrer Place

QUEANBEYAN NSW 2620

Phone: (02) 6229 7002

Fax: (02) 6229 7006

PO Box 622 QUEANBEYAN

NSW 2620

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Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 (“the Act”) and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act); and
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

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The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

BORAL RESOURCES (NSW) PTY LTD

PO BOX 42

WENTWORTHVILLE NSW 2145

subject to the conditions which follow.

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1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled development work listed below at the premises listed in A2:

The licensee is permitted to undertake pre-construction exploratory test pit activities as described in modification application 06_0074 MOD 1 relating to the extraction and despatch of up to 9,000 tonnes of extracted material..

A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Extractive Activities	Land-based extractive activity	> 2000000 T extracted, processed or stored

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
PEPPERTREE QUARRY
MARULAN SOUTH ROAD
MARULAN SOUTH
NSW 2579
LOT 2 DP 106569, LOT 4 DP 106569, LOT 5 DP 111641, LOT 5 DP 203290, LOT 1 DP 216767, LOT 2 DP 216767, LOT 3 DP 216767, LOT 4 DP 216767, LOT 5 DP 216767, LOT 6 DP 216767, LOT 7 DP 216767, LOT 8 DP 216767, LOT 9 DP 216767, LOT 1 DP 261615, LOT 2 DP 261615, LOT 3 DP 261615, LOT 4 DP 261615, LOT 5 DP 261615, LOT 6 DP 261615, LOT 1 DP 371167, LOT 1 DP 557562, LOT 2 DP 557562, LOT 11 DP 570616, LOT 12 DP 570616, LOT 21 DP 657523, LOT 95 DP 750029, LOT 109 DP 750029, LOT 143 DP 750029, LOT 22 DP 867667, LOT 23 DP 867667, LOT 24 DP 867667
AUTO CONSOL 14488213

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

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- a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
- b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 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.

<i>Air</i>			
EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Dust Monitoring- TSP		High Volume Air Sampler labelled 'HV1' on Figure 3.1 'Air Quality Equipment Locations' in 'Peppertree Quarry Air Quality Management Plan' dated 2 August 2012
2	Dust Monitoring- PM10		High Volume Air Sampler labelled 'HV2' on Figure 3.1 'Air Quality Equipment Locations' in 'Peppertree Quarry Air Quality Management Plan' dated 2 August 2012
3	Dust Monitoring		Dust Deposition Gauge labelled 'D1' on Figure 3.1 'Air Quality Equipment Locations' in 'Peppertree Quarry Air Quality Management Plan' dated 2 August 2012
4	Dust Monitoring		Dust Deposition Gauge labelled 'D2' on Figure 3.1 'Air Quality Equipment Locations' in 'Peppertree Quarry Air Quality Management Plan' dated 2 August 2012
5	Dust Monitoring		Dust Deposition Gauge labelled 'D3' on Figure 3.1 'Air Quality Equipment Locations' in 'Peppertree Quarry Air Quality Management Plan' dated 2 August 2012

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Noise limits

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L2.1 Noise generated at the premises must not exceed the noise limits presented in the table below:

Residential Receiver	Day Shift	Night Shift	Night Shift	Night Shift
	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
2	39	35	35	45
5	35	35	35	45
6	35	35	35	45
16	41	35	35	45
Any other noise sensitive location	35	35	35	45

Note: For the purposes of the above table, the following definitions apply:

- Day - the period from 7.00am to 6.00pm Monday to Saturday; or 8.00am to 6.00pm on Sundays and public holidays.
- Evening - the period from 6.00pm to 10.00pm.
- Night - the remaining periods

The identified "Day" noise criteria apply throughout the period of the site's Day Shift (ie 7.00am to 7.00pm) on all days, despite the general definitions of Evening and Night otherwise applying to the approval. The identified "Evening" and "Night" criteria apply only during the period of the site's Night Shift (ie 7.00pm to 7.00am).

L2.2 Noise from the site is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, to determine compliance with the identified noise limits, except where specified below.

Noise from the project is to be measured at 1 metre from the dwelling facade to determine compliance with the LA1(1 minute) noise level.

Where it can be demonstrated the direct measurement of noise from the project is impractical, alternative means of determining compliance may be acceptable (see Chapter 11 of the NSW Industrial Noise Policy).

The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise level where applicable.

The identified noise emission limits apply under meteorological conditions of wind speed up to 3m/s at 10 metres above ground level, and temperature inversions.

L3 Blasting

L3.1 The licensee must ensure that the airblast overpressure level from blasting at the project does not exceed the criteria in the below table at any residence on privately owned land:

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Airblast overpressure level (dB(Lin Peak))	Allowable exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

- L3.2 The licensee must ensure that the ground vibration level from blasting at the project does not exceed the criteria in the below table at any residence or sensitive receiver on privately owned land.

Peak particle velocity (mm/s)	Allowable exceedance
5	5% of the total number of blasts over a period of 12 months
10	0%

4 Operating Conditions

O1 Activities must be carried out in a competent manner

- O1.1 Licensed activities must be carried out in a competent manner.

This includes:

- the processing, handling, movement and storage of materials and substances used to carry out the activity; and
- the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

- O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:

- must be maintained in a proper and efficient condition; and
- must be operated in a proper and efficient manner.

O3 Dust

- O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

5 Monitoring and Recording Conditions

M1 Monitoring records

- M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must

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be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:

- in a legible form, or in a form that can readily be reduced to a legible form;
- kept for at least 4 years after the monitoring or event to which they relate took place; and
- produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

- the date(s) on which the sample was taken;
- the time(s) at which the sample was collected;
- the point at which the sample was taken; and
- the name of the person who collected the sample.

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 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 Air Monitoring Requirements

POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Total suspended particles	micrograms per cubic metre	Special Frequency 1	AS/NZS 3580.9.3:2003

POINT 2

Pollutant	Units of measure	Frequency	Sampling Method
PM10	micrograms per cubic metre	Special Frequency 1	AS/NZS 3580.9.6:2003

POINT 3,4,5

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	Australian Standard 3580.10.1-2003

Note: For the purpose of the above table(s), Special Frequency 1 means the collection of samples over a 24 hour period, every 6 days.

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M3 Testing methods - concentration limits

- 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:
- any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or
 - 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
 - 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.

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".

M4 Recording of pollution complaints

- M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.
- M4.2 The record must include details of the following:
- the date and time of the complaint;
 - the method by which the complaint was made;
 - any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
 - the nature of the complaint;
 - the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
 - if no action was taken by the licensee, the reasons why no action was taken.
- M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.
- M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M5 Telephone complaints line

- M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.
- M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.
- M5.3 The preceding two conditions do not apply until 3 months after:
- the date of the issue of this licence or
 - if this licence is a replacement licence within the meaning of the Protection of the Environment

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Operations (Savings and Transitional) Regulation 1998, the date on which a copy of the licence was served on the licensee under clause 10 of that regulation.

6 Reporting Conditions

R1 Annual return documents

- R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
- a) a Statement of Compliance; and
 - b) a Monitoring and Complaints Summary.
- At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.
- R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.
- R1.3 Where this licence is transferred from the licensee to a new licensee:
- a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
 - b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.
- R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
- a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
 - b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.
- R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').
- R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.
- R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
- a) the licence holder; or
 - b) by a person approved in writing by the EPA to sign on behalf of the licence holder.
- R1.8 A person who has been given written approval to certify a certificate of compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review of this licence.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

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R2 Notification of environmental harm

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R3 Written report

- R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
 - a) where this licence applies to premises, an event has occurred at the premises; or
 - b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.
- R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.
- R3.3 The request may require a report which includes any or all of the following information:
 - a) the cause, time and duration of the event;
 - b) the type, volume and concentration of every pollutant discharged as a result of the event;
 - c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
 - d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
 - e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
 - f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
 - g) any other relevant matters.
- R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

7 General Conditions

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G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

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Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

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flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .

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TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr Julian Thompson

Environment Protection Authority

(By Delegation)

Date of this edition: 22-July-2009

End Notes

- 1 Licence varied by notice 1125628, issued on 22-Mar-2011, which came into effect on 22-Mar-2011.
- 2 Licence varied by notice 1516534 issued on 23-Sep-2013

Appendix B – Project Approval

Project Approval

Section 75J of the *Environmental Planning & Assessment Act 1979*

I, the Minister for Planning approve the project referred to in schedule 1, subject to the conditions set out in schedules 2 to 5.

The reason for these conditions is to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the on-going environmental management of the project.

Frank Sartor MP
Minister for Planning

Sydney

2007

File No. 9040608

SCHEDULE 1

Project Application:	06_0074
Proponent:	Boral Resources (NSW) Pty Ltd
Approval Authority:	Minister for Planning
Land:	See Appendix 1
Project:	Marulan South hard rock quarry and associated infrastructure

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Blue type represents November 2011 Modification
Green type represents October 2012 Modification

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DEFINITIONS

Annual Review	The review required by condition 4 of schedule 5
BCA	Building Code of Australia
CCC	Community Consultative Committee
Council	Goulburn Mulwaree Council
Day	Day is defined as the period from 7.00am to 6.00pm, Monday to Saturday and 8.00am to 6.00pm Sundays and Public Holidays
Department	Department of Planning and Infrastructure
Director-General	Director-General of the Department (or nominee)
DPI	Department of Primary Industries
EA	Environmental Assessment for the project titled <i>Marulan South Quarry Environmental Assessment Report</i> Volumes 1 and 2 dated October 2006 prepared by ERM
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPL	Environment Protection Licence under the <i>Protection of the Environment Operations Act 1997</i>
Evening	Evening is defined as the period from 6.00pm to 10.00pm
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this approval
Night	Night is defined as the period from 10.00pm to 7.00am Monday to Saturday and 10.00pm to 8.00am Sundays and Public Holidays
Noise Bund	Bunds built for noise and visual mitigation purposes and which do not exceed 10 metres in height
NOW	NSW Office of Water, within the Department of Primary Industries
OEH	Office of Environment and Heritage
Project	Development to which the Project Approval applies
Proponent	Boral Resources (NSW) Pty Ltd
RMS	Roads and Maritime Services
Site	Land to which the Project Approval applies (see Appendix 1)
Submissions Report	<i>Marulan South Quarry Submissions Report</i> dated December 2006

SCHEDULE 2 ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Proponent shall implement all practicable measures to prevent or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the project.

Terms of Approval

2. The Proponent shall carry out the project generally in accordance with the:
 - (a) EA;
 - (b) submissions report;
 - (c) modification application 06_0074 – MOD 1 and accompanying Statement of Environmental Effects entitled *Marulan South Quarry Statement of Environmental Effects for a Pre-commencement Exploratory Test Pit* dated 13 November 2008, and letter from Boral Resources Pty Ltd to the Department dated 13 February 2009;
 - (d) modification application 06_0074 – MOD 2 and the accompanying EA titled *Boral Peppertree Quarry Section 75W Modification Report*, dated June 2011, prepared by ERM Australia, and the responses to issues raised in submissions, including those titled *Peppertree Quarry Submissions Report*, dated 24 August 2011, *Response to OEH Submission*, dated 12 October 2011, and *Response to Armit Submission*, dated 25 October 2011;
 - (e) modification application 06_0074 – MOD 3 and the accompanying EA titled *Peppertree Quarry Modification 3 Environmental Assessment*, dated August 2012, prepared by EMGA Mitchell McLennan Pty Limited, and the responses to issues raised in submissions titled *Response to Submissions Peppertree Quarry Modification 3*, dated 3 October 2012; and
 - (f) conditions of this approval.

Note: The general layout of the project is shown in the figure in Appendix 2.

3. If there is any inconsistency between the above, either the most recent document or the conditions of this approval shall prevail to the extent of the inconsistency.
4. The Proponent shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
 - (a) any reports, plans, programs or correspondence that are submitted in accordance with this approval; and
 - (b) the implementation of any actions or measures contained in these reports, plans, programs or correspondence.
- 4A. The proponent shall be permitted to undertake pre-construction exploratory test pit activities as described in modification application 06_0074 MOD 1.

Note: The commencement of test pit activities as described in modification application 06_0074 MOD 1 is not subject to the preparation of management plans.

Limits on Approval

5. This approval shall lapse at the end of 2038.
6. The Proponent shall not transport more than 3.5 million tonnes of product from the site in a year.
7. All extractive materials and products shall be transported from the site by rail. However, the Proponent may transport some product by road in an emergency with the written approval of the Director-General.

Structural Adequacy

8. The Proponent shall ensure that all new buildings and structures on the site are constructed in accordance with the relevant requirements of the BCA.

Notes:

- *Under Part 4A of the EP&A Act, the Proponent is required to obtain construction and occupation certificates for any building works.*
- *Part 8 of the EP&A Regulation sets out the detailed requirements for the certification of development.*

Demolition

9. The Proponent shall ensure that all demolition work on site is carried out in accordance with AS 2601-2001: *The Demolition of Structures*, or its latest version.

Protection of Public Infrastructure

10. The Proponent shall:
 - (a) repair, or pay all reasonable costs associated with repairing any public infrastructure that is damaged by the project; and
 - (b) relocate, or pay all reasonable costs associated with relocating any public infrastructure that needs to be relocated as a result of the project.

Operation of Plant and Equipment

11. The Proponent shall ensure that all plant and equipment used at the site is:
 - (a) maintained in a proper and efficient condition; and
 - (b) operated in a proper and efficient condition.
 12. With the approval of the Director-General, the Proponent may prepare and submit any management plan or monitoring program required by this approval on a progressive basis.
-

SCHEDULE 3 ENVIRONMENTAL PERFORMANCE CONDITIONS

GENERAL EXTRACTION AND PROCESSING PROVISIONS

Identification of Boundaries

1. Prior to the commencement of construction, or as otherwise agreed by the Director-General, the Proponent shall:
 - (a) engage an independent registered surveyor to survey the boundaries of the approved limit of extraction;
 - (b) submit a survey plan of these boundaries to the Director-General; and
 - (c) ensure that these boundaries are clearly marked at all times in a permanent manner that allows operating staff and inspecting officers to clearly identify those limits.

Note: The limit of extraction is shown conceptually on the plan in Appendix 2.

NOISE

Construction of Bunds

2. In carrying out the construction of the noise bunds, the Proponent shall:
 - (a) comply with the construction noise criteria in the *Environmental Noise Control Manual 1994* for the first three months of the construction work; and
 - (b) thereafter, comply with the daytime operational noise criteria in condition 4.

Construction Noise Management Plan

3. The Proponent shall prepare and implement a Construction Noise Management Plan for the project to the satisfaction of the Director-General. This plan must be submitted to the Director-General for approval prior to the commencement of construction, and include:
 - (a) a detailed description of the measures that would be implemented to achieve the construction noise limits in the *Environmental Noise Control Manual 1994* and the operational noise criteria in condition 4;
 - (b) a community notification protocol for the proposed construction activities;
 - (c) a description of the measures that would be implemented where the construction noise limits and/or operational noise limits are unlikely to be achieved or are not being achieved; and
 - (d) details of who would be responsible for monitoring, reviewing and implementing the plan.

Operational Noise Impact Assessment Criteria

4. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1.

<i>Residential Receiver</i>	<i>Day Shift</i>		<i>Night Shift</i>	
	<i>Day</i> <i>L_{Aeq}(15 minute)</i>	<i>Evening</i> <i>L_{Aeq}(15 minute)</i>	<i>Night</i>	
			<i>L_{Aeq}(15 minute)</i>	<i>L_{A1}(1 minute)</i>
2	39	35	35	45
5	35	35	35	45
6	35	35	35	45
16	41	35	35	45
Any other noise sensitive location	35	35	35	45

Table 1: Noise Impact Assessment Criteria

Notes:

- The identified "Day" noise criteria apply throughout the period of the site's Day Shift (ie 7.00am to 7.00pm) on all days, despite the general definitions of Evening and Night otherwise applying to the approval. The identified "Evening" and "Night" criteria apply only during the period of the site's Night Shift (ie 7.00pm to 7.00am).
- Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.
- Residential receiver locations are shown in Appendix 2A.

Land Acquisition Criteria

5. If the noise generated by the project exceeds the criteria in Table 2, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 6-8 of Schedule 4.

Residential Receiver	Day <i>L_{Aeq(15 minute)}</i>	Evening / Night <i>L_{Aeq(15 minute)}</i>
2	44	44
5	40	40
6	40	40
16	44	44

Table 2: Land Acquisition Criteria

Note: The notes under Table 1 apply equally to Table 2.

Cumulative Noise Criteria

6. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other extractive industries does not exceed the following amenity criteria on any privately owned land, to the satisfaction of the Director-General:
- *L_{Aeq(11 hour)}* 50 dB(A) – Day;
 - *L_{Aeq(4 hour)}* 45 dB(A) – Evening; and
 - *L_{Aeq(9 hour)}* 40 dB(A) – Night.

Additional Noise Mitigation Measures

7. Upon receiving a written request from the owner of residential receiver 3 (except where a negotiated noise agreement is in place) the Proponent shall implement additional noise mitigation measures such as double glazing, insulation, and/or air conditioning at any residence on the land in consultation with the owner. These additional mitigation measures must be reasonable and feasible. If within 3 months of receiving this request from the landowner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.
8. Within 3 months of this approval, the Proponent shall notify the owner of residential receiver 3 that he/she is eligible for additional noise mitigation measures.

Operating Conditions

9. The Proponent shall:
- (a) implement best practice noise management, including all reasonable and feasible noise mitigation measures to minimise the noise generated by the project;
 - (b) investigate ways to minimise the noise generated by the project;
 - (c) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and noise monitoring data to guide the day to day planning of quarrying operations and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
 - (d) minimise noise impacts during adverse weather conditions; and
 - (e) report on these investigations and the implementation and effectiveness of these measures in the Annual Review,
- to the satisfaction of the Director-General.

Noise Management Plan

10. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must be prepared in consultation with EPA and submitted to the Director-General for approval by the end of March 2012, and must:
- (a) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval;
 - (b) describe the noise management system;
 - (c) include a noise monitoring program that:
 - supports the noise management system;
 - provides information to evaluate the performance of the project;
 - includes a protocol for determining exceedances of relevant conditions of this approval; and
 - provides for the use of real-time and/or supplementary attended monitoring measures, if directed by the Director-General;
 - (d) include a community notification protocol for the proposed construction activities; and

- (e) detail who would be responsible for monitoring, reviewing and implementing the plan.

Hours of Operation

11. The Proponent shall comply with the hours of operation in Table 3.

Activity	Day	Time
Construction works	Monday-Friday	7.00am to 6.00pm
	Saturday	8.00am to 1.00pm
	Sunday and public holidays	None
Topsoil/overburden removal/emplacement	Any day	7.00am to 7.00pm
Blasting	Monday-Saturday	9.00am to 5.00pm
	Sunday and public holidays	None
In-pit activities (including drilling, extraction, processing, and transfer of material out of the pit)	Any day	7.00am to 7.00pm
Out-of-pit activities (including processing, stockpiling, train loading and distribution, and maintenance)	Any day	24 hours

Table 3 – Hours of Operation

BLASTING AND VIBRATION

Airblast Overpressure Criteria

12. The Proponent shall ensure that the airblast overpressure level from blasting at the project does not exceed the criteria in Table 4 at any residence on privately-owned land.

Airblast overpressure level (dB(Lin Peak))	Allowable exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

Table 4: Airblast Overpressure Impact Assessment Criteria

Ground Vibration Criteria

13. The Proponent shall ensure that the ground vibration level from blasting at the project does not exceed the criteria in Table 5 at any residence or sensitive receiver on privately-owned land.

Peak particle velocity (mm/s)	Allowable exceedance
5	5% of the total number of blasts over a period of 12 months
10	0%

Table 5: Ground Vibration Impact Assessment Criteria for Residences on Privately-owned Land

Operating Conditions

14. The Proponent shall implement best blasting practice to:
- ensure that no flyrock leaves the site;
 - protect the safety of people, property, and livestock; and
 - minimise the dust and fume emissions from blasting on the site, to the satisfaction of the Director-General.

Public Notice

15. The Proponent shall:
- notify the landowner/occupier of any residence within 2 kilometres of the quarry pit who registers an interest in being notified about the blasting schedule on site;
 - operate a blasting hotline, or alternative system agreed to by the Director-General, to enable the public to get up-to-date information on blasting operations at the project; and
 - keep the public informed about this hotline (or any alternative system), to the satisfaction of the Director-General.

Monitoring

16. The Proponent shall prepare and implement a Blast Monitoring Program for the project to the satisfaction of the Director-General. This program must:
- be submitted to the Director-General for approval prior to the commencement of construction;
 - be prepared in consultation with the EPA; and
 - monitor the performance of the project against the relevant blasting criteria.

AIR QUALITY

Air Quality Impact Assessment Criteria

17. The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 6, 7 and 8 at any residence on privately owned land, or on more than 25 percent of any privately owned land.

Table 6: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	^d Criterion
Total suspended particulate (TSP) matter	Annual	^a 90 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	Annual	^a 30 µg/m ³

Table 7: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	^d Criterion
Particulate matter < 10 µm (PM ₁₀)	24 hour	^a 50 µg/m ³

Table 8: Long term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase² in deposited dust level	Maximum total¹ deposited dust level
^c Deposited dust	Annual	^b 2 g/m ² /month	^a 4 g/m ² /month

Notes to Tables 6-8

^a Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

^b Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

^c 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; and

^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Director-General.

Land Acquisition Criteria

18. If particulate matter emissions generated by the project exceed the criteria in Tables 9, 10, and 11 at any residence on privately-owned land, or on more than 25 percent of any privately owned land, then upon written request for acquisition from the landowner, the Proponent shall acquire the land in accordance with the procedures in conditions 6-7 of schedule 4.

Table 9: Long term land acquisition criteria for particulate matter

Pollutant	Averaging period	^d Criterion
Total suspended particulate (TSP) matter	Annual	^a 90 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	Annual	^a 30 µg/m ³

Table 10: Short term land acquisition criteria for particulate matter

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

Table 11: Long term land acquisition criteria for deposited dust

Pollutant	Averaging period	Maximum increase² in deposited dust level	Maximum total¹ deposited dust level
^c Deposited dust	Annual	^b 2 g/m ² /month	^a 4 g/m ² /month

Notes to Tables 9-11

^a Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

^b Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

^c 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; and

^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Director-General.

Operating Conditions

19. The Proponent shall:
- implement best management practice on site, including all reasonable and feasible measures to minimise the off-site odour, fume and dust emissions generated by the project;
 - minimise any visible air pollution generated by the project;
 - minimise the surface disturbance of the site generated by the project; and
 - operate a comprehensive air quality management system that uses a combination of predictive meteorological forecasting and air quality monitoring data to guide the day to day planning of quarrying operations and the implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this approval;
- to the satisfaction of the Director-General.

Air Quality Management Plan

20. The Proponent shall prepare and implement a detailed Air Quality Management Plan for the project to the satisfaction of the Director-General. This plan must:
- be prepared in consultation with EPA and submitted to the Director-General by the end of March 2012;
 - describe the measures that would need to be implemented to ensure compliance with the relevant conditions of this approval;
 - include a program for the implementation of the measures referred to in (b) above; and
 - include an air quality monitoring program that:
 - uses a combination of high volume samplers and dust deposition gauges to evaluate the performance of the project;
 - supports the air quality management system;
 - provides information to evaluate the performance of the project;
 - includes a protocol for determining exceedances of relevant conditions of this approval; and
 - provides for the use of real-time monitoring measures, if directed by the Director-General.

METEOROLOGICAL MONITORING

21. For the life of the project, the Proponent shall ensure that there is a meteorological station 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; and
 - is capable of continuous real-time measurement of temperature lapse rate in accordance with the *NSW Industrial Noise Policy*.

SURFACE AND GROUND WATER

Water Supply

22. Prior to the commencement of construction, the Proponent shall obtain the necessary approvals for the project under the *Water Act 1912*.

Note: The Water Management Act 2000 may apply to the project. The Proponent shall consult with the [NOW](#) on the relevant approvals at the time the application is made.

Discharges

23. Except as may be expressly provided for by an EPL, the Proponent shall not discharge any dirty water from the quarry or ancillary operational areas.
- 23A. The Proponent shall prepare an onsite wastewater report for the proposed effluent management system consistent with the requirements of *Sydney Catchment Authority – “Developments in Sydney’s Drinking Water Catchment” – Water Quality Information Requirements, 2011*. The effluent management system must be designed and constructed to be in accordance with this onsite wastewater report and its design must be approved by Council prior to construction.

Tangarang Creek Environmental Flow

24. The proponent shall provide an environmental flow to Tangarang Creek equivalent to 10% of average daily flows. Details of the management of these environmental flows shall be included in the Site Water Balance for the project (see below).

Sediment Dams

25. The Proponent shall ensure that:
- (d) critical structures such as “dirty water” dams are designed, constructed and maintained to accommodate a 1 in 100 year ARI 24-hour event; and
 - (e) other dams and water management structures are designed, constructed and maintained to accommodate a 1 in 20 year ARI 24-hour event.

Management and Monitoring

26. The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (a) be submitted to the Director-General for approval prior to the commencement of construction;
 - (b) be prepared in consultation with the [NOW](#), [EPA](#) and Sydney Catchment Authority; and
 - (c) include a:
 - Site Water Balance;
 - Erosion and Sediment Control Plan;
 - Surface Water Monitoring Program;
 - Ground Water Monitoring Program; and
 - Surface and Ground Water Response Plan to address any potential adverse impacts associated with the project.

Site Water Balance

27. The Site Water Balance shall
- (a) include details of all water extracted (including make up water), dewatered, transferred, used and/or discharged by the project; and
 - (b) describe measures to minimise water use by the project.

Erosion and Sediment Control

28. The Erosion and Sediment Control Plan shall:
- (a) be consistent with the requirements of *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004* (Landcom);
 - (b) identify activities that could cause soil erosion and generate sediment;
 - (c) describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters;
 - (d) describe the location, function, and capacity of erosion and sediment control structures; and
 - (e) describe what measures would be implemented to maintain (and if necessary decommission) the structures over time.

Surface Water Monitoring

29. The Surface Water Monitoring Program shall include:
- (a) detailed baseline data on surface water flows and quality in Tangarang Creek and Barbers Creek;
 - (b) surface water impact assessment criteria;
 - (c) a program to monitor surface water flows and quality;
 - (d) a protocol for the investigation of identified exceedances of the surface water impact assessment criteria; and
 - (e) a program to monitor the effectiveness of the Erosion and Sediment Control Plan.

Ground Water Monitoring Program

30. The Ground Water Monitoring Program shall include:
- (a) detailed baseline data on ground water levels, flows, and quality, based on statistical analysis;
 - (b) groundwater impact assessment criteria for monitoring bores;
 - (c) a program to monitor regional ground water levels and quality; and
 - (d) a protocol for the investigation of identified exceedances of the ground water impact assessment criteria.

TRAFFIC AND TRANSPORT

31. The Proponent shall prepare and implement a construction traffic management plan for the project to the satisfaction of the RMS and Council.

ABORIGINAL HERITAGE

32. The Proponent shall prepare and implement an Aboriginal Heritage Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (f) be submitted to the Director-General for approval prior to the commencement of construction;
 - (g) be prepared in consultation with the OEH and relevant Aboriginal communities; and
 - (h) include a:
 - description of the measures that would be implemented for the mapping, and salvage or relocation of the archaeological relics in the Tangarang Creek Dam 1 area;
 - description of the measures that would be implemented if any new Aboriginal objects or relics are discovered during the project; and
 - protocol for the ongoing consultation and involvement of the Aboriginal communities in the conservation and management of Aboriginal cultural heritage on the site.

32A If historical archaeological relics are unexpectedly discovered during works, all works must cease and a suitably qualified and experienced historical archaeologist be brought in to assess the find. Depending on the nature of the discovery, additional assessment and recording may be required prior to the recommencement of excavation in the affected area. The Heritage Council (or its Delegate) must be notified of this discovery in writing in accordance with section 146 of the *Heritage Act, 1977*.

FLORA AND FAUNA

33. The Proponent shall:
- (a) rehabilitate the site in a manner that is generally consistent with the conceptual rehabilitation principles in Chapter 2.8 of the EA; and
 - (b) implement the Habitat Management Area in a manner that is generally consistent with the documents listed in condition 2 of schedule 3 (and shown conceptually in Appendix 3), including the establishment, conservation and maintenance of at least 13.5 hectares of vegetation species characteristic of Box Gum Woodland, to the satisfaction of the Director-General.

Threatened Species Protection

- 33A. The Proponent shall:
- (a) prior to clearing of vegetation and site preparation on the site of the Western Overburden Emplacement and extension, clearly and securely mark out the proposed boundary of the emplacement and extension;
 - (b) avoid disturbance of *Box Gum Woodland* Endangered Ecological Community and other native vegetation adjacent to the site of the Western Overburden Emplacement and extension;
 - (c) only undertake clearing of vegetation on the site of the Western Overburden Emplacement and extension following a recent fauna survey undertaken by a suitably qualified expert who has been approved by the Director-General; and
 - (d) seek to avoid clearing of native vegetation on the site of the Western Overburden Emplacement and extension during the period August to November of any year.

Landscape and Rehabilitation Management Plan

34. The Proponent shall prepare and implement a Landscape and Rehabilitation Management Plan for the project to the satisfaction of the Director-General. This plan must:
- (e) be submitted to the Director-General for approval prior to the commencement of construction;
 - (f) be prepared in consultation with the OEH and Council;
 - (g) describe in general the short, medium, and long-term measures that would be implemented to:
 - rehabilitate the site;
 - implement the Habitat Management Area;
 - manage the remnant vegetation and habitat on the site; and
 - landscape the site (including the bunds and overburden emplacement areas) to mitigate any visual impacts of the project;

- (h) describe in detail the measures that would be implemented over the next 5 years to rehabilitate and manage the landscape on the site;
- (i) describe how the performance of these measures would be monitored over time; and
- (j) set completion criteria for the rehabilitation of the site.

Rehabilitation Bond

35. Within 3 months of the first Independent Environmental Audit the Proponent shall lodge a rehabilitation bond for the project with the Director-General. The sum of the bond shall be calculated at \$2.50/m² for the total area to be disturbed in each 5 year period, or as otherwise directed by the Director-General.

Notes:

- *If the rehabilitation is completed to the satisfaction of the Director-General, the Director-General will release the rehabilitation bond.*
 - *If the rehabilitation is not completed to the satisfaction of the Director-General, the Director-General will call in all or part of the rehabilitation bond, and arrange for the satisfactory completion of the relevant works.*
36. Within 3 months of subsequent audits, the Proponent shall review, and if necessary revise, the sum of the bond to the satisfaction of the Director-General. This review must consider:
- (a) the effects of inflation;
 - (b) any changes to the total area of disturbance; and
 - (c) the performance of the rehabilitation against the completion criteria of the Rehabilitation and Landscape Management Plan.

VISUAL IMPACT

Visual Amenity and Lighting

37. The Proponent shall:
- (a) *minimise the visual impacts, and particularly the off-site lighting impacts, of the project;*
 - (b) *revegetate overburden emplacements, emplacement extensions and bunds as soon as practicable;*
 - (c) *take all practicable measures to further mitigate off-site lighting impacts from the project; and*
 - (d) *ensure that all external lighting associated with the project complies with Australian Standard AS4282 (INT) 1995 - Control of Obtrusive Effects of Outdoor Lighting, to the satisfaction of the Director-General.*
38. *(Deleted)*
39. *(Deleted)*

Advertising

40. The Proponent shall not erect or display any advertising structure(s) or signs on the site without the written approval of the Director-General.

Note – This does not include business identification, traffic management and safety or environmental signs.

WASTE MANAGEMENT

41. The Proponent shall:
- (a) monitor the amount of waste generated by the project;
 - (b) investigate ways to minimise waste generated by the project;
 - (c) implement reasonable and feasible measures to minimise waste generated by the project; and
 - (d) report on waste management and minimisation in the [Annual Review](#).
- to the satisfaction of the Director-General.
42. The Proponent shall ensure that all waste generated or stored on site is assessed, classified and managed in accordance with the EPA's *Environmental Guidelines: Assessment Classification and Management of Liquid and Non-Liquid Wastes*.

EMERGENCY AND HAZARDS MANAGEMENT

Dangerous Goods

43. The Proponent shall ensure that the storage, handling, and transport of dangerous goods are conducted in accordance with the relevant *Australian Standards*, particularly AS1940 and AS1596, and the *Dangerous Goods Code*.

Safety

44. The Proponent shall secure the project to ensure public safety to the satisfaction of the Director-General.

Bushfire Management

45. The Proponent shall:
- (a) ensure that the project is suitably equipped to respond to any fires on-site; and
 - (b) assist the rural fire service and emergency services as much as possible if there is a fire on-site.

PRODUCTION DATA

46. The Proponent shall:
- (a) provide annual production data to the DPI using the standard form for that purpose; and
 - (b) include a copy of this data in the [Annual Review](#).

QUARRY EXIT STRATEGY

47. The Proponent shall prepare and implement a Quarry Exit Strategy for the project to the satisfaction of the Director-General. This strategy must:
- (a) be submitted to the Director-General for approval at least 5 years prior to the cessation of the project;
 - (b) be prepared in consultation with the relevant agencies;
 - (c) define the objectives and criteria for quarry closure;
 - (d) investigate options for the future use of the site, including any final void/s;
 - (e) describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the project; and
 - (f) describe how the performance of these measures would be monitored over time.
-

SCHEDULE 4 ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. If the results of monitoring required in Schedule 3 identify that impacts generated by the project are greater than the relevant impact assessment criteria, then the Proponent shall notify the Director-General and the affected landowners and/or existing or future tenants (including tenants of quarry owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the project is complying with the relevant criteria.

INDEPENDENT REVIEW

2. If a landowner (excluding quarry owned properties) considers that the operations of the quarry are exceeding the impact assessment criteria in Schedule 3, then he/she may ask the Proponent in writing for an independent review of the impacts of the project on his/her land.

If the Director-General is satisfied that an independent review is warranted, then within 2 months of the Director-General's decision, the Proponent shall:

- (a) commission a suitably qualified, experienced and independent expert, whose appointment has been approved by the Director-General, to:
 - consult with the landowner to determine his/her concerns;
 - conduct monitoring to determine whether the project is complying with the relevant impact assessment criteria in schedule 3; and
 - if the project is not complying with these criteria then:
 - determine if the more than one quarry/mine is responsible for the exceedance, and if so the relative share of each quarry/mine regarding the impact on the land;
 - identify the measures that could be implemented to ensure compliance with the relevant criteria; and
 - (b) give the Director-General and landowner a copy of the independent review.
3. If the independent review determines that the quarrying operations are complying with the relevant criteria in Schedule 3, then the Proponent may discontinue the independent review with the approval of the Director-General.
 4. If the independent review determines that the quarrying operations are not complying with the relevant criteria in Schedule 3, and that the quarry is primarily responsible for this non-compliance, then the Proponent shall:
 - (a) implement all reasonable and feasible mitigation measures, in consultation with the landowner and appointed independent expert, and conduct further monitoring until the project complies with the relevant criteria; or
 - (b) secure a written agreement with the landowner to allow exceedances of the relevant impact assessment criteria, to the satisfaction of the Director-General.

If the independent review determines that the project is not complying with the relevant acquisition criteria, and that the project is primarily responsible for this non-compliance, then upon receiving a written request from the landowner, the Proponent shall acquire all or part of the landowner's land in accordance with the procedures in condition 6-7 below.

5. If the independent review determines that the relevant criteria are being exceeded, but that more than one quarry/mine is responsible for this exceedance, then together with the relevant quarry/mine/s, the Proponent shall:
 - (a) implement all reasonable and feasible mitigation measures, in consultation with the landowner and appointed independent expert, and conduct further monitoring until there is compliance with the relevant criteria; or
 - (b) secure a written agreement with the landowner and other relevant mine/s to allow exceedances of the relevant impact assessment criteria, to the satisfaction of the Director-General.

If the independent review determines that the project is not complying with the relevant acquisition criteria in schedule 3, but that more than one mine is responsible for this non-compliance, then upon receiving a written request from the landowner, the Proponent shall acquire all or part of the landowner's land on as equitable a basis as possible with the relevant quarries/mine/s, in accordance with the procedures in conditions 6-7 below.

LAND ACQUISITION

6. Within 3 months of receiving a written request from a landowner with acquisition rights, the Proponent shall make a binding written offer to the landowner based on:

- (i) the current market value of the landowner's interest in the property at the date of this written request, as if the land was unaffected by the project the subject of the project application, having regard to the:
 - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
 - presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date, but excluding any improvements that have resulted from the implementation of the 'additional noise mitigation measures' in condition 7 of Schedule 3;
- (j) the reasonable costs associated with:
 - relocating within the Goulburn Mulwaree local government area, or to any other local government area determined by the Director-General; and
 - obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is required; and
- (k) reasonable compensation for any disturbance caused by the land acquisition process.

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

Upon receiving such a request, the Director-General will request the President of the NSW Division of the Australian Property Institute to appoint a qualified independent valuer to:

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

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

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

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

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

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

8. *(deleted)*

SCHEDULE 5 ENVIRONMENTAL MANAGEMENT AND MONITORING CONDITIONS

ENVIRONMENTAL MANAGEMENT STRATEGY

1. The Proponent shall prepare and implement an Environmental Management Strategy for the project to the satisfaction of the Director-General. This strategy must be submitted to the Director-General for approval prior to the commencement of construction, and:
 - (a) provide the strategic context for environmental management of the project;
 - (b) identify the statutory requirements that apply to the project;
 - (c) describe in general how the environmental performance of the project would be monitored and managed;
 - (d) describe the procedures that would be implemented to:
 - keep the local community and relevant agencies informed about the construction, operation and environmental performance of the project;
 - receive, handle, respond to, and record complaints;
 - resolve any disputes that may arise during the life of the project;
 - respond to any non-compliance;
 - manage cumulative impacts; and
 - respond to emergencies; and
 - (e) describe the role, responsibility, authority, and accountability of the key personnel involved in the environmental management of the project.

ENVIRONMENTAL MONITORING PROGRAM

2. The Proponent shall prepare an Environmental Monitoring Program for the project to the satisfaction of the Director-General. This program must be submitted to the Director-General prior to the commencement of construction, and consolidate the various monitoring requirements in Schedule 3 of this approval into a single document.

INCIDENT REPORTING

3. Within 7 days of detecting an exceedance of the goals/limits/performance criteria in this approval or an incident causing (or threatening to cause) material harm to the environment, the Proponent shall report the exceedance/incident to the Department and any relevant agencies. This report must:
 - (a) describe the date, time, and nature of the exceedance/incident;
 - (b) identify the cause (or likely cause) of the exceedance/incident;
 - (c) describe what action has been taken to date; and
 - (d) describe the proposed measures to address the exceedance/incident.

ANNUAL REVIEW

4. By the end of March each year, the Proponent shall prepare and submit a review of the environmental performance of the project to the satisfaction of the Director-General. This review must:
 - (a) describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year;
 - (b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the
 - the relevant statutory requirements, limits or performance measures/criteria;
 - the monitoring results of previous years; and
 - the relevant predictions in the EA;
 - (c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
 - (d) identify any trends in the monitoring data over the life of the project;
 - (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
 - (f) describe what measures will be implemented over the next year to improve the environmental performance of the project.

INDEPENDENT ENVIRONMENTAL AUDIT

5. Within 3 years of the date of the commencement of construction, and every 5 years thereafter, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:
 - (a) be conducted by a suitably qualified, experienced, and independent person(s) whose appointment has been approved by the Director-General;
 - (b) include consultation with the relevant agencies;
 - (c) assess the environmental performance of the project, and its effects on the surrounding environment;
 - (d) assess whether the project is complying with the relevant standards, performance measures and statutory requirements;

- (e) review the adequacy of any strategy/plan/program required under this approval; and, if necessary,
 - (f) recommend measures or actions to improve the environmental performance of the project, and/or any strategy/plan/program required under this approval.
6. Within 1 month of completion of each Independent Environmental Audit, the Proponent shall submit a copy of the audit report to the Director-General and relevant agencies, with a response to any of the recommendations in the audit report.

REVISION OF STRATEGIES, PLANS AND PROGRAMS

7. Within 3 months of:
- the submission of an incident report under condition 3 above;
 - the submission of an Annual Review under condition 4 above;
 - the submission of an audit report under condition 5 above; or
 - any modification to the conditions of this approval, (unless the conditions require otherwise), the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Director-General.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.

COMMUNITY CONSULTATIVE COMMITTEE

8. Prior to the commencement of construction, the Proponent shall establish a Community Consultative Committee (CCC) for the project. The CCC shall:
- (a) be comprised of:
 - 2 representatives from the Proponent, including the person responsible for environmental management at the quarry;
 - 1 representative from Council (if available); and
 - at least 3 representatives from the local community, whose appointment has been approved by the Director-General;
 - (b) be chaired by an independent chairperson, whose appointment has been approved by the Director-General;
 - (c) meet at least twice a year;
 - (d) review the Proponent's performance with respect to environmental management and community relations;
 - (e) undertake regular inspections of the quarry operations;
 - (f) review community concerns or complaints about the quarry operations, and the Proponent's complaints handling procedures; and
 - (g) provide advice to:
 - the Proponent on improved environmental management and community relations, including the provision of information to the community and the identification of community initiatives to which the Proponent could contribute;
 - the Department regarding the conditions of this approval; and
 - the general community on the performance of the quarry with respect to environmental management and community relations.

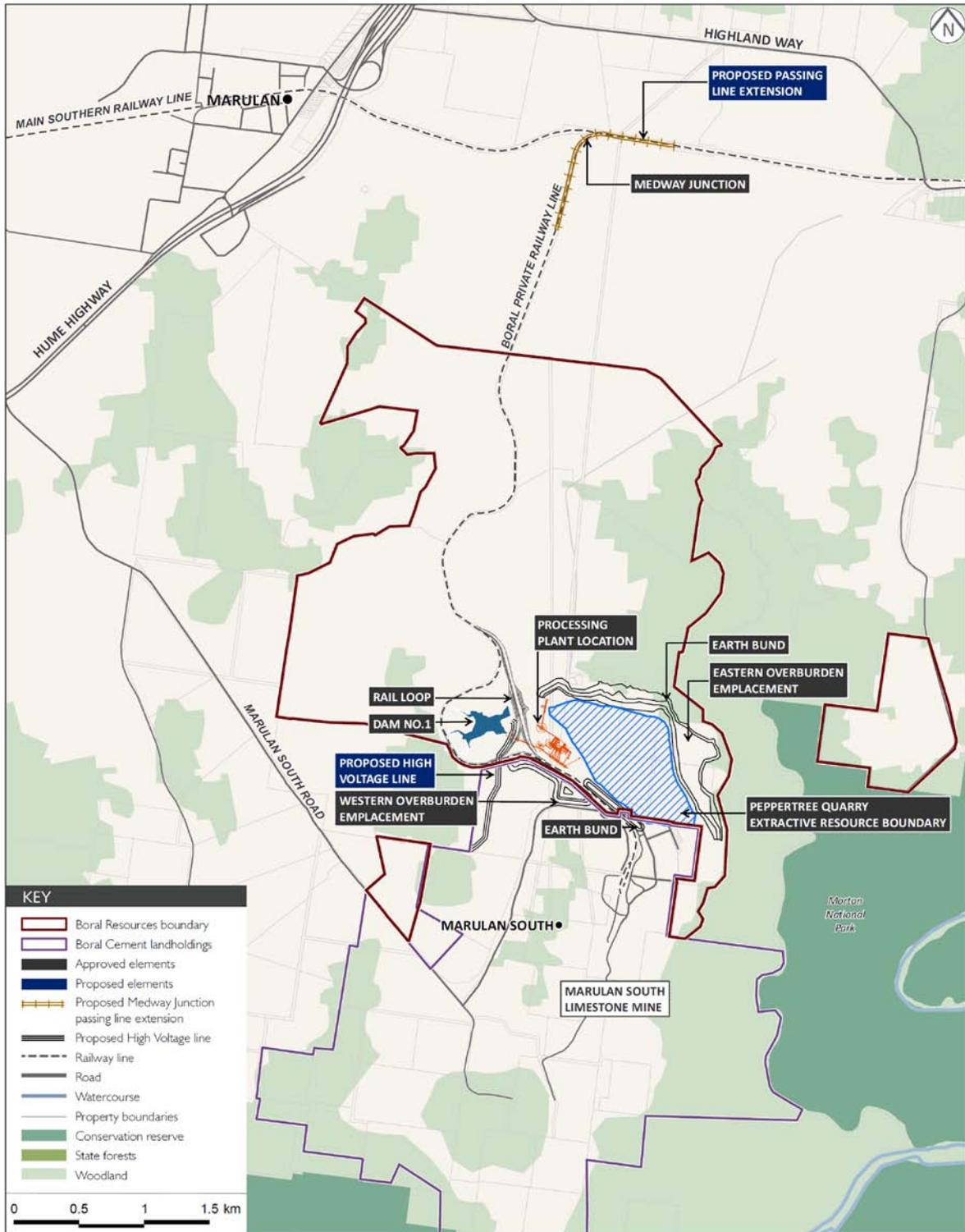
Notes

- *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Proponent complies with this approval.*
 - *The membership of the CCC should be reviewed on a regular basis (every 3 years).*
 - *If possible, an alternate member should be appointed for each of the representatives from the local community.*
9. At its own expense, the Proponent shall,:
- (a) ensure that 2 of its representatives attend CCC meetings;
 - (b) provide the CCC with regular information on the environmental performance and management of the project;
 - (c) provide meeting facilities for the CCC;
 - (d) arrange site inspections for the CCC, if necessary;
 - (e) take minutes of the CCC meetings;
 - (f) make these minutes available to the public;
 - (g) respond to any advice or recommendations the CCC may have in relation to the environmental management or community relations; and
 - (h) forward a copy of the minutes of each CCC meeting, including a response to any recommendations from the CCC, to the Director-General within a month of the CCC meeting.

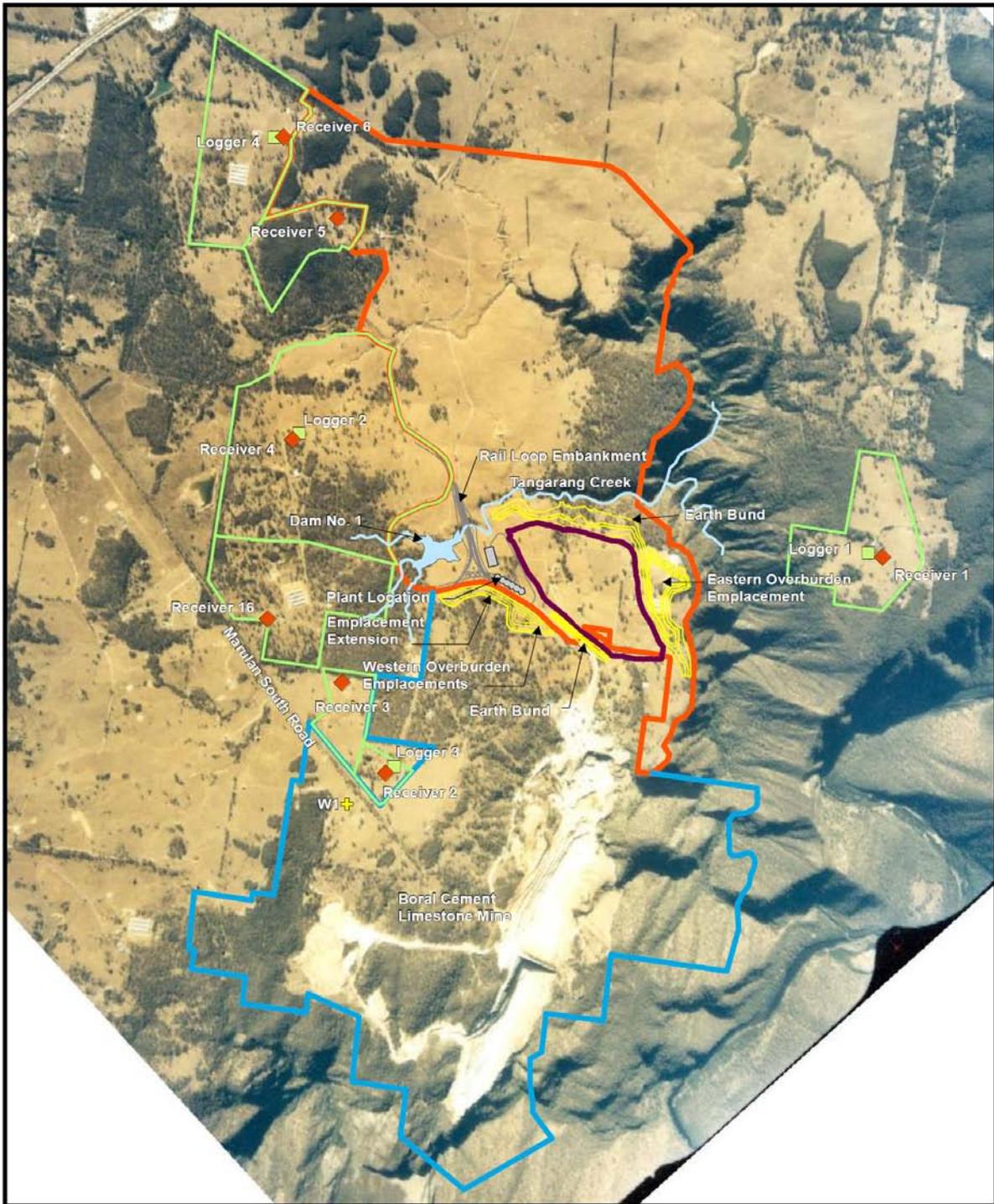
**APPENDIX 1
SCHEDULE OF LAND**

<i>Lot</i>	<i>DP</i>
23	867667
5	203290
95	750029
24	867667
109	750029
1	371167
1-6	261615
1	557562
143	750029
12	570616
2	557562
21	657523
100	1064794
4	106569
1-9	216767
11	570616
5	111641
22	867667
1	1124189
2	106569

APPENDIX 2 PROJECT SITE



APPENDIX 2A NOISE RECEIVER LOCATION PLAN



Legend

- ◆ Receiver Locations
- ◆ Noise Logger Locations
- + Weather Station
- Quarry Location
- Boral Cement Property Boundary
- Boral Peppertree Property Boundary
- Proposed Dam Location
- Proposed Plant Location
- Cadastre
- Tangarang Creek

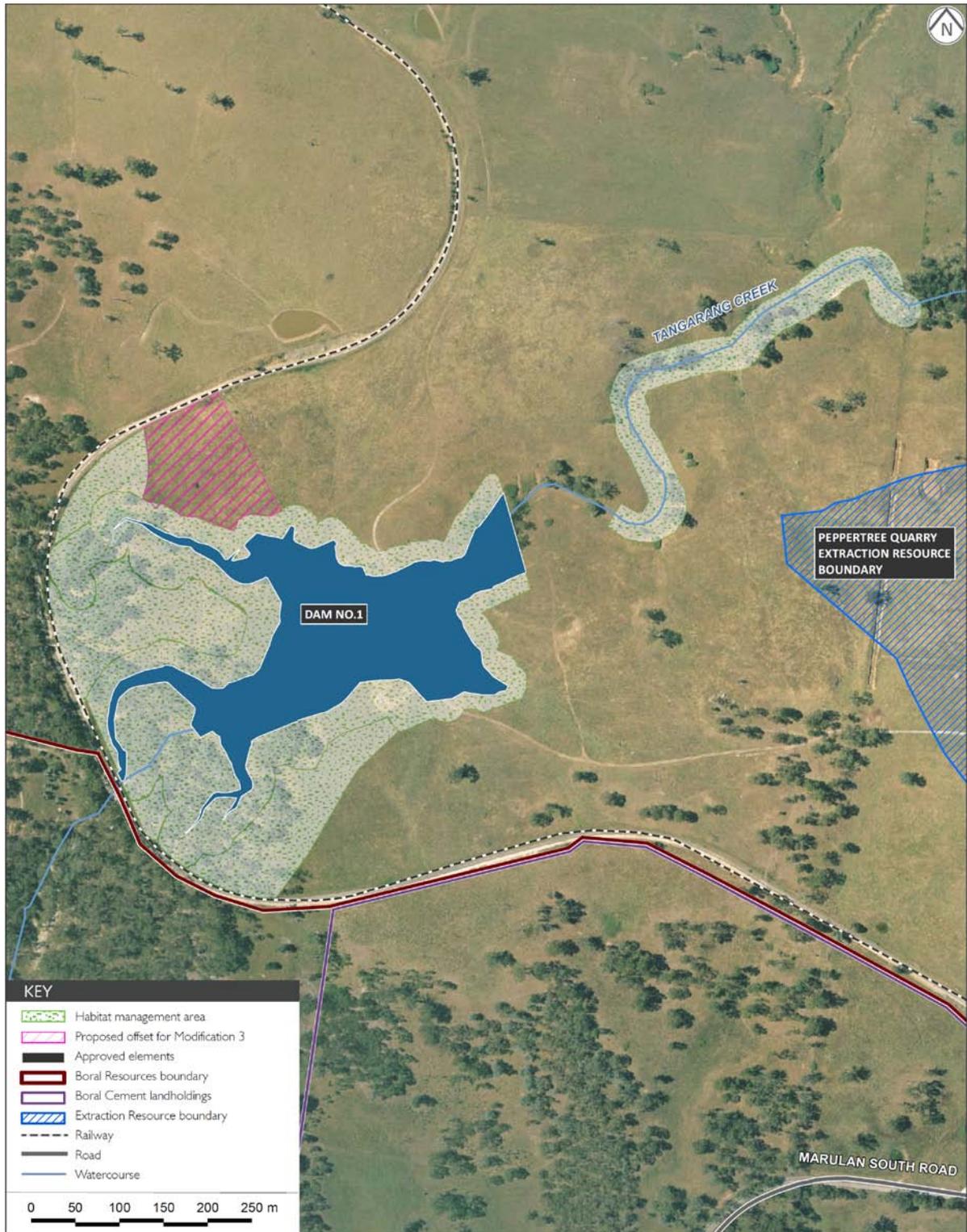
Client:	Boral
Project:	Peppertree Quarry
Drawing:	0118028s_Sect75W_G016_R0.mxd
Date:	27/10/2011
Drawn By:	SQW
Projection:	GDA 1994 MGA Zone 56
Scale:	Refer to scale bar

**Figure 5.1
Location of Noise Receivers**

Environmental Resources Management Australia Pty Ltd
Brisbane, Canberra, Hunter Valley, Melbourne, Perth,
Port Macquarie, Sydney



APPENDIX 3 HABITAT MANAGEMENT AREA



Appendix C – Community Newsletters

Boral Peppertree Quarry

Newsletter | Issue 6 | April 2013

Boral is pleased to present this issue of the Boral Peppertree Quarry newsletter.

Construction works continue to progress at the site, with an aim to commission some of the processing equipment in May.

Construction of the rail line through the site is now complete, with the line now being used by Boral Marulan South Limestone trains.

The in-pit crusher has been delivered with its operation to be tested with our material in coming weeks. We do not envisage any of our neighbours will be inconvenienced during commissioning but should this happen, please raise any concerns with **Sharon Makin**.

The building of infrastructure associated with the processing plant is also nearing completion.

We have had more than 330 shipping containers delivered to site holding the plant components. More than 6698m³ of concrete has been poured for the foundations.



Staff

New appointments to the positions of Operational Quarry Manager, Maintenance Manager and Assistant Quarry Manager have been made.

Angus Shedden has been recruited as the Boral Peppertree Quarry Manager. Angus hails from the UK and previously worked for Lafarge as the Quarry Manager for Mountsorrel Quarry in England.

Angus has met a number of Marulan residents and is looking forward to working with the community through our Stakeholder Engagement Plan.

Brian Albers takes on the role as the Quarry Maintenance Manager and will be responsible for keeping equipment and plant running safely, effectively and efficiently.

Brian has a background in hard rock quarry maintenance and has been associated with Boral for 13 years through work at other quarries including

Emu Plains, Prospect, Peats Ridge and Seaham. Brian and his wife have made their home in Marulan.

Cameron Madeira has commenced as the Assistant Quarry Manager and brings experience from our operations at Emu Plains and from Boral Widemere Recycling.

Blasting

To operate and test the new equipment, we require rock. A blast was undertaken in mid April to provide this rock. As with all other blasts, this was planned to ensure we met the performance criteria in our approval.

We have a notification system in place for residents who wish to be contacted before any blasts. If you would like to be contacted prior to future blasting please contact **Sharon Makin**.

Community

We have continued to work with a number of groups in Marulan and Tallong regarding projects we can support and partner with as part of our Stakeholder Engagement Plan. A workshop has been arranged for early May with invited members from local groups to develop and identify the projects.

We are proud to say that we will again support the Marulan Kite Festival in 2013 and the associated Design a Kite Competition for local school children.

We are also proud to sponsor the inaugural Boral Large Sculpture Competition to be held in conjunction with the 2013 Tallong Apple Day Festival on May 5. This is an exciting new competition to develop and promote sculpture art in the Tallong area. We will have an information stall as well as participate in a historic display at the festival.

Details about the Festival can be found at www.facebook.com/TallongAppleDay.

We are also happy to announce we are working with the Marulan Chamber of Commerce on the installation of two rock entrance walls to Marulan. These will be constructed over the next couple of months with the assistance of Council.

Consultation

The Boral Peppertree Quarry Community Consultative Committee (CCC) met in February 2013. Progress of the work to date and planned for the next three months was discussed, as was an outline on our environmental and safety performance. Minutes of the meeting can be found on our website.

Boral Peppertree Quarry

Newsletter | Issue 7 | June 2013

Boral is pleased to present this issue of the Boral Peppertree Quarry newsletter.

June has been an exciting time for the Peppertree team. Construction works are continuing however commissioning of the in-pit crusher and primary section of the process was commenced on 6 June.

After two years of works it was great to see the first load of rock placed into the crusher, transported along the conveyors, processed and delivered to the main stockpile.

All systems performed well with no excessive noise or dust generated.

Over the next couple of months, this part of the process will be refined to operate at maximum capacity.

It is planned to commission the second part of the process during August.



First load to the crusher



Conveyors in operation

Environment

Environmental monitoring has continued on a regular basis with the results available on our website, www.boral.com.au/peppertreequarry

Quarterly noise monitoring was undertaken in early May with all results in compliance with our approval. The next round will be completed in July - the first with the crusher and primary plant in operation.

Blasting

Two blasts took place during May and June. Both met the requirements of our approval and were not heard at surrounding residences.

We have a notification system in place for residents who wish to be contacted before any blasts. If you would like to be notified, contact **Sharon Makin**.

Community

May and June have been busy months for us in regard to our community commitments. A workshop was held in May with a number of groups from Marulan and Tallong regarding projects we can support and partner as part of our Stakeholder Engagement Plan. From this workshop, the Marulan Tallong Community Network was formed, combining a number of community projects for the establishment of a heritage precinct in Marulan and Tallong. Further meetings of the Network have refined these down to a heritage centre and park in Marulan, with a satellite park facility in Tallong. A submission and presentation has been made to Goulburn Mulwaree Council to seek support.

As a member of the community, Boral is continuing to participate in the Network.

During May we also participated in the Tallong Apple Festival and were proud to be able to award the \$500 first prize to the Tallong Public School as the winners of the inaugural Boral Large Sculpture competition for their amazing sculpture, *Clown Juggler*.

We would also like to congratulate 'Darcey Berrell' from Marulan for guessing the correct weight of our granodiorite rock at 8.16kgs.

Consultation

The Boral Peppertree Quarry Community Consultative Committee (CCC) met again in May 2013. Progress of the work to date and that planned over the next three months was discussed, as was an outline of our environmental and safety performance. Minutes of the meeting can be found on our website.

Boral Peppertree Quarry

Newsletter | Issue 9 | October 2013

Boral is pleased to present this issue of the Boral Peppertree Quarry newsletter.

This has been another exciting month for Boral's Peppertree Quarry on several fronts; production, recruitment and community.

At the end of September we completed the last of the major crane lifts putting into place the conveyors to the silos.

The whole plant is now going through its commissioning phase ready to swing into full production early next year.



Lifting the conveyors in place

Another milestone was also achieved with the first finished products leaving the Peppertree site by train this month and taken to the dedicated offloading facility built at Maldon.

Community

It was great that Boral were able to help fund the construction of the new Marulan entrance signs. The signs made it up in time for the Kite Festival and they look fantastic.

Boral were also delighted to be the major sponsors of the Kite festival again this year. We thoroughly enjoy the day and its great to see so many coming to Marulan and enjoying everything the town and festival have to offer.

This year the Kite judging was difficult with over 200 entries and at an exceptional high standard. Many different schools were represented in the different age categories however the overall winner came from the Tallong School who now receive \$500 from Boral.



2013 Kite Festival Kite Parade

Employment

In addition to the activity around Marulan the Peppertree site has progressed well with further recruitment taking place. The quarry operations team is now made up of employees from Marulan, Tallong and Goulburn. It is fantastic for the site to be able to get high quality staff from the local area and we hope to continue this as we fill upcoming vacancies.

Anybody wishing to apply for roles can do so through www.seek.com.au or via the Boral website under vacancies.

Environment

Environmental monitoring has continued on a regular basis with the results available on our website, www.boral.com.au/peppertreequarry

Over 30 000 stakes have been placed onsite to mark out the initial planting to be undertaken as part of our rehabilitation works. The first plants will be planted next week.

Blasting

Two blasts took place during October. All met the requirements of our approval.

We have a notification system in place for residents who wish to be contacted before any blasts. If you would like to be notified, contact **Sharon Makin**.

Boral Peppertree Quarry Newsletter | Issue 11 | December 2013

Boral is pleased to present this issue of the Boral Peppertree Quarry newsletter.

As we approach the end of 2013 it is a time to reflect on the achievements of the year and look forward to the exciting times ahead. The achievements of all the employees and contractors working at Boral's Peppertree quarry over the course of 2013 have been outstanding. The site has been transformed from a few concrete foundations into a world class fully operational site.

Over the course of the project over 600,000 hours have been worked with many local companies and suppliers being involved in everything from on site fabrication work to providing accommodation for those who have travelled from afar.

It was with much anticipation and excitement that we welcomed the first train to Peppertree last month. We have now loaded several trains with the finished products making their way by rail to our terminal at Maldon. The site is now moving from a construction site to a fully operational site and as we move into 2014 we will be optimising the plant and gradually increasing our output.

We will be continuing to recruit in the new year and again urge anybody interested in applying for roles to keep a watch on ww.seek.com.au.

On a personal note I (Angus) have thoroughly enjoyed meeting many of you at the community events we have participated in and when around Marulan. It has been great to get to know the community here and I am looking forward to spending more time with you in 2014.

From the Boral team, we wish you and your family all the best for Christmas and a safe and happy new year.



Appendix D – Noise Audits

Boral Resources (NSW) Pty Ltd

Peppertree Quarry

Noise Compliance Monitoring Report

Monitoring Period: January 2013

Reporting Date: January 2013

Reference: 0146289RP09

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EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd has completed noise compliance monitoring for the current works at Peppertree Quarry, located at Marulan South in the Southern Tablelands of New South Wales. The assessment was undertaken on behalf of Boral Resources (NSW) Pty Ltd, with due regard to, and in accordance with, local and international standards, guidelines and documents presented in this report, during January 2013.

Site noise emissions associated with construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria for construction works contained in Boral's November 2012 approval, and cumulative noise criteria, at all receiver locations. Based on these findings ERM has made in-principle acoustic recommendations; each designed to assist Boral in reducing noise emissions from construction activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry, where required. These are presented below:

- Continue to ensure that all significant noise generating plant and equipment are tested to satisfy the design level limits presented in the Peppertree Quarry Construction Noise Management Plan and that appropriate mitigation is applied where feasible and reasonable;*
- Avoid concentrations of equipment in sensitive work areas e.g. on top of the dump or bund;*
- Avoid bunching of trucks along internal haulage roads;*
- Continue to monitor local meteorological conditions to manage the placement of equipment so that it is suitable for best outcome for those conditions; and*
- Undertake noise compliance monitoring at affected receiver(s) or at nominated (alternate) representative locations in accordance with Section 2 of the (06_0074) November 2012 Project Approval, where applicable.*

ERM makes no additional recommendations and notes that Boral continues to manage noise generated by construction plant within the site and continues to operate within the construction noise criteria specified in the November 2012 Project Approval.

INTRODUCTION

This document has been prepared by Environmental Resources Management Australia Pty Ltd (ERM) on behalf of Boral Resources (NSW) Pty Ltd (Boral). It presents the methodology, findings and recommendations of noise compliance monitoring conducted at the Peppertree Quarry (the quarry), located at Marulan South in the Southern Tablelands of New South Wales (NSW) during January 2013.

1.1

RELEVANT DOCUMENTS, STANDARDS AND GUIDELINES

This report has been prepared with due regard to and in accordance with the following documents, standards and guidelines:

- Marulan South Consolidated Project Approval (06_0074) November 2012;
- the *Peppertree Quarry Construction Noise Management Plan (CNMP)*, the *Peppertree Quarry Noise and Blast Monitoring Plan (NBMP)* and the *Peppertree Quarry Environmental Monitoring Program (EMP)*;
- NSW Environment Protection Authority - *NSW Environmental Noise Management - Industrial Noise Policy (INP)*, January 2000 and relevant application notes;
- NSW Department of Environment and Climate Change - *NSW Interim Construction Noise Guideline (ICNG)*, July 2009;
- Standards Australia AS1055-1997™ (AS1055) - *Description and Measurement of Environmental Noise*, Parts 1, 2 and 3;
- Standards Australia AS IEC 61672.1-2004™ (AS61672) - *Electro Acoustics - Sound Level Meters Specifications Monitoring*; and
- Standards Australia AS 2436-2010™ (AS2436) - *Guide To Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

A glossary of relevant acoustic concepts and terminology is presented as *Annex A*.

1.2

BACKGROUND

Boral Resources (NSW) Pty Ltd (Boral) was granted project approval (06_0074) to establish and operate the Peppertree Quarry (a granodirite hard rock quarry, formerly called the Marulan South Quarry) including all in-pit quarrying activities and supporting infrastructure such as a rail siding and loading facility, processing plant and water supply dams under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) in February 2007.

Under Section 75W of the *Environment Planning and Assessment Act 1979*, Boral applied for a modification of the Peppertree Quarry Development in regards to rail line construction and operations. Boral received a 'Notice of Modification' for the Peppertree Quarry Project Approval (06_0074), dated Thursday, 3 November 2011. This notice approved the revised Project consolidating relevant aspects of March 2009 and November 2011 modifications. A further modification was applied for in September 2012 for the installation and operation of a High Voltage Power line to the Peppertree Quarry site and an extension of the existing Medway rail siding. This modification application was approved Friday, 2 November 2012.

1.2.1

Noise and Vibration Management

ERM was engaged to prepare the NBMP and CNMP for the quarry in accordance with the Project Approval and subsequent modifications; incorporating key components of the noise and blast monitoring programs for the quarry. Both NBMP and CNMP monitoring programs have been established and incorporated into the overall Environmental Monitoring Program (EMP), which consolidates the specific requirements of the abovementioned monitoring programs as well as other monitoring required by specific Project Approval conditions. The EMP provides an overall framework to assist with the implementation of monitoring for the project.

The purpose of the NBMP and CNMP is to fulfil the requirement of Schedule 3 of the Project Approval and the Statement of Commitments contained within the Part 3A Environmental Assessment. The NBMP, amongst other things, provides procedures for monitoring and assessing noise impacts from the quarry and methods to determine compliance with the operational noise impact assessment criteria. The CNMP, in addition to other things, provides: methods for managing construction noise; procedures for monitoring and assessing noise from construction; and methods to determine compliance with limits for residential receivers.

Construction and site establishment activities associated with the quarry are currently in progress and include week day (7am to 6pm) and Saturday (7am to 1pm) works only. ERM has been engaged to conduct noise compliance monitoring in January 2013 on behalf of Boral in accordance with the CNMP, NBMP and Project Approval conditions for the quarry.

Guidance Note

Under Section 75W of the Environment Planning and Assessment Act 1979 Boral received a 'Notice of Modification' for the (06_0074) Peppertree Quarry Project Approval. This notice, received on Thursday, 3 November 2011 also enabled a revised Project Approval to be prepared which consolidated relevant aspects of March 2009 and November 2011 modifications.

During this process and in consultation with the NSW Department of Planning and Infrastructure (DoPI), it is understood that Boral received advice that construction noise criteria would remain valid through January 2012 and thereafter, the Operational Noise Impact Assessment Criteria (as presented in Schedule 3, Section 4, Table 1 of the November 2011 modification) would apply. The subsequent approval in November 2012 does not alter the application of the Operational Noise Impact Assessment Criteria as outlined above.

This report presents the noise compliance assessment prepared with due regard to these Operational Noise Impact Assessment Criteria, which now apply for the quarry site.

1.3 ***SITE UNDERSTANDING***

The Peppertree Quarry is located in the Southern Tablelands of NSW, approximately 10 kilometres (km) southeast of Marulan and 175 km southwest of Sydney.

The site, the project-specific noise sensitive localities (including the unique identification number used to describe each location) and other items of acoustic importance relative to this assessment are visually presented in *Figure 1.1*.

Figure 1.1 Locality Map

A4

This sections presents an overview of the noise compliance monitoring methodology for continuous unattended and operator attended noise monitoring undertaken in accordance with the NBMP and CNMP.

2.1 RECEIVER LOCATIONS

The key monitoring locations representative of the surrounding receivers identified in the NBMP, CNMP and Project Approval for operations are to be used for evaluating and assessing noise emissions from construction and site establishment activities, as presented in *Table 2.1* and visually presented on *Figure 1.1*.

Table 2.1 *Nearest Potentially Affected Receiver Locations*

Receiver ID	Description	MGA (Zone 56) Coordinates		Direction and Distance from Quarry Centre	
		Easting	Northing	Compass point	Distance, m
1 ¹	Montgomery	230481	6150110	E	2730
2	Ordasi	226934	6148560	SSW	1730
3 ¹	Brown	226623	6149210	SW	1410
4 ¹	Armitt	226271	6150950	WNW	1480
5	Cooper	226592	6152540	NW	2520
6	Bartolo	226244	6153120	NW	3230
16	Pace	226094	6149665	WSW	1050

1. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership

Guidance Note

At Receiver 16 (Pace), an alternate location was selected in consultation with the resident. At this alternate location, site noise levels were identified (where audible) to be broadly similar to those at the designated assessment location.

Compliance has been determined based on the measured site noise levels at the selected location (close to the site) rather than applying an extrapolated value. ERM considers this to be a robust method by which compliance may be determined at this location.

2.2

ASSESSMENT CRITERIA

This section summarises the Operational Noise Impact Assessment Criteria (as presented in Schedule 3, Condition 4; Table 1 of the November 2012 modification) and presented in the NBMP.

2.2.1

Operational Noise Criteria

The Project Approval requires that the construction noise criteria are complied with for the first three months of construction (valid to January 2012) and thereafter, meet the operational criteria. Noise criteria for construction after the first three months are applicable at this stage of the project and have been adopted to determine compliance. These are reproduced in *Table 2.2*.

Table 2.2 *Operational Noise Impacts Assessment Criteria*

Receiver ID	Description	Noise Impact Assessment Criteria, dB(A) ^{1,2}		
		Daytime 7:00am to 7:00pm	Evening and Night 7:00pm to 7:00am	
		LAeq, 15min	LAeq, 15min	LA1, 1min
1 ³	Montgomery	35	35	45
2	Ordasi	39	35	45
3 ³	Brown	42	35	46
4 ³	Armitt	37	35	46
5	Cooper	35	35	45
6	Bartolo	35	35	45
16	Pace	41	35	45
	Any other noise sensitive location	35	35	45

1. The identified 'Daytime' noise criteria apply throughout the period of the site's Day Shift (i.e. 7.00am to 7.00pm) on all days, despite the general definitions of 'Evening' and 'Night time' otherwise applying to the approval. The identified 'Evening' and 'Night time' criteria apply only during the period of the site's Night Shift (i.e. 7.00pm to 7.00am);
2. Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW INP; and
3. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership.

2.2.2

Cumulative Noise Criteria

ERM has also considered Schedule 3, Condition 6 of the Project Approval which states:

The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other extractive industries does not exceed the following amenity criteria on any privately owned land, to the satisfaction of the Director-General:

- $L_{Aeq, 11hr} 50 \text{ dB(A)} - \text{Day}^1$;
- $L_{Aeq, 4hr} 45 \text{ dB(A)} - \text{Evening}$; and
- $L_{Aeq, 9hr} 40 \text{ dB(A)} - \text{Night}$.

Although not mandatory for the current construction and site establishment works, these cumulative guideline values provide a parameter by which daily site noise levels may be assessed with regard to other extractive industries in the area.

2.3

MEASUREMENT METHODOLOGY

ERM visited the quarry on Wednesday, 16 January and Thursday, 17 January 2013 to conduct continuous unattended and operator attended noise monitoring. The monitoring methodology was determined with due regard to the relevant documents, standards and guidelines presented in *Section 1.1*.

Operator attended noise measurements were conducted at all locations specified in *Table 2.1*. Supplementary continuous unattended noise monitoring was undertaken at the following four locations:

- Receiver 2 (Ordasi);
- Receiver 5 (Cooper);
- Receiver 6 (Bartolo); and
- Receiver 16 (Pace)².

¹ The identified 'Daytime' noise criteria apply throughout the period of the site's Day Shift (i.e. 7.00am to 7.00pm) on all days, despite the general definitions of 'Evening' and 'Night time' otherwise applying to the approval. The identified 'Evening' and 'Night time' criteria apply only during the period of the site's Night Shift (i.e. 7.00pm to 7.00am).

² Due to influencing factors outside ERM or Boral control the noise logging device located at Receiver 16 failed to record valid data, accordingly no unattended noise monitoring results are presented for this location.

2.3.1

Measurement Equipment

All measurements were conducted by trained ERM personnel; with due regard to and in accordance with the relevant local and international standards for environmental noise monitoring.

The measurement instrumentation used to complete the assessment complied with the requirements of AS 61672.1 with current NATA calibration certificates, with certification at intervals not exceeding two years at the time of use. The equipment used for this assessment was as follows:

- 1 x Brüel & Kjær 2250 Investigator Type 1 Sound Analyser;
- 1 x ARL Ngara (Type 1) Environmental Noise Logger
- 3 x ARL 215 (Type 2) Environmental Noise Loggers; and
- 1 x Brüel & Kjær Type 1 Sound Level Calibrator.

Instrument calibration was checked prior to monitoring and again at the conclusion with no difference noted between the two measurements. All data handling and analysis has been completed by a member of the Australian Acoustical Society, being at the grade of 'Associate Member' or higher.

This section presents the results, findings and any recommendations of continuous unattended and operator attended noise monitoring conducted on Wednesday, 16 January and Thursday, 17 January 2013.

During the January 2013 noise compliance monitoring, the site was noted to be operating under normal conditions representative of typical activities associated with this stage of the project. In comparison to recent monitoring events, works were somewhat limited, with no significant high noise level generating plant, equipment or activities in use or being undertaken on site. The number of plant in use was also limited. Construction and site establishment activities associated with the quarry were limited to the approved week day (7am to 6pm) hours on both days of monitoring.

Site noise level events were based on observed noise events, detailed review of field logs and analysis of audio files using the Brüel & Kjær Evaluator Type 7820 Version 4.16.2 software package. Site noise level contributions ($L_{Aeq, 15 \text{ minute}}$) were determined via calculation to exclude extraneous noise emissions, which were of influence during each of the measurements. Where site noise emissions were inaudible, site noise level contributions were estimated to be approximately 10 dB(A) below the measured background (L_{90}) noise level.

Furthermore, site noise level contributions have been determined with due regard to Section 4 of the INP which presents modifying factor corrections for tonal, low-frequency or impulsive noise emissions. ERM notes that due to the significant influence of extraneous noise sources at each receiver, no penalty has been applied for tonal and low-frequency factors. Impulsive and/or intermittent modifying factor corrections were considered but these penalties did not qualify, for data captured in this round of monitoring.

3.1

NOTED NOISE SOURCES

Prior to noise compliance monitoring, ERM was engaged to conduct plant and equipment noise testing on behalf of Boral in accordance with the CNMP and Project Approval conditions. The objective of this noise testing was to guide Boral during the start of construction, and to ensure that plant and equipment used would meet the specified Sound Power Level (L_W) design noise level limits presented in Table 3.1 in Section 3.2 of the CNMP.

To date a significant number of plant and equipment has been tested and in general, the overall fleet L_W value (cumulative, all plant in use) is calculated to be approximately 128 dB(A) whilst the cumulative L_W of the fleet based on the design level limits is calculated to be 130 dB(A). The cumulative L_W values presented here identify that because the calculated dynamic L_W values for the majority of plant are significantly below the design level limits, the cumulative sound power of the fleet is approximately 2 dB(A) lower than anticipated.

This reduction in noise level has been achieved by the use of smaller (and quieter) items of plant e.g. articulated dump trucks and dozers.

As noted above, in comparison to recent monitoring events, works were somewhat limited during the January 2013 monitoring, with no significant high noise level generating plant, equipment or activities in use or being undertaken on site.

As part of the January 2013 monitoring no additional noise testing was undertaken to determine L_W values for any new plant. However, site related noise generating activities were typically associated with the use of motion alarms or limited metal on metal contact. These were the only items of plant, equipment and activities being used or undertaken that was audible at the receiver locations.

November 2012 monitoring identified an excavator being used to break rock in the current pit area. However, this activity was not being undertaken during the January 2013 monitoring period. ERM notes that previously, rock breaking typically remained inaudible, however, when some rock material was being broken noise levels increased to be just audible at some receivers. This noise level increase was associated with the size and type of material being broken, not the actual plant in use.

3.2 OPERATOR ATTENDED MEASUREMENTS

Measured overall ambient and background noise levels are presented in *Table 3.1* and *Table 3.2*, including all relevant statistical and acoustic parameters i.e. L_{Max} , L_{Min} , L_{Aeq} , L_{A1} , L_{A10} and L_{A90} .

Table 3.1 Overall Measured Noise Levels - 16 January 2013

Receiver ID	Description	Start Time	Measured Noise Levels ^{1,2,3}					
			LMax	LMin	Leq	L1	L10	L90
1	Montgomery	13:55	53	33	41	48	44	36
2	Ordasi	10:07	56	28	40	48	44	32
3	Brown	15:18	61	36	42	46	44	39
4	Armitt	14:44	73	26	39	50	39	27
5	Cooper	11:48	68	30	40	46	42	32
6	Bartolo	12:30	58	38	44	51	46	41
16	Pace	10:50	50	29	35	42	37	32

1. dB(A) re 2×10^{-5} Pa;
2. all measurements were of 15 minutes duration; and
3. meteorological conditions varied with temperatures ranging between 25 and 28 ° Celsius, maximum wind speeds of up to 4.5m/s, average wind speeds of between 2 and 4 m/s (typically from a western direction) and with cloud coverage varying significantly between 0/8 and 7/8 octas.

Table 3.2 Overall Measured Noise Levels – 17 January 2013

Receiver ID	Description	Start Time	Measured Noise Levels ^{1,2,3}					
			LMax	LMin	Leq	L1	L10	L90
1	Montgomery	09:05	58	35	41	49	43	37
2	Ordasi	12:05	59	31	39	47	42	33
3	Brown	07:20	56	38	42	48	44	40
4	Armitt	07:49	56	32	40	49	42	35
5	Cooper	10:12	54	32	39	45	40	35
6	Bartolo	10:50	55	36	48	52	51	44
16	Pace	11:33	55	33	42	49	46	35

1. dB(A) re 2 x 10⁻⁵ Pa;
2. all measurements were of 15 minutes duration; and
3. meteorological conditions varied with temperatures ranging between 12 and 17 ° Celsius, maximum wind speeds of up to 4.5m/s, average wind speeds of between 1.5 and 3 m/s (typically from a western direction) and with cloud coverage of between 6/8 and 7/8 octas.

Table 3.1 and Table 3.2 provide overall noise levels measured on Wednesday, 16 January and Thursday, 17 January 2013. At the majority of these locations, construction and site establishment activities were inaudible or just audible and did not dominate the acoustic environment, masked by extraneous noise emissions not associated with the site.

Observed extraneous noise sources (not associated with the site) included emissions associated with near-by fauna, rail movements, wind-blown vegetation and on occasion, other industrial premises.

3.2.1 Compliance Assessment

ERM has completed the noise compliance assessment comparing resultant site noise level contributions (L_{Aeq}, 15 minute) to the Operational Noise Impact Assessment criteria, as presented in Table 3.3 and Table 3.4.

Table 3.3 Compliance Assessment – 16 January 2013

ID	Description	Operational Noise Impact Assessment Criteria ¹	Site Noise Level Contribution Leq, 15 minute ^{1, 2}	Comply with Criteria
1 ³	Montgomery	35	<30	Yes
2	Ordasi	39	≤30	Yes
3 ³	Brown	42	≤30	Yes
4 ³	Armitt	37	<30	Yes
5	Cooper	35	<30	Yes
6	Bartolo	35	≤31	Yes
16	Pace	41	<30	Yes

1. dB(A) re 2 x 10⁻⁵ Pa;
2. ERM considered INP modifying factor corrections for tonal, low-frequency or impulsive noise where necessary; and
3. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership.

Table 3.4 Compliance Assessment – 17 January 2013

ID	Description	Operational Noise Impact Assessment Criteria ¹	Site Noise Level Contribution Leq, 15 minute ^{1, 2}	Comply with Criteria
1 ³	Montgomery	35	≤30	Yes
2	Ordasi	39	<30	Yes
3 ³	Brown	42	≤30	Yes
4 ³	Armitt	37	<30	Yes
5	Cooper	35	≤30	Yes
6	Bartolo	35	≤34	Yes
16	Pace	35	<30	Yes

1. dB re 2 x 10⁻⁵ Pa;
2. ERM considered INP modifying factor corrections for tonal, low-frequency or impulsive noise where necessary; and
3. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership.

The results presented in *Table 3.3* and *Table 3.4* identify that current construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria contained in Boral’s November 2012 approval, at all receiver locations.

3.3

UNATTENDED MEASUREMENTS

Overall ambient (L_{Aeq}) noise levels measured during the daytime (7am to 6pm) assessment period, and the estimated site noise level contribution determined from unattended noise monitoring are presented below³. Unattended noise monitoring charts are presented in *Annex B*.

- Receiver 2 (Ordasi) – 45 dB(A) $L_{Aeq, 11hr}$ with an estimated site noise level contribution of <30 dB $L_{Aeq, 11hr}$;
- Receiver 5 (Cooper) – 46 dB $L_{Aeq, 11hr}$ with an estimated site noise level contribution of <30 dB $L_{Aeq, 11hr}$;
- Receiver 6 (Bartolo) – 43 dB $L_{Aeq, 11hr}$ with an estimated site noise level contribution of ≤33 dB $L_{Aeq, 11hr}$; and
- Receiver 16 (Pace) – due to influencing factors outside ERM or Boral control the noise logging device located at Receiver 16 failed to record valid data, accordingly no unattended noise monitoring results are presented for this location.

Unattended site noise level contributions ($L_{Aeq, 11 Hour}$) were estimated based on observed noise events noted during noise logger deployment, review of attended measurement results (including audio data analysis) and review of field logs. Site noise level contributions ($L_{Aeq, 11 Hour}$) were estimated via calculation to exclude extraneous noise emissions, which were of influence during the unattended monitoring period.

At each of these locations, construction and site establishment noise was typically inaudible audible (or just inaudible) and did not dominate the acoustic environment of the area. Site noise level contributions are below the daytime cumulative criteria (50 dB(A)) applicable to unattended noise monitoring analysis. Other extractive industries were not always clearly audible at these locations, and as such overall noise (i.e. other extractive industries plus the quarry) is unlikely to increase to be above the daytime amenity criteria.

Extraneous noise sources (not associated with the site) noted during noise logger deployment were similar to those of operator attended noise measurements and included emissions associated with near-by fauna, rail movements, wind-blown vegetation and on occasion, other industrial premises.

³ Where insufficient data was available to determine average ambient noise level in accordance with the INP, the logarithmic average of available samples was calculated; ERM considers this to be a robust and comprehensive method by which overall noise levels may be determined in accordance with the NBMP assessment methodology.

3.3.1

Recommendations

Based on the results of January 2013 noise compliance monitoring, ERM makes the following in-principle acoustic recommendations to assist Boral in reducing noise emissions from construction activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry in complying with the operational noise criteria, in accordance with the November 2012 Project Approval;

- Continue to ensure that all significant noise generating plant and equipment are tested to satisfy the design level limits presented in the CNMP and that mitigation is applied where feasible and reasonable;
- Avoid concentrations of equipment in sensitive work areas e.g. on top of the dump or bund;
- Avoid bunching of trucks along internal haul roads;
- Continue monitoring of local meteorological conditions to manage the placement of equipment so that it is suitable for best outcome for those conditions; and
- Continue noise compliance monitoring at affected receiver(s) or at nominated (alternate) representative locations in accordance with the November 2012 Project Approval.

ERM makes no additional recommendations but notes that Boral continues to manage noise generated by construction plant within the site and continues to operate within the operational noise criteria specified in the November 2012 Project Approval.

CONCLUSION

ERM, on behalf of Boral Resources (NSW) Pty Ltd, has completed noise compliance monitoring for the current works at Peppertree Quarry. The assessment was undertaken with due regard to and in accordance with local and international standards, guidelines and documents presented in this report.

Site noise emissions associated with construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria for construction works contained in Boral's November 2012 approval, and the cumulative noise criteria, at all receiver locations.

Based on these findings ERM has made in-principle acoustic recommendations; each designed to assist Boral in reducing noise emissions from construction activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry, where required. ERM makes no additional recommendations and notes that Boral continues to manage noise generated by plant and equipment within the site and continues to operate within the operational noise criteria specified in the November 2012 Project Approval.

REFERENCES

Marulan South Consolidated Project Approval (06_0074) November 2012

Peppertree Quarry Noise and Blast Monitoring Plan, dated August 2012

Peppertree Quarry Construction Noise Management Plan, dated August 2012

Peppertree Quarry Environmental Monitoring Program, dated August 2012

NSW Environment Protection Authority - **NSW Environmental Noise Management - Industrial Noise Policy (INP)**, January 2000 and relevant application notes

NSW Department of Environment and Climate Change - **NSW Interim Construction Noise Guideline (ICNG)**, July 2009

Standards Australia AS1055-1997™ (AS1055) - **Description and Measurement of Environmental Noise**, Parts 1, 2 and 3

Standards Australia AS IEC 61672.1-2004™ (AS61672) - **Electro Acoustics - Sound Level Meters Specifications Monitoring**

Standards Australia AS 2436-2010™ (AS2436) - **Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites**

Annex A

Acoustic Glossary

A.1 WHAT IS NOISE AND VIBRATION?

A.1.1 Noise

Noise is often defined as a sound, especially one that is loud or unpleasant or that causes disturbance* or simply as unwanted sound, but technically, noise is the perception of a series of compressions and rarefactions above and below normal atmospheric pressure.

A.1.2 Vibration

Vibration refers to the oscillating movement of any object. In a sense noise is the movement of air particles and is essentially vibration, though in regards to an environmental assessment vibration is typically taken to refer to the oscillation of a solid object(s). The impact of noise on objects can lead to vibration of the object, or vibration can be experienced by direct transmission through the ground, this is known as ground-borne vibration.

Essentially, noise can be described as what a person hears, and vibration as what they feel.

A.2 HOW TO MEASURE AND DESCRIBE NOISE?

Noise is measured using a specially designed 'sound level' meter which must meet internationally recognised performance standards. Audible sound pressure levels vary across a range of 10^7 Pascals (Pa), from the threshold of hearing at $20\mu\text{Pa}$ to the threshold of pain at 200Pa . Scientists have defined a statistically described logarithmic scale called Decibels (dB) to more manageably describe noise.

To demonstrate how this scale works, the following points give an indication of how the noise levels and differences are perceived by an average person:

- 0 dB - represents the threshold of human hearing (for a young person with ears in good condition);
- 50 dB - represents average conversation;
- 70 dB - represents average street noise, local traffic etc;
- 90 dB - represents the noise inside an industrial premises or factory;
- 140 dB - represents the threshold of pain - the point at which permanent hearing damage may occur.

A.3

WHAT FACTORS CONTRIBUTE TO ENVIRONMENTAL NOISE?

The noise from an activity, like construction works, at any location can be affected by a number of factors, the most significant being:

- How loud the activity is;
- How far away the activity is from the receiver;
- What type of ground is between the activity and the receiver location e.g. concrete, grass, water or sand;
- How the ground topography varies between the activity and the receiver (is it flat, hilly, mountainous) as blocking the line of sight to a noise source will generally reduce the level of noise; and
- Any other obstacles that block the line of sight between the source to receiver e.g. buildings or purpose built noise walls.

A.4

HOW TO CALCULATE OR MODEL NOISE LEVELS?

There are two recognised methods which are commonly adopted to determine the noise at particular location from a proposed activity. The first is to undertake noise measurements whilst the activity is in progress and measure the noise, the second is to calculate the noise based on known noise emission data for the activity in question.

The second option is preferred as the first option is largely impractical in terms of cost and time constraints, notwithstanding the meteorological factors that may also influence its quantification. Furthermore, it is also generally considered unacceptable to create an environmental impact simply to measure it. In addition, the most effective mitigation measures are determined and implemented during the design phase and often cannot be readily applied during or after the implementation phase of a project.

Because a number of factors can affect how 'loud' a noise is at a certain location, the calculations can be very complex. The influence of other ambient sources and the contribution from a particular source in question can be difficult to ascertain. To avoid these issues, and to quantify the direct noise contribution from a source/site in question, the noise level is often calculated using noise modelling software packages. The noise emission data used in each noise model of this assessment has been obtained from ERM's database of measured noise emissions.

Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dB(A). The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Time varying noise sources are often described in terms of statistical noise descriptors. The following descriptors are commonly used when assessing noise and are referred to throughout this acoustic assessment:

- **Decibel (dB is the adopted abbreviation for the decibel)** - The unit used to describe sound levels and noise exposure. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure;
- **dB(A)** - unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear;
- **dB(C)** - unit used to measure 'A-weighted' sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans;
- **dB(Z) or dB(L)** - unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear;
- **Hertz (Hz)** - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz;
- **Octave** - a division of the frequency range into bands, the upper frequency limit;
- **1/3 Octave** - single octave bands divided into three parts;
- **Leq** - this level represents the equivalent or average noise energy during a measurement period. The $Leq, 15min$ noise descriptor simply refers to the Leq noise level calculated over a 15 minute period. Indeed, any of the below noise descriptors may be defined in this way, with an accompanying time period (e.g. $L_{10, 15\text{ minute}}$) as required;
- **Lmax** - the absolute maximum noise level in a noise sample;
- **LN** - the percentile sound pressure level exceeded for N% of the measurement period calculated by statistical analysis;
- **L10** - the noise level exceeded for 90 per cent of the time and is approximately the average of the maximum noise levels;

- **L90** - the noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L90 level is often referred to as the “background” noise level and is commonly used as a basis for determining noise criteria for assessment purposes;
- **Sound Power Level (L_W)** - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment;
- **Sound Pressure Level (L_P)** - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from L_W in that this is the received sound as opposed to the sound ‘intensity’ at the source;
- **Air-blast Overpressure** - a transient air pressure, such as the shock wave from an explosion that is greater than the surrounding atmospheric pressure;
- **Background noise** - the underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor;
- **Ambient noise** - the all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far;
- **Cognitive noise** - noise in which the source is recognised as being annoying; and
- **Masking** - the phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.

A.6

TERMS TO DESCRIBE THE PERCEPTION OF NOISE

The following concepts offer qualitative guidance in respect of the average response to changes in noise levels:

- Differences in noise levels of less than approximately 2 dB(A) are generally imperceptible in practice;
- Differences in noise levels of around 5 dB(A) are considered to be significant; and
- Differences in noise levels of around 10 dB(A) are generally perceived to be a doubling (or halving) of the perceived loudness of the noise.

The following terms offer quantitative and qualitative guidance in respect of the audibility of a noise source:

- **Inaudible / Not Audible** - the noise source and/or event could not be heard by the operator, masked by extraneous noise sources not associated with the source. If a noise source is 'inaudible' its noise level may be quantified as being less than the measured LA90 background noise level, potentially by 10 dB or greater;
- **Barely Audible** - the noise source and/or event are difficult to define by the operator, typically masked by extraneous noise sources not associated with the source. If a source is 'barely audible' its noise level may be quantified as being 5 - 7 dB below the measured LA90 or LAeq noise level, depending on the nature of the source e.g. constant or intermittent;
- **Just Audible** - the noise source and/or event may be defined by the operator. However there are a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator;
- **Audible** - the noise source and/or event may be easily defined by the operator. There may be a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator; and
- **Dominant** - the noise source and/or event are noted by the operator to be significantly 'louder' than all other noise sources. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

The following terms offer qualitative guidance in respect of acoustic terms used to describe the frequency of occurrence of a noise source during an operator attended environmental noise measurements:

- **Constant** - this indicates that the operator has noted the noise source(s) and/or event to be constantly audible for the duration of the noise measurement e.g. an air-conditioner that runs constantly during the measurement;
- **Intermittent** - this indicates that the operator has noted the noise source(s) and/or event to be audible, stopping and starting intervals for the duration of the noise measurement e.g. car pass-by's; and
- **Infrequent** - this indicates that the operator has noted the noise source(s) and/or event to be constantly audible, however; not occurring regularly or at intervals for the duration of the noise measurement e.g. a small number of aircraft are noted during the measurement.

A.6.1

Industrial Noise Policy (INP Terminology)

- **Assessment Background Level (ABL)** - is defined in the INP as a single figure background level representing each assessment period (day, evening and night). Its determination is by the tenth percentile method (of the measured LA90 statistical noise levels) described in *Appendix B* on the INP; and
- **Rating Background Level (RBL)** - is defined in the INP as the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24hr period used for the ABL). This is the level used for assessment purposes. It is defined as the median value of:
 - All the day assessment background levels over the monitoring period for the day;
 - All the evening assessment background levels over the monitoring period for the evening; or
 - All the night assessment background levels over the monitoring period for the night.
- **Extraneous noise** - noise resulting from activities that are not typical of the area. Atypical INP activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous;
- **Most affected location(s)** - locations that experience (or will experience) the greatest noise impact from the noise source under consideration. In determining these locations, one needs to consider existing background levels, exact noise source location(s), distance from source (or proposed source) to receiver, and any shielding between source and receiver;
- **Noise criteria** - the general set of non-mandatory noise level targets for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (for example, noise levels for various land uses);
- **Noise limits** - enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action;
- **Project Specific Noise Levels** - target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility;

- **Compliance** – the process of checking that source noise levels meet with the noise limits in a statutory context;
- **Non-compliance** – development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit by more than 2 dB;
- **Feasible and Reasonable measures** – feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors:
 - Noise mitigation benefits (amount of noise reduction provided, number of people protected);
 - Cost of mitigation (cost of mitigation versus benefit provided);
 - Community views (aesthetic impacts and community wishes); and
 - Noise levels for affected land uses (existing and future levels, and changes in noise levels).
- **Meteorological Conditions** – wind and temperature inversion conditions;
- **Temperature Inversion** – an atmospheric condition in which temperature increases with height above the ground; and
- **Adverse Weather** – weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).

A.7

OPERATOR ATTENDED NOISE MEASUREMENTS

Noise level deductions that may be applied based on the percentage contribution of a noise source(s) are presented in *Table A.1* below.

Table A.1 Noise Level Deductions – Noted Percentile Contribution

Percentage Contribution	Noise Level Deduction, dB(A)
5%	-13.0
10%	-10.0
15%	-8.2
20%	-7.0
25%	-6.0
30%	-5.2
35%	-4.6
40%	-4.0
45%	-3.5
50%	-3.0
55%	-2.6
60%	-2.2
65%	-1.9
70%	-1.5
75%	-1.2
80%	-1.0
85%	-0.7
90%	-0.5
95%	-0.2
100%	0.0

1. **EXAMPLE:** the measured LAeq, 15 minute noise level is 49 dB and the site contribution was observed to be 10% of this level (extraneous noise sources were noted to dominate the measurement), therefore the LAeq, 15 minute noise level deduction is 10 dB, with a resultant noise level contribution of approximately 39 dB.

Noise level deductions that may be applied based on the percentage of time that a noise source(s) is audible during a 15 minute measurement are presented in *Table A.2* below.

Table A.2 Noise Level Deductions – Noted Time Contribution

Event Duration (minutes)	Noise Level Deduction, dB(A)
1	-11.8
2	-8.8
3	-7.0
4	-5.7
5	-4.8
6	-4.0
7	-3.3
8	-2.7
9	-2.2
10	-1.8
11	-1.3
12	-1.0
13	-0.6
14	-0.3
15	0.0

1. **EXAMPLE:** the measured LAeq, 15 minute noise level contribution of an excavator was noted to be 56 dB, however it was only audible for 6 minutes during the 15 minute measurement period, therefore the LAeq, 15 minute noise level deduction is 4 dB, with a resultant noise level contribution of approximately 52 dB.

Annex B

Unattended Noise Monitoring Charts

Boral Resources (NSW) Pty Ltd

Peppertree Quarry

Noise Compliance Monitoring Report

Monitoring Period: April 2013

Reporting Date: May 2013

Reference: 0146289RP10

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EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd has completed noise compliance monitoring for the current site establishment and construction works at Peppertree Quarry, located at Marulan South in the Southern Tablelands of New South Wales.

Monitoring was undertaken on behalf of Boral Resources (NSW) Pty Ltd, with due regard to, and in accordance with, local and international standards, guidelines and documents presented in this report. This round of quarterly noise compliance monitoring was completed during May 2013. Boral requested monitoring to occur during the April 2013 period (to coincide with the quarterly monitoring program) however due to intermittent adverse weather conditions (rain and winds >5m/s) during the month, the monitoring event was postponed until calm weather conditions were forecast, thus the monitoring works were completed in early May.

Site noise emissions associated with construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria for construction works contained in Boral's November 2012 approval, and cumulative noise criteria, at all receiver locations. Based on these findings ERM has made in-principle acoustic recommendations; each designed to assist Boral in reducing noise emissions from construction activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry, where required. These are presented below:

- continue to ensure that all significant noise generating plant and equipment are tested to satisfy the design level limits presented in the Peppertree Quarry Construction Noise Management Plan and that appropriate mitigation is applied where feasible and reasonable;*
- avoid concentrations of equipment in sensitive work areas e.g. on top of the dump or bund;*
- avoid bunching of trucks along internal haulage roads;*
- continue to monitor local meteorological conditions to manage the placement of equipment so that it is suitable for best outcome for those conditions; and*
- undertake noise compliance monitoring at affected receiver(s) or at nominated (alternate) representative locations in accordance with Section 2 of the (06_0074) November 2012 Project Approval, where applicable.*

ERM makes no additional recommendations and notes that Boral continues to manage noise generated by construction plant within the site and continues to operate within the construction noise criteria specified in the November 2012 Project Approval.

INTRODUCTION

This document has been prepared by Environmental Resources Management Australia Pty Ltd (ERM) on behalf of Boral Resources (NSW) Pty Ltd (Boral). It presents the methodology, findings and recommendations of noise compliance monitoring conducted at the Peppertree Quarry (the quarry), located at Marulan South in the Southern Tablelands of New South Wales (NSW) during May 2013.

Boral requested monitoring to occur during the April 2013 period (to coincide with the quarterly monitoring program) however due to intermittent adverse weather conditions (rain and winds >5m/s) during the month, the monitoring event was postponed until calm weather conditions were forecast, thus the monitoring works were completed in early May.

1.1

RELEVANT DOCUMENTS, STANDARDS AND GUIDELINES

This report has been prepared with due regard to and in accordance with the following documents, standards and guidelines:

- Marulan South Consolidated Project Approval (06_0074) November 2012;
- the *Peppertree Quarry Construction Noise Management Plan (CNMP)*, the *Peppertree Quarry Noise and Blast Monitoring Plan (NBMP)* and the *Peppertree Quarry Environmental Monitoring Program (EMP)*;
- NSW Environment Protection Authority - *NSW Environmental Noise Management - Industrial Noise Policy (INP)*, January 2000 and relevant application notes;
- NSW Department of Environment and Climate Change - *NSW Interim Construction Noise Guideline (ICNG)*, July 2009;
- Standards Australia AS1055-1997™ (AS1055) - *Description and Measurement of Environmental Noise*, Parts 1, 2 and 3;
- Standards Australia AS IEC 61672.1-2004™ (AS61672) - *Electro Acoustics - Sound Level Meters Specifications Monitoring*; and
- Standards Australia AS 2436-2010™ (AS2436) - *Guide To Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

A glossary of relevant acoustic concepts and terminology is presented as *Annex A*.

1.2

BACKGROUND

Boral Resources (NSW) Pty Ltd (Boral) was granted project approval (06_0074) to establish and operate the Peppertree Quarry (a granodiorite hard rock quarry, formerly called the Marulan South Quarry) including all in-pit quarrying activities and supporting infrastructure such as a rail siding and loading facility, processing plant and water supply dams, under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) in February 2007.

Under Section 75W of the *Environment Planning and Assessment Act 1979*, Boral applied for a modification of the Peppertree Quarry Development in regards to rail line construction and operations. Boral received a 'Notice of Modification' for the Peppertree Quarry Project Approval (06_0074), dated Thursday, 3 November 2011. This notice approved the revised Project consolidating relevant aspects of March 2009 and November 2011 modifications. A further modification was applied for in September 2012 for the installation and operation of a High Voltage Power line to the Peppertree Quarry site and an extension of the existing Medway rail siding. This modification application was approved Friday, 2 November 2012.

1.2.1

Noise and Vibration Management

ERM was engaged to prepare the NBMP and CNMP for the quarry in accordance with the Project Approval and subsequent modifications; incorporating key components of the noise and blast monitoring programs for the quarry. Both NBMP and CNMP monitoring programs have been established and incorporated into the overall Environmental Monitoring Program (EMP), which consolidates the specific requirements of the abovementioned monitoring programs as well as other monitoring required by specific Project Approval conditions. The EMP provides an overall framework to assist with the implementation of monitoring for the project.

The purpose of the NBMP and CNMP is to fulfil the requirement of Schedule 3 of the Project Approval and the Statement of Commitments contained within the Part 3A Environmental Assessment. The NBMP, amongst other things, provides procedures for monitoring and assessing noise impacts from the quarry and methods to determine compliance with the operational noise impact assessment criteria. The CNMP, in addition to other things, provides: methods for managing construction noise; procedures for monitoring and assessing noise from construction; and methods to determine compliance with limits for residential receivers.

Construction and site establishment activities associated with the quarry are currently in progress and include week day (7am to 6pm) and Saturday (7am to 1pm) works only. ERM has been engaged to conduct quarterly noise compliance monitoring on behalf of Boral in accordance with the CNMP, NBMP and Project Approval conditions for the quarry.

Guidance Note

Under Section 75W of the Environment Planning and Assessment Act 1979 Boral received a 'Notice of Modification' for the (06_0074) Peppertree Quarry Project Approval. This notice, received on Thursday, 3 November 2011 also enabled a revised Project Approval to be prepared which consolidated relevant aspects of March 2009 and November 2011 modifications.

During this process and in consultation with the NSW Department of Planning and Infrastructure (DoPI), Boral received advice that construction noise criteria would remain valid through January 2012 and thereafter, the Operational Noise Impact Assessment Criteria (as presented in Schedule 3, Section 4: Table 1 of the November 2011 modification) would apply. The subsequent approval in November 2012 does not alter the application of the operational noise criteria as outlined above; complying with DoPI advice the construction noise criteria are no longer valid for assessing quarry noise emissions.

This report presents the noise compliance assessment prepared with due regard to the November 2012 operational noise criteria, which now apply for the quarry site, as the Project Approval required that construction noise criteria were complied with for the first three months of construction (valid to January 2012) and that thereafter, site construction noise emissions must meet the Operational Noise Impact Assessment Criteria. However, following land acquisition or negotiated agreements, three assessment locations (refer *Table 2.1*) are now part of the overall Boral land ownership. Conservatively, the November 2011 criteria have been applied to assess noise at these locations in this report.

1.3 *SITE UNDERSTANDING*

The Peppertree Quarry is located in the Southern Tablelands of NSW, approximately 10 kilometres (km) southeast of Marulan and 175 km southwest of Sydney.

The site, the project-specific noise sensitive localities (including the unique identification number used to describe each location) and other items of acoustic importance relative to this assessment are visually presented in *Figure 1.1*.

Figure 1.1 *Locality Map*

A4

This section presents an overview of the noise compliance monitoring methodology for continuous unattended and operator attended noise monitoring undertaken in accordance with the NBMP and CNMP.

2.1 RECEIVER LOCATIONS

Monitoring locations representative of the surrounding receivers identified in the NBMP, CNMP and Project Approval for operations are to be used for evaluating and assessing noise emissions from construction and site establishment activities, as presented in *Table 2.1* and visually presented on *Figure 1.1*.

Table 2.1 *Nearest Potentially Affected Receiver Locations*

Receiver ID	Description	MGA (Zone 56) Coordinates		Direction and Distance from Quarry Centre	
		Easting	Northing	Compass point	Distance, m
1 ¹	Montgomery	230481	6150110	E	2730
2	Ordasi	226934	6148560	SSW	1730
3 ¹	Brown	226623	6149210	SW	1410
4 ¹	Armitt	226271	6150950	WNW	1480
5	Cooper	226592	6152540	NW	2520
6	Bartolo	226244	6153120	NW	3230
16	Pace	226094	6149665	WSW	1050

1. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership

Guidance Note

At Receiver 16 (Pace), an alternate location (closer to the site) was selected in consultation with the resident. At Receiver 6 (Bartolo), an alternate location was selected at a publically accessible location. At these alternate locations, site noise levels have been previously identified (where audible) to be broadly similar to those at the designated assessment location. These alternate locations are shown on *Figure 1.1* of *Section 1*.

Compliance has been determined based on the measured site noise levels at these selected alternate locations rather than applying an extrapolated value. ERM considers this to be a robust method by which compliance may be determined at these locations, as the alternate locations are at same relative distance from quarry, or closer to the site. Given the overall distance from quarry, the difference between the receiver location and the adopted locations is insignificant.

2.2

ASSESSMENT CRITERIA

This section summarises the Operational Noise Impact Assessment Criteria (including values required presented in Schedule 3, Condition 4; Table 1 of the November 2012 modification) as presented in the NBMP.

2.3

OPERATIONAL NOISE

The Project Approval required that construction noise criteria were complied with for the first three months of construction (valid to January 2012) and thereafter, site construction noise emissions meet the Operational Noise Impact Assessment Criteria. These are reproduced in *Table 2.2*.

Table 2.2 Operational Noise Impact Assessment Criteria

Receiver ID	Description	Noise Impact Assessment Criteria, dB(A) ^{1,2}		
		Daytime 7:00am to 7:00pm	Evening and Night 7:00pm to 7:00am	
		LAeq, 15min	LAeq, 15min	LA1, 1min
1 ³	Montgomery	35	35	45
2	Ordasi	39	35	45
3 ³	Brown	42	35	46
4 ³	Armitt	37	35	46
5	Cooper	35	35	45
6	Bartolo	35	35	45
16	Pace	41	35	45
	Any other noise sensitive location	35	35	45

1. The identified 'Daytime' noise criteria apply throughout the period of the site's Day Shift (i.e. 7.00am to 7.00pm) on all days, despite the general definitions of 'Evening' and 'Night time' otherwise applying to the approval. The identified 'Evening' and 'Night time' criteria apply only during the period of the site's Night Shift (i.e. 7.00pm to 7.00am);
2. Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW INP; and
3. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership.

2.4

CUMULATIVE NOISE CRITERIA

ERM has also considered Schedule 3, Condition 6 of the Project Approval which states:

The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other extractive industries does not exceed the following amenity criteria on any privately owned land, to the satisfaction of the Director-General:

- *L_{Aeq, 11hr} 50 dB(A) – Day¹;*
- *L_{Aeq, 4hr} 45 dB(A) – Evening; and*
- *L_{Aeq, 9hr} 40 dB(A) – Night.*

Although not mandatory for the current construction and site establishment works, these cumulative guideline values provide a parameter by which daily site noise levels may be assessed with regard to other extractive industries in the area.

2.5

MEASUREMENT METHODOLOGY

ERM visited the quarry on Thursday, 9 May 2013 and Friday, 10 May 2013 to conduct continuous unattended and operator attended noise monitoring. The monitoring methodology was determined with due regard to the relevant documents, standards and guidelines presented in *Section 1.1*.

Operator attended noise measurements were conducted at all locations specified in *Table 2.1*. Supplementary continuous unattended noise monitoring was undertaken at the following four locations:

- Receiver 2 (Ordasi);
- Receiver 5 (Cooper);
- Receiver 6 (Bartolo); and
- Receiver 16 (Pace).

¹ The identified 'Daytime' noise criteria apply throughout the period of the site's Day Shift (i.e. 7.00am to 7.00pm) on all days, despite the general definitions of 'Evening' and 'Night time' otherwise applying to the approval. The identified 'Evening' and 'Night time' criteria apply only during the period of the site's Night Shift (i.e. 7.00pm to 7.00am).

2.5.1 *Measurement Equipment*

All measurements were conducted by trained ERM personnel; with due regard to and in accordance with the relevant local and international standards for environmental noise monitoring.

The measurement instrumentation used to complete the assessment complied with the requirements of AS 61672.1 with current NATA calibration certificates, with certification at intervals not exceeding two years at the time of use. The equipment used for this assessment was as follows:

- 1 x Brüel & Kjær 2250 Investigator Type 1 Sound Analyser;
- 2 x ARL Ngarra (Type 1) Environmental Noise Logger
- 2 x ARL 215 (Type 2) Environmental Noise Loggers; and
- 1 x Brüel & Kjær Type 1 Sound Level Calibrator.

Instrument calibration was checked prior to monitoring and again at the conclusion with no difference noted between the two measurements. All data handling and analysis has been completed by a member of the Australian Acoustical Society, being at the grade of 'Associate Member' or higher.

ASSESSMENT RESULTS

This section presents the results, findings and any recommendations of continuous unattended and operator attended noise monitoring conducted on Thursday, 9 May 2013 and Friday, 10 May 2013

During noise compliance monitoring, the site was noted to be operating under normal conditions representative of typical construction and site establishment activities associated with this stage of the project. All works associated with the quarry were limited to the approved week day construction hours (7am to 6pm) on both days of monitoring.

Site noise level events were based on observed noise events, detailed review of field logs and analysis of audio files using the Brüel & Kjær Evaluator Type 7820 Version 4.16.2 software package. Site noise level contributions ($L_{Aeq, 15 \text{ minute}}$) were determined via calculation to exclude extraneous noise emissions, which would otherwise influence the contributions. Where site noise emissions were inaudible, site noise level contributions were estimated to be approximately 10 dB(A) below the measured background (L_{90}) noise level.

The site noise level contributions have been determined with due regard to Section 4 of the INP which presents modifying factor corrections for tonal, low-frequency or impulsive noise emissions. Because of the significant influence of extraneous noise sources at each receiver, no penalty has been applied for tonal and low-frequency factors. Impulsive and/or intermittent modifying factor corrections were considered but these penalties did not qualify for data captured in this round of monitoring.

3.1 NOTED NOISE SOURCES

3.1.1 Overall Site Sound Power Levels

Prior to noise compliance monitoring, ERM was engaged to conduct plant and equipment noise testing on behalf of Boral in accordance with the CNMP and Project Approval conditions. The objective of this noise testing was to guide Boral during the start of construction, and to ensure that plant and equipment used would meet the specified Sound Power Level (L_W) design noise level limits presented in Table 3.1 in Section 3.2 of the CNMP.

To date a significant number of plant and equipment has been tested and in general, the overall fleet L_W value (cumulative, all plant in use) was calculated to be approximately 128 dB(A) whilst the cumulative L_W of the fleet based on the design level limits (refer CNMP) was calculated to be 130 dB(A). The cumulative L_W values presented here identify that because the calculated dynamic L_W values for the majority of plant are significantly below the design level limits, the cumulative sound power of the fleet is approximately 2 dB(A) lower than anticipated.

This reduction in noise level has been achieved by the use of smaller (and quieter) items of plant e.g. articulated dump trucks and dozers.

3.1.2 *Observed Plant and Equipment*

Compared to previous monitoring events, works were relatively limited during the May 2013 monitoring event, with no significant high noise level generating plant, equipment or activities in use or being undertaken on site, although ERM understand that this is consistent with the current level of day to day activity at the site.

Site related noise generating activities were typically associated with the use of motion alarms, heavy vehicles, construction machinery (e.g. excavators) or limited metal on metal contact. These were the only items of plant, equipment and activities being used or undertaken that was audible at the receiver locations.

3.2 OPERATOR ATTENDED MEASUREMENTS

Measured overall ambient and background noise levels are presented in *Table 3.1* and *Table 3.2*, including all relevant statistical and acoustic parameters i.e. L_{Max}, L_{Min}, L_{Aeq}, L_{A1}, L_{A10} and L_{A90}.

Table 3.1 Overall Measured Noise Levels – 9 May 2013

Receiver ID	Description	Start Time	Measured Noise Levels ^{1,2,3}					
			L _{Max}	L _{Min}	L _{eq}	L ₁	L ₁₀	L ₉₀
1	Montgomery	14:31	63	25	39	52	38	26
2	Ordasi	10:38	54	30	40	49	43	33
3	Brown	15:38	53	36	41	45	42	39
4	Armitt	15:13	69	32	40	50	39	34
5	Cooper	12:54	54	37	41	48	43	40
6	Bartolo	12:22	56	37	45	51	47	41
16	Pace	11:27	55	34	39	47	41	37

1. dB(A) re 2 x 10⁻⁵ Pa;
2. all measurements were of 15 minutes duration; and
3. meteorological conditions varied with temperatures ranging between 17 and 25 ° Celsius, maximum wind speeds of up to 1.7m/s, average wind speeds of between 0.5 and 1 m/s (typically from a western direction) and with cloud coverage 0/8 octas.

Table 3.2 Overall Measured Noise Levels – 10 May 2013

Receiver ID	Description	Start Time	Measured Noise Levels ^{1,2,3}					
			LMax	LMin	Leq	L1	L10	L90
1	Montgomery	11:38	56	33	41	51	44	35
2	Ordasi	13:56	57	33	41	52	43	36
3	Brown	10:30	56	33	40	50	41	35
4	Armitt	10:58	57	28	35	44	35	31
5	Cooper	12:49	71	31	44	51	40	34
6	Bartolo	12:12	55	32	36	44	38	33
16	Pace	13:25	61	36	42	51	43	38

1. dB(A) re 2 x 10⁻⁵ Pa;
2. all measurements were of 15 minutes duration; and
3. meteorological conditions varied with temperatures ranging between 12 and 23 ° Celsius, maximum wind speeds of up to 2.1m/s, average wind speeds of between 0.5 and 2 m/s (which varied from eastern and western directions) and with cloud coverage of 0/8 octas.

Table 3.1 and Table 3.2 provide overall noise levels measured on Thursday, 9 May 2013 and Friday, 10 May 2013. At the majority of these locations, construction and site establishment activities were inaudible or just audible and did not dominate the acoustic environment, but were masked by extraneous noise emissions not associated with the site.

Observed extraneous noise sources (not associated with the site) included emissions associated with near-by fauna, rail movements, wind-blown vegetation, aircraft noise and on occasion, other industrial premises.

3.2.1 Compliance Assessment

ERM has completed the noise compliance assessment comparing resultant site noise level contributions (L_{Aeq, 15 minute}) to the Operational Noise Impact Assessment criteria, as presented in Table 3.3 and Table 3.4.

Table 3.3 Compliance Assessment – 9 May 2013

ID	Description	Operational Noise Impact Assessment Criteria ¹	Site Noise Level Contribution Leq, 15 minute ^{1, 2}	Comply with Criteria
1 ³	Montgomery	35	<30	Yes
2	Ordasi	39	<30	Yes
3 ³	Brown	42	40	Yes
4 ³	Armitt	37	31	Yes
5	Cooper	35	30	Yes
6	Bartolo	35	31	Yes
16	Pace	41	<30	Yes

1. dB(A) re 2 x 10⁻⁵ Pa;
2. ERM considered INP modifying factor corrections for tonal, low-frequency or impulsive noise where necessary; and
3. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership.

Table 3.4 Compliance Assessment – 10 May 2013

ID	Description	Operational Noise Impact Assessment Criteria ¹	Site Noise Level Contribution Leq, 15 minute ^{1, 2}	Comply with Criteria
1 ³	Montgomery	35	30	Yes
2	Ordasi	39	<30	Yes
3 ³	Brown	42	31	Yes
4 ³	Armitt	37	<30	Yes
5	Cooper	35	<30	Yes
6	Bartolo	35	<30	Yes
16	Pace	41	30	Yes

1. dB re 2 x 10⁻⁵ Pa;
2. ERM considered INP modifying factor corrections for tonal, low-frequency or impulsive noise where necessary; and
3. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership.

The results presented in *Table 3.3* and *Table 3.4* identify that current construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria contained in Boral's November 2012 approval, at all receiver locations.

Overall ambient (L_{Aeq}) noise levels measured during the daytime (7am to 6pm) assessment period, and the estimated site noise level contribution determined from unattended noise monitoring are presented below². Unattended noise monitoring charts are presented in *Annex B*.

- **Receiver 2 (Ordasi)** – 44 dB(A) $L_{Aeq, 11hr}$ with an estimated site noise level contribution of <30 dB $L_{Aeq, 11hr}$;
- **Receiver 5 (Cooper)** – 42 dB $L_{Aeq, 11hr}$ with an estimated site noise level contribution of <30 dB $L_{Aeq, 11hr}$;
- **Receiver 6 (Bartolo)** – 43 dB $L_{Aeq, 11hr}$ with an estimated site noise level contribution of ≤ 30 dB $L_{Aeq, 11hr}$; and
- **Receiver 16 (Pace)** – 47 dB $L_{Aeq, 11hr}$ with an estimated site noise level contribution of ≤ 32 dB $L_{Aeq, 11hr}$.

Unattended site noise level contributions ($L_{Aeq, 11 Hour}$) were estimated based on observed noise events noted during noise logger deployment, review of attended measurement results (including audio data analysis) and review of field logs. Site noise level contributions ($L_{Aeq, 11 Hour}$) were estimated via calculation to exclude extraneous noise emissions, which were of influence during the unattended monitoring period.

At each of these locations, construction and site establishment noise was typically inaudible (or just audible) and did not dominate the acoustic environment of the area. Site noise level contributions are below the daytime cumulative criteria (50 dB(A)) applicable to unattended noise monitoring analysis. Other extractive industries were not always clearly audible at these locations, and as such overall noise (i.e. other extractive industries plus the quarry) is considered unlikely to increase above the daytime amenity criteria.

Extraneous noise sources (not associated with the site) noted during noise logger deployment were similar to those of operator attended noise measurements and included emissions associated with near-by fauna, rail movements, wind-blown vegetation, aircraft noise and on occasion, other industrial premises.

² Where insufficient data was available to determine average ambient noise level in accordance with the INP, the logarithmic average of available samples was calculated; ERM considers this to be a robust and comprehensive method by which overall noise levels may be determined in accordance with the NBMP assessment methodology.

3.3.1

Recommendations

Based on the results of May 2013 monitoring event, ERM makes the following in-principle acoustic recommendations to assist Boral in managing noise emissions from construction activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry in complying with the operational noise criteria, in accordance with the November 2012 Project Approval;

- continue to ensure that all significant noise generating plant and equipment are tested to satisfy the design level limits presented in the CNMP and that mitigation is applied where feasible and reasonable;
- avoid concentrations of equipment in sensitive work areas e.g. on top of the dump or bund;
- avoid bunching of trucks along internal haul roads;
- continue monitoring of local meteorological conditions to manage the placement of equipment so that it is suitable for best outcome for those conditions; and
- continue noise compliance monitoring at affected receiver(s) or at nominated (alternate) representative locations in accordance with the November 2012 Project Approval.

ERM makes no additional recommendations but notes that Boral continues to manage noise generated by construction plant within the site and continues to operate within the operational noise criteria specified in the November 2012 Project Approval.

CONCLUSION

ERM, on behalf of Boral Resources (NSW) Pty Ltd, has completed noise compliance monitoring for the current works at Peppertree Quarry. The assessment was undertaken with due regard to and in accordance with local and international standards, guidelines and documents presented in this report.

Site noise emissions associated with construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria for construction works contained in Boral's November 2012 approval, and the cumulative noise criteria, at all receiver locations.

Based on these findings ERM has made in-principle acoustic recommendations; designed to assist Boral in reducing noise emissions from construction activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry, where required. ERM makes no additional recommendations and notes that Boral continues to manage noise generated by plant and equipment within the site and continues to operate within the operational noise criteria specified in the November 2012 Project Approval.

REFERENCES

Marulan South Consolidated Project Approval (06_0074) November 2012

Peppertree Quarry Noise and Blast Monitoring Plan, dated August 2012

Peppertree Quarry Construction Noise Management Plan, dated August 2012

Peppertree Quarry Environmental Monitoring Program, dated August 2012

NSW Environment Protection Authority - **NSW Environmental Noise Management - Industrial Noise Policy (INP)**, January 2000 and relevant application notes

NSW Department of Environment and Climate Change - **NSW Interim Construction Noise Guideline (ICNG)**, July 2009

Standards Australia AS1055-1997™ (AS1055) - **Description and Measurement of Environmental Noise**, Parts 1, 2 and 3

Standards Australia AS IEC 61672.1-2004™ (AS61672) - **Electro Acoustics - Sound Level Meters Specifications Monitoring**

Standards Australia AS 2436-2010™ (AS2436) - **Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites**

Annex A

Acoustic Glossary

A.1 WHAT IS NOISE AND VIBRATION?

A.1.1 Noise

Noise is often defined as a sound, especially one that is loud or unpleasant or that causes disturbance* or simply as unwanted sound, but technically, noise is the perception of a series of compressions and rarefactions above and below normal atmospheric pressure.

A.1.2 Vibration

Vibration refers to the oscillating movement of any object. In a sense noise is the movement of air particles and is essentially vibration, though in regards to an environmental assessment vibration is typically taken to refer to the oscillation of a solid object(s). The impact of noise on objects can lead to vibration of the object, or vibration can be experienced by direct transmission through the ground, this is known as ground-borne vibration.

Essentially, noise can be described as what a person hears, and vibration as what they feel.

A.2 HOW TO MEASURE AND DESCRIBE NOISE?

Noise is measured using a specially designed 'sound level' meter which must meet internationally recognised performance standards. Audible sound pressure levels vary across a range of 10^7 Pascals (Pa), from the threshold of hearing at $20\mu\text{Pa}$ to the threshold of pain at 200Pa . Scientists have defined a statistically described logarithmic scale called Decibels (dB) to more manageably describe noise.

To demonstrate how this scale works, the following points give an indication of how the noise levels and differences are perceived by an average person:

- 0 dB - represents the threshold of human hearing (for a young person with ears in good condition);
- 50 dB - represents average conversation;
- 70 dB - represents average street noise, local traffic etc;
- 90 dB - represents the noise inside an industrial premises or factory;
- 140 dB - represents the threshold of pain - the point at which permanent hearing damage may occur.

A.3

WHAT FACTORS CONTRIBUTE TO ENVIRONMENTAL NOISE?

The noise from an activity, like construction works, at any location can be affected by a number of factors, the most significant being:

- how loud the activity is;
- how far away the activity is from the receiver;
- what type of ground is between the activity and the receiver location e.g. concrete, grass, water or sand;
- how the ground topography varies between the activity and the receiver (is it flat, hilly, mountainous) as blocking the line of sight to a noise source will generally reduce the level of noise; and
- any other obstacles that block the line of sight between the source to receiver e.g. buildings or purpose built noise walls.

A.4

HOW TO CALCULATE OR MODEL NOISE LEVELS?

There are two recognised methods which are commonly adopted to determine the noise at particular location from a proposed activity. The first is to undertake noise measurements whilst the activity is in progress and measure the noise, the second is to calculate the noise based on known noise emission data for the activity in question.

The second option is preferred as the first option is largely impractical in terms of cost and time constraints, notwithstanding the meteorological factors that may also influence its quantification. Furthermore, it is also generally considered unacceptable to create an environmental impact simply to measure it. In addition, the most effective mitigation measures are determined and implemented during the design phase and often cannot be readily applied during or after the implementation phase of a project.

Because a number of factors can affect how 'loud' a noise is at a certain location, the calculations can be very complex. The influence of other ambient sources and the contribution from a particular source in question can be difficult to ascertain. To avoid these issues, and to quantify the direct noise contribution from a source/site in question, the noise level is often calculated using noise modelling software packages. The noise emission data used in each noise model of this assessment has been obtained from ERM's database of measured noise emissions.

Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dB(A). The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Time varying noise sources are often described in terms of statistical noise descriptors. The following descriptors are commonly used when assessing noise and are referred to throughout this acoustic assessment:

- **Decibel (dB is the adopted abbreviation for the decibel)** - The unit used to describe sound levels and noise exposure. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure;
- **dB(A)** - unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear;
- **dB(C)** - unit used to measure 'A-weighted' sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans;
- **dB(Z) or dB(L)** - unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear;
- **Hertz (Hz)** - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz;
- **Octave** - a division of the frequency range into bands, the upper frequency limit;
- **1/3 Octave** - single octave bands divided into three parts;
- **Leq** - this level represents the equivalent or average noise energy during a measurement period. The $Leq, 15min$ noise descriptor simply refers to the Leq noise level calculated over a 15 minute period. Indeed, any of the below noise descriptors may be defined in this way, with an accompanying time period (e.g. $L10, 15\text{ minute}$) as required;
- **Lmax** - the absolute maximum noise level in a noise sample;
- **LN** - the percentile sound pressure level exceeded for N% of the measurement period calculated by statistical analysis;
- **L10** - the noise level exceeded for 90 per cent of the time and is approximately the average of the maximum noise levels;

- **L90** - the noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L90 level is often referred to as the “background” noise level and is commonly used as a basis for determining noise criteria for assessment purposes;
- **Sound Power Level (L_W)** - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment;
- **Sound Pressure Level (L_P)** - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from L_W in that this is the received sound as opposed to the sound ‘intensity’ at the source;
- **Air-blast Overpressure** - a transient air pressure, such as the shock wave from an explosion that is greater than the surrounding atmospheric pressure;
- **Background noise** - the underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor;
- **Ambient noise** - the all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far;
- **Cognitive noise** - noise in which the source is recognised as being annoying; and
- **Masking** - the phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.

A.6

TERMS TO DESCRIBE THE PERCEPTION OF NOISE

The following concepts offer qualitative guidance in respect of the average response to changes in noise levels:

- differences in noise levels of less than approximately 2 dB(A) are generally imperceptible in practice;
- differences in noise levels of around 5 dB(A) are considered to be significant; and
- differences in noise levels of around 10 dB(A) are generally perceived to be a doubling (or halving) of the perceived loudness of the noise.

The following terms offer quantitative and qualitative guidance in respect of the audibility of a noise source:

- **Inaudible / Not Audible** - the noise source and/or event could not be heard by the operator, masked by extraneous noise sources not associated with the source. If a noise source is 'inaudible' its noise level may be quantified as being less than the measured LA90 background noise level, potentially by 10 dB or greater;
- **Barely Audible** - the noise source and/or event are difficult to define by the operator, typically masked by extraneous noise sources not associated with the source. If a source is 'barely audible' its noise level may be quantified as being 5 - 7 dB below the measured LA90 or LAeq noise level, depending on the nature of the source e.g. constant or intermittent;
- **Just Audible** - the noise source and/or event may be defined by the operator. However there are a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator;
- **Audible** - the noise source and/or event may be easily defined by the operator. There may be a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator; and
- **Dominant** - the noise source and/or event are noted by the operator to be significantly 'louder' than all other noise sources. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

The following terms offer qualitative guidance in respect of acoustic terms used to describe the frequency of occurrence of a noise source during an operator attended environmental noise measurements:

- **Constant** - this indicates that the operator has noted the noise source(s) and/or event to be constantly audible for the duration of the noise measurement e.g. an air-conditioner that runs constantly during the measurement;
- **Intermittent** - this indicates that the operator has noted the noise source(s) and/or event to be audible, stopping and starting intervals for the duration of the noise measurement e.g. car pass-by's; and
- **Infrequent** - this indicates that the operator has noted the noise source(s) and/or event to be constantly audible, however; not occurring regularly or at intervals for the duration of the noise measurement e.g. a small number of aircraft are noted during the measurement.

- **Assessment Background Level (ABL)** - is defined in the INP as a single figure background level representing each assessment period (day, evening and night). Its determination is by the tenth percentile method (of the measured LA90 statistical noise levels) described in *Appendix B* on the INP; and
- **Rating Background Level (RBL)** - is defined in the INP as the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24hr period used for the ABL). This is the level used for assessment purposes. It is defined as the median value of:
 - All the day assessment background levels over the monitoring period for the day;
 - All the evening assessment background levels over the monitoring period for the evening; or
 - All the night assessment background levels over the monitoring period for the night.
- **Extraneous noise** - noise resulting from activities that are not typical of the area. Atypical INP activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous;
- **Most affected location(s)** - locations that experience (or will experience) the greatest noise impact from the noise source under consideration. In determining these locations, one needs to consider existing background levels, exact noise source location(s), distance from source (or proposed source) to receiver, and any shielding between source and receiver;
- **Noise criteria** - the general set of non-mandatory noise level targets for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (for example, noise levels for various land uses);
- **Noise limits** - enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action;
- **Project Specific Noise Levels** - target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility;

- **Compliance** – the process of checking that source noise levels meet with the noise limits in a statutory context;
- **Non-compliance** – development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit by more than 2 dB;
- **Feasible and Reasonable measures** – feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors:
 - noise mitigation benefits (amount of noise reduction provided, number of people protected);
 - cost of mitigation (cost of mitigation versus benefit provided);
 - community views (aesthetic impacts and community wishes); and
 - noise levels for affected land uses (existing and future levels, and changes in noise levels).
- **Meteorological Conditions** – wind and temperature inversion conditions;
- **Temperature Inversion** – an atmospheric condition in which temperature increases with height above the ground; and
- **Adverse Weather** – weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).

A.7

OPERATOR ATTENDED NOISE MEASUREMENTS

Noise level deductions that may be applied based on the percentage contribution of a noise source(s) are presented in *Table A.1* below.

Table A.1 Noise Level Deductions – Noted Percentile Contribution

Percentage Contribution	Noise Level Deduction, dB(A)
5%	-13.0
10%	-10.0
15%	-8.2
20%	-7.0
25%	-6.0
30%	-5.2
35%	-4.6
40%	-4.0
45%	-3.5
50%	-3.0
55%	-2.6
60%	-2.2
65%	-1.9
70%	-1.5
75%	-1.2
80%	-1.0
85%	-0.7
90%	-0.5
95%	-0.2
100%	0.0

1. **EXAMPLE:** the measured LAeq, 15 minute noise level is 49 dB and the site contribution was observed to be 10% of this level (extraneous noise sources were noted to dominate the measurement), therefore the LAeq, 15 minute noise level deduction is 10 dB, with a resultant noise level contribution of approximately 39 dB.

Noise level deductions that may be applied based on the percentage of time that a noise source(s) is audible during a 15 minute measurement are presented in *Table A.2* below.

Table A.2 **Noise Level Deductions – Noted Time Contribution**

Event Duration (minutes)	Noise Level Deduction, dB(A)
1	-11.8
2	-8.8
3	-7.0
4	-5.7
5	-4.8
6	-4.0
7	-3.3
8	-2.7
9	-2.2
10	-1.8
11	-1.3
12	-1.0
13	-0.6
14	-0.3
15	0.0

1. **EXAMPLE:** the measured LAeq, 15 minute noise level contribution of an excavator was noted to be 56 dB, however it was only audible for 6 minutes during the 15 minute measurement period, therefore the LAeq, 15 minute noise level deduction is 4 dB, with a resultant noise level contribution of approximately 52 dB.

Annex B

Unattended Noise Monitoring Charts

Boral Resources (NSW) Pty Ltd

Peppertree Quarry

Noise Compliance Monitoring

Monitoring Period: October 2013

Reporting Period: July 2016

Reference: 0210419RP03

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EXECUTIVE SUMMARY

General Overview

Environmental Resources Management Australia Pty Ltd has completed noise compliance monitoring for the current construction and site establishment works at Peppertree Quarry, located at Marulan South in the Southern Tablelands of New South Wales.

Monitoring was undertaken on behalf of Boral Resources (NSW) Pty Ltd, with due regard to, and in accordance with, local and international standards, guidelines and documents presented in this report.

Assessment Findings

Site noise emissions associated with construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria contained in Boral's November 2012 approval, and cumulative noise criteria, at all receiver locations. To help maintain this record of compliance ERM has made in-principle acoustic recommendations; each designed to assist Boral in reducing noise emissions from construction and site establishment activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry, where required. These are presented below:

- continue to ensure that all significant noise generating plant and equipment are tested to satisfy the design level limits presented in the Peppertree Quarry Construction Noise Management Plan and that appropriate mitigation is applied where feasible and reasonable;*
- avoid concentrations of equipment in sensitive work areas e.g. on top of the dump or bund;*
- avoid bunching of trucks along internal haulage roads;*
- continue to monitor local meteorological conditions to manage the placement of equipment so that it is suitable for best outcome for those conditions; and*
- continue noise compliance monitoring at affected receiver(s) in accordance with Section 2 of the (06_0074) the November 2012 Project Approval, or at nominated (alternate) representative locations, justified as per the requirements of the NSW Environment Protection Authority – NSW Environmental Noise Management – Industrial Noise Policy (INP), January 2000.*

ERM makes no additional recommendations and notes that Boral continues to manage noise generated by plant and equipment within the site and continues to operate within the operational noise criteria specified in the November 2012 Project Approval.

INTRODUCTION

This document has been prepared by Environmental Resources Management Australia Pty Ltd (ERM) on behalf of Boral Resources (NSW) Pty Ltd (Boral). It presents the methodology, findings and recommendations of noise compliance monitoring conducted at the Peppertree Quarry (the quarry), located at Marulan South in the Southern Tablelands of New South Wales (NSW) during October 2013.

1.1

RELEVANT DOCUMENTS, STANDARDS AND GUIDELINES

This report has been prepared with due regard to and in accordance with the following documents, standards and guidelines:

- Marulan South Consolidated Project Approval (06_0074) November 2012;
- the *Peppertree Quarry Construction Noise Management Plan (CNMP)*, the *Peppertree Quarry Noise and Blast Monitoring Plan (NBMP)* and the *Peppertree Quarry Environmental Monitoring Program (EMP)*;
- NSW Environment Protection Authority - *NSW Environmental Noise Management - Industrial Noise Policy (INP)*, January 2000 and relevant application notes;
- NSW Department of Environment and Climate Change - *NSW Interim Construction Noise Guideline (ICNG)*, July 2009;
- Standards Australia AS1055-1997™ (AS1055) - *Description and Measurement of Environmental Noise*, Parts 1, 2 and 3;
- Standards Australia AS IEC 61672.1-2004™ (AS61672) - *Electro Acoustics - Sound Level Meters Specifications Monitoring*;
- International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - *Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation*; and
- Standards Australia AS 2436-2010™ (AS2436) - *Guide To Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

A glossary of relevant acoustic concepts and terminology is presented as *Annex A*.

1.2

BACKGROUND

Boral was granted project approval (06_0074) to establish and operate the Peppertree Quarry (a granodiorite hard rock quarry, formerly called the Marulan South Quarry) including all in-pit quarrying activities and supporting infrastructure such as a rail siding and loading facility, processing plant and water supply dams, under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) in February 2007.

Under Section 75W of the *Environment Planning and Assessment Act 1979*, Boral applied for a modification of the Peppertree Quarry Development in regards to rail line construction and operations. Boral received a 'Notice of Modification' for the Peppertree Quarry Project Approval (06_0074), dated Thursday, 3 November 2011. This notice approved the revised Project consolidating relevant aspects of March 2009 and November 2011 modifications. A further modification was applied for in September 2012 for the installation and operation of a High Voltage Power line to the Peppertree Quarry site and an extension of the existing Medway rail siding. This modification application was approved Friday, 2 November 2012.

1.2.1

Noise and Vibration Management

ERM was engaged to prepare the NBMP and CNMP for the quarry in accordance with the Project Approval and subsequent modifications; incorporating key components of the noise and blast monitoring programs for the quarry. Both NBMP and CNMP monitoring programs have been established and incorporated into the overall Environmental Monitoring Program (EMP), which consolidates the specific requirements of the abovementioned monitoring programs as well as other monitoring required by specific Project Approval conditions. The EMP provides an overall framework to assist with the implementation of monitoring for the project.

The purpose of the NBMP and CNMP is to fulfil the requirement of Schedule 3 of the Project Approval and the Statement of Commitments contained within the Part 3A Environmental Assessment. The NBMP, amongst other things, provides procedures for monitoring and assessing noise impacts from the quarry and methods to determine compliance with the operational noise impact assessment criteria. The CNMP, in addition to other things, provides: methods for managing construction noise; procedures for monitoring and assessing noise from construction; and methods to determine compliance with limits for residential receivers.

Construction and site establishment activities associated with the quarry are currently in progress and include week day (7am to 6pm) and Saturday (7am to 1pm) works only. ERM has been engaged to conduct quarterly noise compliance monitoring on behalf of Boral in accordance with the CNMP, NBMP and Project Approval conditions for the quarry.

Guidance Note

Under Section 75W of the Environment Planning and Assessment Act 1979 Boral received a 'Notice of Modification' for the (06_0074) Peppertree Quarry Project Approval. This notice, received on Thursday, 3 November 2011 also enabled a revised Project Approval to be prepared which consolidated relevant aspects of March 2009 and November 2011 modifications.

During this process and in consultation with the NSW Department of Planning and Infrastructure (DoPI), Boral received advice that construction noise criteria would remain valid through January 2012 and thereafter, the Operational Noise Impact Assessment Criteria (as presented in Schedule 3, Section 4: Table 1 of the November 2011 modification) would apply. The subsequent approval in November 2012 does not alter the application of the operational noise criteria as outlined above; complying with DoPI advice the construction noise criteria are no longer valid for assessing quarry noise emissions.

This report presents the noise compliance assessment prepared with due regard to the November 2012 operational noise criteria, which now apply for the quarry site, as the Project Approval required that construction noise criteria were complied with for the first three months of construction (valid to January 2012) and that thereafter, site construction noise emissions must meet the Operational Noise Impact Assessment Criteria.

Following land acquisition, three assessment locations (refer *Table 2.1*) are now part of the overall Boral land ownership and monitoring is no longer required at these sites, Boral have negotiated agreements in place. Conservatively, the November 2012 criteria have been applied to assess noise at these locations in this report.

1.3 *SITE UNDERSTANDING*

The Peppertree Quarry is located in the Southern Tablelands of NSW, approximately 10 kilometres (km) southeast of Marulan and 175 km southwest of Sydney.

The site, the project-specific noise sensitive localities (including the unique identification number used to describe each location) and other items of acoustic importance relative to this assessment are visually presented in *Figure 1.1*.

Figure 1.1 Locality Map

A4

This section presents an overview of the noise compliance monitoring methodology for continuous unattended and operator attended noise monitoring undertaken in accordance with the NBMP and CNMP; and supplementary noise modelling completed to assist demonstrate compliance.

2.1 RECEIVER LOCATIONS

Monitoring locations representative of the surrounding receivers identified in the NBMP, CNMP and Project Approval for operations are to be used for evaluating and assessing noise emissions from construction and site establishment activities, as presented in *Table 2.1* below and visually presented on *Figure 1.1*.

Table 2.1 *Nearest Potentially Affected Receiver Locations*

Receiver ID	Description	Direction and Distance from Quarry Centre			
		MGA (Zone 56) Coordinates		Compass point	Distance, m
		Easting	Northing		
1 ¹	Montgomery	230481	6150110	E	2730
2	Ordasi	226934	6148560	SSW	1730
3 ¹	Brown	226623	6149210	SW	1410
4 ¹	Armitt	226271	6150950	WNW	1480
5	Cooper	226592	6152540	NW	2520
6	Bartolo	226244	6153120	NW	3230
16	Pace	226094	6149665	WSW	1050

1. Following land acquisition or negotiated agreements, these assessment locations are now part of the overall Boral land ownership.

Guidance Note

Noise compliance monitoring was required to be undertaken at alternate locations for three receivers as access was not available, the alternate locations were selected with due regard to the INP.

For the majority of receiver/alternate locations site noise levels were inaudible, masked by extraneous noise events. ERM notes that all noise modelling predictions (refer *Section 3*) are made at the nearest potentially affected receiver locations described in *Table 2.1* above.

2.2 ASSESSMENT CRITERIA

This section summarises the Operational Noise Impact Assessment Criteria (including values required presented in Schedule 3, Condition 4; Table 1 of the November 2012 modification) as presented in the NBMP.

2.2.1 Operational Noise

The Project Approval required that construction noise criteria were complied with for the first three months of construction (valid to January 2012) and thereafter, site construction noise emissions meet the Operational Noise Impact Assessment Criteria. These are reproduced in Table 2.2.

Table 2.2 Operational Noise Impact Assessment Criteria

Receiver		Noise Impact Assessment Criteria, dB(A) ^{1,2}		
		Daytime 7:00am to 7:00pm		Evening and Night 7:00pm to 7:00am
		LAeq, 15min	LAeq, 15min	LA1, 1min
1 ³	Montgomery	35	35	45
2	Ordasi	39	35	45
3 ³	Brown	42	35	46
4 ³	Armitt	37	35	46
5	Cooper	35	35	45
6	Bartolo	35	35	45
16	Pace	41	35	45
Any other noise sensitive location		35	35	45

1. The identified 'Daytime' noise criteria apply throughout the period of the site's Day Shift (i.e. 7.00am to 7.00pm) on all days, despite the general definitions of 'Evening' and 'Night time' otherwise applying to the approval. The identified 'Evening' and 'Night time' criteria apply only during the period of the site's Night Shift (i.e. 7.00pm to 7.00am);
2. noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW INP; and
3. Following land acquisition or negotiated agreements, these assessment locations are now part of the overall Boral land ownership.

2.2.2 Cumulative Noise Criteria

ERM has also considered Schedule 3, Condition 6 of the Project Approval which states:

The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other extractive industries does not exceed the following amenity criteria on any privately owned land, to the satisfaction of the Director-General:

- $L_{Aeq, 11hr} 50 \text{ dB(A)} - \text{Day}^1$;
- $L_{Aeq, 4hr} 45 \text{ dB(A)} - \text{Evening}$; and
- $L_{Aeq, 9hr} 40 \text{ dB(A)} - \text{Night}$.

Although not mandatory for the current construction and site establishment works, these cumulative guideline values provide a parameter by which daily site noise levels may be assessed with regard to other extractive industries in the area.

2.3 MEASUREMENT METHODOLOGY

ERM (one person) visited the quarry on Tuesday, 22 October; Wednesday, 23 October; and Thursday, 24 October 2013 to conduct continuous unattended and operator attended noise monitoring.

The monitoring methodology was determined with due regard to the relevant documents, standards and guidelines presented in *Section 1.1*.

Operator attended noise measurements were conducted at the locations specified in *Table 2.1* and alternate locations selected, if necessary. Supplementary continuous unattended noise monitoring was undertaken at the following five locations:

- at the METSO LT160 (ON SITE) crusher;
- Receiver 2 (Ordasi);
- Receiver 5 (Cooper);
- Receiver 6 (Bartolo); and
- Receiver 16 (Pace).

2.3.1 Measurement Equipment

All measurements were conducted by trained ERM personnel; with due regard to and in accordance with the relevant local and international standards for environmental noise monitoring.

¹ The identified 'Daytime' noise criteria apply throughout the period of the site's Day Shift (i.e. 7.00am to 7.00pm) on all days, despite the general definitions of 'Evening' and 'Night time' otherwise applying to the approval. The identified 'Evening' and 'Night time' criteria apply only during the period of the site's Night Shift (i.e. 7.00pm to 7.00am).

The measurement instrumentation used to complete the assessment complied with the requirements of AS 61672.1 with current NATA calibration certificates, with certification at intervals not exceeding two years at the time of use. The equipment used for this assessment was as follows:

- 1 x Brüel & Kjær 2250 Investigator (Type 1) Sound Analyser;
- 2 x ARL Ngara (Type 1) Environmental Noise Logger;
- 3 x RION NL-42 (Type 2) Environmental Noise Loggers; and
- 1 x SVATECH (Type 1) Sound Level Calibrator.

Instrument calibration was checked prior to monitoring and again at the conclusion with no difference noted between the two measurements. All data handling and analysis has been completed by a member of the Australian Acoustical Society, being at the grade of 'Associate Member' or higher.

2.4 *ADVERSE METEOROLOGICAL CONDITIONS*

Adverse meteorological conditions have the potential to increase noise levels, for example wind speeds up to 3m/s or temperature inversions, however wind speeds above 5m/s (and rainfall) have the potential to generate extraneous and erroneous noise events which reduce the accuracy and confidence in measured data. These events also increase ambient noise levels, to the extent that a sites noise emission (which may be typically audible) is masked by these events, becoming inaudible.

2.4.1 *October 2013 Monitoring*

During the October 2013 monitoring period adverse weather conditions (rain and winds >5m/s) impacted the collection of meaningful noise data at receiver locations attended during the monitoring event. These meteorological conditions occurred intermittently over the three day monitoring period and wind speeds significantly increased ambient noise levels associated with wind-blown vegetation (a feature of the receptor areas).

Effects from wind (which exceeded 8m/s at times) on the microphone were also observed, and significantly impacted the measurement data, to the extent that a site noise level contribution could not be observed or estimated at each location. Site noise levels were only barely audible during one measurement, and a site noise level was not able to be determined accurately.

These adverse meteorological conditions occurred throughout the month of October in 2013. This trend is shown in the monthly Bureau of Meteorology (BOM) weather summary data for the Goulburn Airport Automated Weather Station (AWS); included here as *Annex B*.

2.4.2 *Supplementary Noise Modelling*

As site noise level contributions typically remained inaudible and due to the limitation in measured data confidence as a result of the effects from wind on the microphone, refer *Section 3*, ERM has completed supplementary noise modelling to assist in determining compliance for the current period of works, with the modelled scenario developed based on the observed noise generating plant and equipment on site and activities being undertaken. As detailed in *Section 3*, observed meteorological conditions with the potential to increase noise levels e.g. observed prevailing winds, were included in the model.

2.5 *ON SITE NOISE MONITORING*

The October 2013 monitoring event included the introduction of the METSO LT160 primary crusher to site, which was under test conditions and not fully operational. A very limited number of conveyors were also in use. Thus, ERM deployed an additional noise logging device at the METSO LT160 and the data recorded at this location is utilised to determine actual operational periods of the crusher.

Daily noise logging charts for noise data recorded on site at the METSO LT160 primary crusher and recorded meteorological data (from the off-site Boral AWS) are included here as *Annex C*. ERM notes that the adverse meteorological conditions observed at the receiver locations were not as acute on site, with reduced wind speeds, most likely due to shielding provided by local topography.

ASSESSMENT RESULTS

This section presents the results, findings and any recommendations of continuous unattended and operator attended noise monitoring conducted on Tuesday, 22 October; Wednesday, 23 October; and Thursday, 24 October 2013.

All works associated with the quarry were limited to the approved week day construction hours (7am to 6pm) on all three days of monitoring.

3.1

NOISE GENERATING ACTIVITIES

Compared to previous monitoring events (undertaken during full scale construction), site works were relatively limited during the October 2013 monitoring event, with no significant high noise level generating plant, equipment or activities operating at full capacity for extended periods. ERM understand that this is consistent with the current level of day to day activity associated with establishment works (dry and wet testing) where site machinery have only operated intermittently for testing purposes.

On site, the METSO LT160 primary (mobile) crusher (and Hitachi 120T excavator; used to feed the crusher) were operational. The METSO LT160 was identified to be the "loudest" item of machinery in use on site. Other general site noise emission sources (noise generating activities) were observed by ERM to include the limited use of motion alarms; heavy vehicles (articulated dump trucks etc), front end loaders, hand tools, general site vehicles and/or limited metal on metal contact. ERM targeted operator attended noise measurements to be undertaken whilst the METSO LT160 was operational, however due to logistical constraints associated with adverse meteorological conditions and the intermittent testing of machinery, this was not always possible.

3.1.1

Metso LT160 - Primary (Mobile) Crusher

On site the METSO LT 160 was identified to be the most dominant noise source, significantly louder than other plant and equipment in use. Accordingly ERM undertook Sound Power Level (L_w) testing and determined a $L_{w, total}$ value of 114.3 dB(A).

This L_w data, in combination with other general noise emission sources, has been used to predict site noise emissions via modelling, refer *Section 3.4*, when they could not be accurately determined via measurement.

3.2

OPERATOR ATTENDED MEASUREMENTS

Measured overall ambient and background noise levels are presented in *Table 3.1* and *Table 3.2*, including all relevant statistical and acoustic parameters i.e. L_{Amax} , L_{Amin} , L_{Aeq} , L_{A1} , L_{A10} and L_{A90} .

At the majority of locations (all but one), site noise contributions were inaudible. During the one measurement at R1 (Montgomery) where site activities were audible, they did not dominate the acoustic environment and were typically masked by extraneous noise emissions not associated with the site.

Table 3.1 Overall Measured Noise Levels – 22 October 2013

Receiver ID	Description	Start Time	Measured Noise Levels					
			LMax	LMin	Leq	L1	L10	L90
2	Ordasi	14:22	55	32	38	46	40	34
4	Armitt	14:59	68	30	37	46	38	32

1. All noise levels are dB(A) re 2 x 10⁻⁵ Pa; and
2. All measurements were of 15 minutes duration.

Observed Meteorological Conditions

Meteorological conditions during the measurements described in Table 3.2 included temperatures of between approximately 22 and 23°C, wind speeds of ≤5m/s (generally from a westerly direction) and cloud coverage of 8/8 octas.

Table 3.2 Overall Measured Noise Levels – 24 October 2013

Receiver ID	Description	Start Time	Measured Noise Levels ^{1,2,3}					
			LMax	LMin	Leq	L1	L10	L90
1	Montgomery	07:41	70	42	51	59	55	45
5	Cooper	08:33	72	44	52	59	54	47
6	Bartolo	08:58	75	50	59	66	62	54
4	Armitt	09:40	67	43	53	59	55	48
2	Ordasi	10:12	82	48	57	67	59	51
16	Pace	11:11	68	49	57	64	61	52

1. All noise levels are dB(A) re 2 x 10⁻⁵ Pa; and
2. All measurements were of 15 minutes duration.

Observed Meteorological Conditions

Meteorological conditions during the measurements described in Table 3.2 included temperatures of between approximately 13 and 15°C, average wind speeds of between 2.5m/s and 5m/s (generally from a south-westerly or westerly direction), maximum wind speeds of ≤8m/s and cloud coverage of 8/8 octas.

3.2.2 Observed Noise Emissions

Site noise level contributions were generally inaudible during the measurements described in Table 3.1 and Table 3.2. The METSO LT160 (crushing rock) was barely audible at Receiver 1 (Montgomery) when ambient noise levels were at their lowest.

Other influencing factors included elevated wind speeds (intermittently >5m/s) that increased ambient noise levels when compared to previous monitoring events for the quarry; wind-blown vegetation typically dominated the measurements. Observed extraneous noise sources (not associated with the site) included emissions associated with near-by fauna, aircraft noise and limited operator noise.

The effects of wind on the microphone were also observed, and significantly impacted the measurement data, to the extent that a site noise level contribution could not be measured or estimated at each location.

3.3 *UNATTENDED MEASUREMENTS*

3.3.1 *Receiver (Off-Site) Compliance Monitoring*

Due to the significant influence of adverse meteorological conditions noted above at the receiver locations, an accurate measured daytime (7am to 6pm) ambient (L_{Aeq}) noise level (and estimated site noise level contribution) was not able to be determined from unattended noise monitoring. There were too few samples unaffected by these conditions to determine a meaningful value.

Extraneous noise sources (not associated with the site) noted during noise logger deployment were observed to be similar to those noted during operator attended noise measurements and included emissions associated with wind-blown vegetation, near-by fauna and aircraft noise.

Unattended noise monitoring charts which show the measured unattended noise data and recorded meteorological data (from the nearby Boral AWS) are presented in *Annex D*.

ERM notes that the device situated at Receiver 16 (Pace) failed at approximately 22:30 on Wednesday, 23 October 2013 and as a result no data was recorded past the last reliable sample recorded immediately prior to this time.

3.3.2 *METSO LT160 (On Site) Monitoring*

On site meteorological conditions were less acute than at the receivers and meaningful monitoring data was recorded. Furthermore, noise levels associated with the METSO LT160 crusher were measured between 102 dB(A) and 104 dB(A) $L_{eq, 15minute}$ while in use on site, significantly (>20 dB) above wind or rain effected ambient data.

Unattended noise monitoring charts which show the measured unattended on-site METSO LT160 noise data (and Boral meteorological data) are presented in *Annex C*. They clearly identify periods that the crusher was operational, summarised below:

- Tuesday, 22 October 2013 from approximately 10:45 to 13:45 and from approximately 15:30 to 17:00;
- Wednesday, 23 October 2013 from approximately 07:30 to 12:45; and
- Thursday, 24 October 2013 from approximately 08:00 to 09:30.

3.4 *COMPLIANCE ASSESSMENT*

Due to the limitation in measured data confidence associated the effects from wind on the microphone; ERM has completed supplementary noise modelling to assist in demonstrating compliance.

3.4.1 *Noise Modelling*

Brüel & Kjær's Predictor (Version 8.14) noise modelling software package was used to predict all noise levels at each receiver. The ISO9613:2 industrial noise (1/1 octave) algorithms were used.

Predictor (Version 8.14) allows 3D topographic details (site terrain) to be combined with ground regions, water, grass, significant building structures etc. and project-specific assessment locations, (noise receptors), to create a detailed and accurate representation of the site and surrounding area. Noise emission sources deemed representative of site conditions were placed at relevant locations within the site areas; representative of noise emission heights were adopted for all sources.

Noise levels were predicted adopting observed prevailing conditions, refer the parameters shown in *Table 3.4*. All noise levels were predicted at a height of 1.5m which represents the single storey buildings at each receiver.

Source Term Data

Based on a review of available project data, and observations and measurements made whilst on site and L_w data (representative spectral values and overall L_w , dB(A)) for known equipment, noise emission sources were determined by ERM.

These noise emission sources were included in the model to be operating concurrently and are summarised in *Table 3.3* below.

Table 3.3 *Noise Source Term Data*

Frequency [Hz] (1/1 Octave)	METSO LT160	Site Vehicles - Primary Pit	Site Vehicles - General	Conveyors (Primary only)	
	LW, total	LW, total	LW, total	dB/m	LW, total
31.5	79.8	81.8	81.8	37.3	65.4
63	96.2	85.18	85.2	40.0	68.2
125	103.3	86.0	86.0	47.6	75.8
250	105.9	86.4	86.4	54.2	82.4
500	109.3	91.5	91.5	64.0	92.2
1000	108.0	105.1	105.1	71.8	100.0
2000	106.0	95.2	95.2	74.9	103.1
4000	101.8	89.6	89.6	70.0	98.2
8000	92.8	80.6	80.6	66.1	94.3
Lw, Total	114.3	106.0	106.0	78.0	106.2

1. Nine vehicle trips were included in the noise model

Table 3.4 *Noise Modelling Parameters*

Modelling Parameter	Value
Temperature Inversion	Class D
Wind Direction	225
Wind Speed	3m/s
Temperature	20°C
Humidity	60%
Ground Factor (0-1, soft to hard)	0.6

3.4.2 *Predicted Noise Levels*

The noise compliance assessment comparing predicted site noise level contributions ($L_{Aeq, 15 \text{ minute}}$) to the Operational Noise Impact Assessment criteria is tabulated in *Table 3.5* below. Predicted site noise levels are also presented in the noise contour map included as *Annex E*.

Table 3.5 Compliance Assessment (Noise Modelling)

Receiver ID	Description	Operational Noise Impact Assessment Criteria ¹	Predicted Site Noise Level Leq, 15 minute ^{1,2}	Comply with Criteria
1 ³	Montgomery	35	27	Yes
2	Ordasi	39	25	Yes
3 ³	Brown	42	26	Yes
4 ³	Armitt	37	24	Yes
5	Cooper	35	23	Yes
6	Bartolo	35	23	Yes
16	Pace	41	24	Yes

1. All noise levels are dB(A) re 2 × 10⁻⁵ Pa; and
2. Following land acquisition or negotiated agreements, this assessment location is now part of the overall Boral land ownership.

Discussion

The modelling results presented in *Table 3.5* identify that current construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria contained in Boral’s November 2012 approval, at all receiver locations.

The noise contour map prepared to illustrate October 2013 site noise levels (refer *Annex E*) shows that site noise contributions are generally <25 dB(A) and do not extend to influence any other known community receptors to than those considered in this report.

Based on the predicted noise levels presented in *Table 3.5* and conservatively assuming that on site crushing was undertaken for the duration of the daytime assessment period (7am to 7pm); ERM estimates that site noise level contributions would be ≤30 dB(A) LAeq, 11hr, at all receivers and significantly below the LAeq, 11hr 50 dB(A) cumulative criteria.

RECOMMENDATIONS

Based on the results of October 2013 monitoring event, ERM makes the following in-principle acoustics recommendations.

These are designed to assist Boral in managing noise emissions from construction and site establishment activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry in complying with the operational noise criteria, in accordance with the November 2012 Project Approval. It is recommended that Boral:

- continue to ensure that all significant noise generating plant and equipment are tested to satisfy the design level limits presented in the CNMP and that mitigation is applied where feasible and reasonable;
- avoid concentrations of equipment in sensitive work areas e.g. on top of the dump or bund;
- avoid bunching of trucks along internal haul roads;
- continue monitoring of local meteorological conditions to manage the placement of equipment so that it is suitable for best outcome for those conditions; and
- continue noise compliance monitoring at affected receiver(s) in accordance with *Section 2* of the (06_0074) the November 2012 Project Approval, or at nominated (alternate) representative locations, justified as per the requirements of the INP.

ERM makes no additional recommendations but notes that Boral continues to manage noise generated by construction and site establishment plant within the site and continues to operate within the operational noise criteria specified in the November 2012 Project Approval.

CONCLUSION

ERM, on behalf of Boral Resources (NSW) Pty Ltd, has completed noise compliance monitoring (and supplementary modelling) for the current works at Peppertree Quarry. The assessment was undertaken with due regard to and in accordance with local and international standards, guidelines and documents presented in this report.

Site noise emissions associated with construction and site establishment activities within the quarry continue to comply with the relevant Operational Noise Impact Assessment Criteria contained in Boral's November 2012 approval, and the cumulative noise criteria, at all receiver locations.

Based on these findings ERM has made in-principle acoustic recommendations; designed to assist Boral in reducing noise emissions from construction and site establishment activities associated with the quarry and ensuring that all feasible and reasonable measures are considered for the quarry, where required.

ERM makes no additional recommendations and notes that Boral continues to manage noise generated by plant and equipment within the site and continues to operate within the operational noise criteria specified in the November 2012 Project Approval.

REFERENCES

Marulan South Consolidated Project Approval (06_0074) November 2012

Peppertree Quarry Noise and Blast Monitoring Plan, dated August 2012

Peppertree Quarry Construction Noise Management Plan, dated August 2012

Peppertree Quarry Environmental Monitoring Program, dated August 2012

NSW Environment Protection Authority - **NSW Environmental Noise Management - Industrial Noise Policy (INP)**, January 2000 and relevant application notes

NSW Department of Environment and Climate Change - **NSW Interim Construction Noise Guideline (ICNG)**, July 2009

Standards Australia AS1055-1997™ (AS1055) - **Description and Measurement of Environmental Noise**, Parts 1, 2 and 3

Standards Australia AS IEC 61672.1-2004™ (AS61672) - **Electro Acoustics - Sound Level Meters Specifications Monitoring**

International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - **Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation**

Standards Australia AS 2436-2010™ (AS2436) - **Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites**

Annex A

Acoustics Glossary

A.1 **WHAT IS NOISE AND VIBRATION?**

A.1.1 **Noise**

Noise is often defined as a sound, especially one that is loud or unpleasant or that causes disturbance* or simply as unwanted sound, but technically, noise is the perception of a series of compressions and rarefactions above and below normal atmospheric pressure.

A.1.2 **Vibration**

Vibration refers to the oscillating movement of any object. In a sense noise is the movement of air particles and is essentially vibration, though in regards to an environmental assessment vibration is typically taken to refer to the oscillation of a solid object(s). The impact of noise on objects can lead to vibration of the object, or vibration can be experienced by direct transmission through the ground, this is known as ground-borne vibration.

Essentially, noise can be described as what a person hears, and vibration as what they feel.

A.2 **HOW TO MEASURE AND DESCRIBE NOISE?**

Noise is measured using a specially designed 'sound level' meter which must meet internationally recognised performance standards. Audible sound pressure levels vary across a range of 10^7 Pascals (Pa), from the threshold of hearing at $20\mu\text{Pa}$ to the threshold of pain at 200Pa. Scientists have defined a statistically described logarithmic scale called Decibels (dB) to more manageably describe noise.

To demonstrate how this scale works, the following points give an indication of how the noise levels and differences are perceived by an average person:

- 0 dB - represents the threshold of human hearing (for a young person with ears in good condition);
- 50 dB – represents average conversation;
- 70 dB – represents average street noise, local traffic etc;
- 90 dB – represents the noise inside an industrial premises or factory;
- 140 dB - represents the threshold of pain – the point at which permanent hearing damage may occur.

A.3

WHAT FACTORS CONTRIBUTE TO ENVIRONMENTAL NOISE?

The noise from an activity, like construction works, at any location can be affected by a number of factors, the most significant being:

- how loud the activity is;
- how far away the activity is from the receiver;
- what type of ground is between the activity and the receiver location e.g. concrete, grass, water or sand;
- how the ground topography varies between the activity and the receiver (is it flat, hilly, mountainous) as blocking the line of sight to a noise source will generally reduce the level of noise; and
- any other obstacles that block the line of sight between the source to receiver e.g. buildings or purpose built noise walls.

A.4

HOW TO CALCULATE OR MODEL NOISE LEVELS?

There are two recognised methods which are commonly adopted to determine the noise at particular location from a proposed activity. The first is to undertake noise measurements whilst the activity is in progress and measure the noise, the second is to calculate the noise based on known noise emission data for the activity in question.

The second option is preferred as the first option is largely impractical in terms of cost and time constraints, notwithstanding the meteorological factors that may also influence its quantification. Furthermore, it is also generally considered unacceptable to create an environmental impact simply to measure it. In addition, the most effective mitigation measures are determined and implemented during the design phase and often cannot be readily applied during or after the implementation phase of a project.

Because a number of factors can affect how 'loud' a noise is at a certain location, the calculations can be very complex. The influence of other ambient sources and the contribution from a particular source in question can be difficult to ascertain. To avoid these issues, and to quantify the direct noise contribution from a source/site in question, the noise level is often calculated using noise modelling software packages. The noise emission data used in each noise model of this assessment has been obtained from ERM's database of measured noise emissions.

Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dB(A). The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Time varying noise sources are often described in terms of statistical noise descriptors. The following descriptors are commonly used when assessing noise and are referred to throughout this acoustic assessment:

- **Decibel (dB is the adopted abbreviation for the decibel)** - The unit used to describe sound levels and noise exposure. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure;
- **dB(A)** - unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear;
- **dB(C)** - unit used to measure 'A-weighted' sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans;
- **dB(Z) or dB(L)** - unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear;
- **Hertz (Hz)** - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz;
- **Octave** - a division of the frequency range into bands, the upper frequency limit;
- **1/3 Octave** - single octave bands divided into three parts;
- **Leq** - this level represents the equivalent or average noise energy during a measurement period. The $Leq, 15min$ noise descriptor simply refers to the Leq noise level calculated over a 15 minute period. Indeed, any of the below noise descriptors may be defined in this way, with an accompanying time period (e.g. $L_{10, 15\text{ minute}}$) as required;
- **Lmax** - the absolute maximum noise level in a noise sample;
- **LN** - the percentile sound pressure level exceeded for N% of the measurement period calculated by statistical analysis;
- **L10** - the noise level exceeded for 90 per cent of the time and is approximately the average of the maximum noise levels;

- **L90** - the noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L90 level is often referred to as the “background” noise level and is commonly used as a basis for determining noise criteria for assessment purposes;
- **Sound Power Level (L_W)** - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment;
- **Sound Pressure Level (L_P)** - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from L_W in that this is the received sound as opposed to the sound ‘intensity’ at the source;
- **Air-blast Overpressure** - a transient air pressure, such as the shock wave from an explosion that is greater than the surrounding atmospheric pressure;
- **Background noise** - the underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor;
- **Ambient noise** - the all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far;
- **Cognitive noise** - noise in which the source is recognised as being annoying; and
- **Masking** - the phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.

A.6

TERMS TO DESCRIBE THE PERCEPTION OF NOISE

The following concepts offer qualitative guidance in respect of the average response to changes in noise levels:

- differences in noise levels of less than approximately 2 dB(A) are generally imperceptible in practice;
- differences in noise levels of around 5 dB(A) are considered to be significant; and
- differences in noise levels of around 10 dB(A) are generally perceived to be a doubling (or halving) of the perceived loudness of the noise.

The following terms offer quantitative and qualitative guidance in respect of the audibility of a noise source:

- **Inaudible / Not Audible** - the noise source and/or event could not be heard by the operator, masked by extraneous noise sources not associated with the source. If a noise source is 'inaudible' its noise level may be quantified as being less than the measured LA90 background noise level, potentially by 10 dB or greater;
- **Barely Audible** - the noise source and/or event are difficult to define by the operator, typically masked by extraneous noise sources not associated with the source. If a source is 'barely audible' its noise level may be quantified as being 5 - 7 dB below the measured LA90 or LAeq noise level, depending on the nature of the source e.g. constant or intermittent;
- **Just Audible** - the noise source and/or event may be defined by the operator. However there are a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator;
- **Audible** - the noise source and/or event may be easily defined by the operator. There may be a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator; and
- **Dominant** - the noise source and/or event are noted by the operator to be significantly 'louder' than all other noise sources. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

The following terms offer qualitative guidance in respect of acoustic terms used to describe the frequency of occurrence of a noise source during an operator attended environmental noise measurements:

- **Constant** - this indicates that the operator has noted the noise source(s) and/or event to be constantly audible for the duration of the noise measurement e.g. an air-conditioner that runs constantly during the measurement;
- **Intermittent** - this indicates that the operator has noted the noise source(s) and/or event to be audible, stopping and starting intervals for the duration of the noise measurement e.g. car pass-by's; and
- **Infrequent** - this indicates that the operator has noted the noise source(s) and/or event to be constantly audible, however; not occurring regularly or at intervals for the duration of the noise measurement e.g. a small number of aircraft are noted during the measurement.

- **Assessment Background Level (ABL)** - is defined in the INP as a single figure background level representing each assessment period (day, evening and night). Its determination is by the tenth percentile method (of the measured LA90 statistical noise levels) described in *Appendix B* on the INP; and
- **Rating Background Level (RBL)** - is defined in the INP as the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24hr period used for the ABL). This is the level used for assessment purposes. It is defined as the median value of:
 - All the day assessment background levels over the monitoring period for the day;
 - All the evening assessment background levels over the monitoring period for the evening; or
 - All the night assessment background levels over the monitoring period for the night.
- **Extraneous noise** - noise resulting from activities that are not typical of the area. Atypical INP activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous;
- **Most affected location(s)** - locations that experience (or will experience) the greatest noise impact from the noise source under consideration. In determining these locations, one needs to consider existing background levels, exact noise source location(s), distance from source (or proposed source) to receiver, and any shielding between source and receiver;
- **Noise criteria** - the general set of non-mandatory noise level targets for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (for example, noise levels for various land uses);
- **Noise limits** - enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action;
- **Project Specific Noise Levels** - target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility;

- **Compliance** – the process of checking that source noise levels meet with the noise limits in a statutory context;
- **Non-compliance** – development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit by more than 2 dB;
- **Feasible and Reasonable measures** – feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors:
 - noise mitigation benefits (amount of noise reduction provided, number of people protected);
 - cost of mitigation (cost of mitigation versus benefit provided);
 - community views (aesthetic impacts and community wishes); and
 - noise levels for affected land uses (existing and future levels, and changes in noise levels).
- **Meteorological Conditions** – wind and temperature inversion conditions;
- **Temperature Inversion** – an atmospheric condition in which temperature increases with height above the ground; and
- **Adverse Weather** – weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).

A.7

OPERATOR ATTENDED NOISE MEASUREMENTS

Noise level deductions that may be applied based on the percentage contribution of a noise source(s) are presented in *Table A.1* below.

Table A.1 Noise Level Deductions – Noted Percentile Contribution

Percentage Contribution	Noise Level Deduction, dB(A)
5%	-13.0
10%	-10.0
15%	-8.2
20%	-7.0
25%	-6.0
30%	-5.2
35%	-4.6
40%	-4.0
45%	-3.5
50%	-3.0
55%	-2.6
60%	-2.2
65%	-1.9
70%	-1.5
75%	-1.2
80%	-1.0
85%	-0.7
90%	-0.5
95%	-0.2
100%	0.0

1. **EXAMPLE:** the measured LAeq, 15 minute noise level is 49 dB and the site contribution was observed to be 10% of this level (extraneous noise sources were noted to dominate the measurement), therefore the LAeq, 15 minute noise level deduction is 10 dB, with a resultant noise level contribution of approximately 39 dB.

Noise level deductions that may be applied based on the percentage of time that a noise source(s) is audible during a 15 minute measurement are presented in *Table A.2* below.

Table A.2 **Noise Level Deductions – Noted Time Contribution**

Event Duration (minutes)	Noise Level Deduction, dB(A)
1	-11.8
2	-8.8
3	-7.0
4	-5.7
5	-4.8
6	-4.0
7	-3.3
8	-2.7
9	-2.2
10	-1.8
11	-1.3
12	-1.0
13	-0.6
14	-0.3
15	-0.0

1. **EXAMPLE:** the measured LAeq, 15 minute noise level contribution of an excavator was noted to be 56 dB, however it was only audible for 6 minutes during the 15 minute measurement period, therefore the LAeq, 15 minute noise level deduction is 4 dB, with a resultant noise level contribution of approximately 52 dB.

Annex B

Goulburn AWS Weather Data (October 2013)

Annex C

Metso LT160 (On SITE) Noise Logging Charts

Annex D

Unattended Noise Logging Charts

Annex E

Noise Contour Map

Appendix E – Rehabilitation Management

Table E.1 Management Actions: Rehabilitation and Revegetation

Phase	Action	Purpose	Priority	Timeframe¹	Responsibility
Preconstruction - construction	1. Retention of the existing Box-Gum Grassy Woodland The remnant of Box-Gum Grassy Woodland to be retained is to be defined by protection fencing to prohibit construction access. The area within must be kept free from all building materials, contaminants and other debris, and must not be used for storage of any building materials.	Minimise potential impact to endangered Box Gum Woodland	Priority 1 – High	At all times	Boral Quarries Construction Contractor. Fencing implemented July – December 2011. Ongoing management
Preconstruction	2.Collection of seed, vegetative material or trans locatable individuals within the development area to be grown or used in rehabilitation and reconstructive landscaping.	To ensure correct provenance of the species being used for revegetation and maximise survival rate	Priority 1 – High	Immediately Prior to clearing in all stages	Contractor. Seed collected in December 2011 – march 2012 for propagation of rehab trees.
Preconstruction	3.Contract a qualified rehabilitation and re-vegetation consultant to undertake on-ground planning for and rehabilitation works across the subject site	To ensure success and of rehabilitation works	Priority 1 - High	Immediate	Proposal December 2011 Southern Bushland Restorations. Rehabilitation work commenced July 2013.
Construction following dam construction)	4.Direct establishment of tree, shrub and groundcover species characteristic of Box-Gum Grassy Woodland surrounding a 20 metre buffer around the periphery of Dam No. 1 and on either side of Tangarang Creek providing a direct offset of 12.5 ha.	To minimise potential impact to endangered Box Gum Woodland and increase areas of woodland vegetation in the future	Priority 2 - Moderate	Within 1 month of dam completion or when practical dependent on seasonality	Rehabilitation planting work commenced July 2013. Direct seeding not possible due to grass cover, over planting undertaken rather than disturbance of soil.
Rehabilitation	5.Revegetation around the dams and the addition of semi-submerged rocky areas around the perimeter of the dams.	To create habitat for native frogs and reptiles	Priority 2 - Moderate	Within 1 month of dam completion or when practical dependent on growing season	Rehabilitation work commenced July 2013.
Rehabilitation	6.Tubestock to be used in conjunction with direct seeding during establishment of the 20 metre buffer around the periphery of Dam No. 1, adjoining the remnant Box-Gum Grassy Woodland.	To ensure success and of rehabilitation works	Priority 2 - Moderate	Within 1 month of dam completion or when practical dependent on growing season	Seed collected and propagated for use. All tubestock utilised in the rehabilitation of the area. Rehabilitation planting work commenced July 2013.

Phase	Action	Purpose	Priority	Timeframe¹	Responsibility
Rehabilitation	7.Direct Seeding to be used on bunding, (consider jute matting for high erosion areas).	To ensure success and of rehabilitation works	Priority 2 - Moderate	Within 1 month of construction beginning or when practical dependent on growing season	Noise bund hydromulched progressively from October to December 2012.
Rehabilitation	8.Seedlings and small plants within newly established areas should be protected with tree guards.	To protect revegetation from feral browsers such as rabbits	Priority 2 - Moderate	Within 1 month of dam completion or when practical dependent on growing season	Not implemented. Decision made to increase density of plantings and to replace as necessary.
Rehabilitation	9.Install permanent fencing around HMA to prevent human, stock and vehicular access.	Minimise ongoing impacts of on vegetation	Priority 1 – High	At all times	Boral Quarries October to December 2011. Area fenced.
Rehabilitation	10.Signs indicating that rehabilitation work is occurring should be erected (e.g. 'No access –rehabilitation in progress') along HMA fence line.	To advise construction workers and other people accessing the site of works being carried out	Priority 1 – High	At all times	Boral Quarries October to December 2011. Area fenced.
Ongoing – progressive rehabilitation	11.Site maintenance to be carried out. This will include regular watering schedules, maintenance of tree guards, progressive re-vegetation / rehabilitation, halo spraying, and re-placement planting if required.	To ensure survival rate of revegetation	Priority 2 - Moderate	At all times	Contractor

Where practical, feasible and reasonable.

Table E.2 Management Actions Relating To Native Vegetation

Phase	Action	Purpose	Priority	Timeframe¹	Responsibility
Pre-Construction	1.Contractors to follow specific guidelines for vegetation removal, as follows: Construction vehicle access routes, soil stockpiles and machinery are to be located outside the Primary Root Zone (PRZ) of the remnant tree stands identified as being protected in the Environment Assessment (ERM 2006). The PRZ is generally defined as a radial offset 10 times trunk diameter. If stumps of felled trees are within the PRZ of the remnant vegetation stand, stumps are to be ground where practicable rather than completely grubbed or removed. This will enhance the long-term viability of the retained vegetation.	To avoid soil compaction and damage to the roots, stems and branches of trees to be retained	Priority 1 – High	3 months	Boral Quarries EO and or Independent Consultant October to December 2011 area fenced to ensure no disturbance.
Pre-Construction	2.Pre-clearance surveys of all trees to be removed, to be undertaken by an appropriately qualified person.	To ensure no fauna are in the trees when removed	Priority 1 – High	Immediately Prior to clearing in all stages	Boral Quarries ERM Consultants employed, site clearance surveys undertaken October to December 2011.
Construction	3.An appropriately qualified person to be on site while hollows bearing trees are removed so that any fauna inhabiting the trees can be captured and relocated.	To ensure survival of all fauna on site during clearing	Priority 1 – High	Immediately During clearing in all stages	Boral Quarries ERM Consultants employed, site clearance surveys undertaken October to December 2011.
Pre-Construction - construction	4.Retention of the existing Box-Gum Grassy Woodland. The remnant of Box-Gum Grassy Woodland to be retained is to be defined by protection fencing to prohibit construction access to the area. The area within must be kept free from all building materials, contaminants and other debris, and must not be used for storage of any building materials.	Minimise potential impact to endangered Box Gum Woodland	Priority 1 – High	At all times	Boral Quarries Construction Contractor October to December 2011 area fenced to ensure no disturbance
Construction	5.Manage protected trees throughout the construction process (particularly if a portion of the tree's root system has been disturbed by excavation).	Maintain health and maximise survival rate of vegetation to be retained	Priority 1 – High	At all times	Boral Quarries Construction Contractor October to December 2011 area fenced to ensure no disturbance
Pre-Construction - construction	6.Majority of mature trees within the upper reaches of reservoir of Dam No. 1 to be retained, including all hollow bearing trees.	To retain existing habitats for local fauna	Priority 1 – High	At all times	Boral Quarries Construction Contractor October to December 2011 area fenced to ensure no disturbance

Phase	Action	Purpose	Priority	Timeframe ¹	Responsibility
Construction	7.Minimise vegetation removal by trimming limbs rather than removing entire trees or bushes, where possible. Leave rootstock in the ground to stabilise the soil.	Minimise disturbance and damage to vegetation	Priority 1 – High	At all times	Boral Quarries Construction Contractor
Construction	8.Stockpile vegetative cuttings for respreading as mulch and soil protection and seed material for regeneration.	Aid in regeneration activities	Priority 1 – High	At all times	Boral Quarries Construction Contractor Material mulched January-March 2012 and utilised on bund wall.
Rehabilitation	9.Install permanent fencing around remnant bushland and re-vegetated area to prevent human, stock and vehicular access.	Minimise ongoing impacts of human activity on vegetation	Priority 1 – High	At all times	Boral Quarries October to December 2011 area fenced to ensure no disturbances

Where practical, feasible and reasonable.

Table E.3 Management Actions Relating To Habitat Corridors and Connectivity

Phase	Action	Purpose	Priority	Timeframe ¹	Responsibility
Pre-Construction	1.Contract a qualified rehabilitation and re-vegetation consultant to undertake rehabilitation activities.	To ensure success of rehabilitation works	Priority 1 - High	Prior to undertaking works	Boral Quarries Southern Bushland Restoration contracted to prepare plans, undertake planting and maintenance – December 2011.
Rehabilitation	2.Direct establishment of tree, shrub and groundcover species characteristic of Box-Gum Grassy Woodland on either side of Tangarang Creek to connect with remnant Box-Gum Grassy Woodland and nearby Bungonia State Recreation Area and Morton National Park.	To establish connectivity with vegetation and create a biodiversity corridor for endemic species	Priority 2 - Moderate	Within 1 month of construction beginning or when practical dependent on growing season	Rehabilitation planting work commenced July 2013. Direct seeding not possible due to grass cover, over planting undertaken rather than disturbance of soil.

Phase	Action	Purpose	Priority	Timeframe¹	Responsibility
Pre-construction	3. Clearly identify and demarcate (with markers or temporary fencing) the boundaries between area to be revegetated and construction area.	Minimise disturbance and creation of informal walkways	Priority 1 – High	Prior to clearing in all stages	Boral Quarries October – December 2011 Area fenced to ensure no disturbance.
Pre-construction	4. Collect seed from the development area to be grown for direct planting or used for direct seeding of the HMA.	To ensure correct provenance of the species being used for revegetation and maximise survival rate	Priority 1 – High	Prior to clearing in all stages	Contractor. Seed collected December 2011 to March 2012 for propagation of rehab trees.
Rehabilitation – ongoing rehabilitation	5. Consideration of Jute matting to stabilize drainage channels or areas assessed to be a high erosion hazard to avoid run-off of top-soil and improve soil organic content.	Minimise soil erosion, and improve water retention and organic content in soil to maximise survival rate	Priority 2 - Moderate	When required post construction	
Rehabilitation – ongoing rehabilitation	6. Seedlings and small plants within newly established areas to be protected with tree guards.	To protect revegetation from feral predators such as rabbits	Priority 2 - Moderate	Upon establishment of seedlings and small plants or when required	Not implemented. Decision made to increase density of plantings and to replace as necessary.
Rehabilitation	7. Install permanent fencing around HMA to prevent human, stock and vehicular access.	Minimise ongoing impacts of on vegetation	Priority 1 – High	At all times	Boral Quarries October – December 2011 Area fenced to ensure no disturbance.
Rehabilitation	8. Signs indicating that rehabilitation work is occurring should be erected (e.g. 'No access –rehabilitation in progress') along HMA fence line	To advise construction workers and other people accessing the site of works being carried out	Priority 1 – High	At all times	Boral Quarries October – December 2011 Area fenced to ensure no disturbance.

Phase	Action	Purpose	Priority	Timeframe ¹	Responsibility
Ongoing-progressive rehabilitation	9.Site maintenance to be carried out. This will include monthly watering schedules, maintenance of tree guards, progressive rehabilitation, halo spraying, and re-placement planting if required.	To ensure survival rate of revegetation	Priority 2 - Moderate	At all times	Contractor
Where practical, feasible and reasonable.					

Table E.4 Management Actions Relating To Significant Species

Phase	Action	Purpose	Priority	Timeframe ¹	Responsibility
Pre-Construction	1.Suitably qualified ecologist to conduct a survey (species specific) of known populations and potential habitat, to provide greater insight into the current status of the species, threats to its persistence and management actions.	To gain a greater understanding of the distribution of <i>Solanum celatum</i> within the area and its requirements for survival and to ensure no other plants will be impacted	Priority 1 – High	Immediately Prior to clearing in all stages	Boral Quarries and Consultant July – September 2011 (Onsite work December 2011)
Pre-Construction	2.Vegetation clearance strategy Construction vehicle access routes, soil stockpiles and machinery are to be located outside the Primary Root Zone (PRZ) of the remnant vegetation stand identified as being protected. The PRZ is generally defined as a radial offset 10 times trunk diameter. If stumps of felled trees are within the PRZ of the remnant vegetation stand, stumps are to be ground where practicable rather than completely grubbed or removed. This will enhance the long-term viability of the retained vegetation.	To ensure no impacts during clearance activities	Priority 1 – High	Immediately Prior to clearing	Boral Quarries and Consultant October – December 2011 Area Fenced.
Pre-Construction	3.An appropriately qualified person to conduct a survey of trees to identify any nesting species.	To ensure survival of species within the area	Priority 1 – High	Immediately Prior to clearing	Boral Quarries and Consultant July- September 2011 October-December 2011.

Phase	Action	Purpose	Priority	Timeframe ¹	Responsibility
Construction - ongoing	4. Engage qualified weed contractors to conduct weed removal of blackberry and all exotic species/garden escapes located within potential habitat areas of <i>Solanum celatum</i>	To suppress weed growth and decrease habitat degradation from invasive species	Priority 2 - Moderate	Within 1 month of construction beginning	April-June 2012 July-September 2012 July-September 2013 Wolfcon.
Pre-construction - ongoing	5. Protect areas of known and potential habitat of <i>Solanum celatum</i> from clearing and further fragmentation.	To ensure outbreaks of weeds do not occur, affecting native species growth	Priority 1 – High	At all times	Boral Quarries July-September 2011 Fenced.
Rehabilitation	6. Install permanent fencing around HMA to prevent human, stock and vehicular access.	To minimise on going impacts to the species	Priority 1 – High	At all times	Boral Quarries October – Decemerb 2011 Area fenced.
Pre-construction - Ongoing	7. Advise the NPWS and RFS of nesting parrots	To minimise potential impact from government activities, such as back-burning or clearing	Priority 1 – High	Immediately after survey is conducted	Boral Quarries No nesting parrots identified.
Rehabilitation – ongoing	8. Monitor weed populations by survey every six months and eradicate new weeds promptly. Weed distribution and abundance should be re-mapped and control methods and timing updated accordingly	To ensure outbreaks of weeds do not occur, affecting native species growth	Priority 1 – High	At all times	Contractor April-June 2012 July-September 2012 July-September 2013 Wolfcon.
Construction	9. Install fauna -sensitive lighting (high-pressure sodium lighting or luminare shields) to be installed should not be directed towards the HMA.	To avoid disruption to fauna species in adjacent areas	Priority 1 – High	Immediately	Boral Quarries

¹Where practical, feasible and reasonable.

Table E.5 Management Actions Relating to Supporting Actions

Supporting Action	Phase	Action	Purpose	Priority	Timeframe¹	Responsibility
Earthworks - Topsoil	Preconstruction - Construction	1.Fertile topsoil when stripped will be, where feasible used for rehabilitation.	Maximise seed bank in rehabilitation areas	Priority 1 – High	Immediately Prior to and during clearing	Boral Quarries Construction Contractor Reapplied to noise walls and pit across life of the operation
	Rehabilitation – progressive rehabilitation	2.Most recently stripped topsoil will be used to top-dress emplacement areas and bunds to an average depth of 10 cm.	To achieve the greatest benefits from the seedbank and soil	Priority 1 – High	Immediately Prior to and during clearing	Boral Quarries Construction Contractor Reapplied to noise walls and pit across life of the operation
	Rehabilitation – progressive rehabilitation	3.Rehabilitation will include shaping of the bund and emplacement areas to provide drainage and irregular features for integration with the surrounding landscape.	Ensure minimal soil erosion throughout the site	Priority 1 – High	Immediately Prior to and during clearing	Boral Quarries Construction Contractor Bund built as designed – over life of operation
	Rehabilitation	4.Topsoil unable to be used immediately will be stockpiled for later rehabilitation of disturbed areas. These stockpiles will be kept to a limited size and seeded to ensure topsoil quality.	Ensure stabilisation and preservation of topsoil quality	Priority 1 – High	At all times	Boral Quarries Construction Contractor
	Pre-construction - Ongoing	5.Apply appropriate soil conservation measures when undertaking any earthworks that involve soil disturbance	Minimise soil degradation and erosion and damage to waterways	Priority 1 – High	At all times	Boral Quarries Construction Contractor Erosion controls implemented from commencement of noise bund works – July 2011 Sediment pond and fencing

Supporting Action	Phase	Action	Purpose	Priority	Timeframe ¹	Responsibility
Weed Control - General	Post-construction - ongoing	1. Engage qualified weed contractors to conduct weed removal of Blackberry (<i>Rebus furiosus</i>), <i>Acacia concurrent</i> , and all exotic species/garden escapes located in areas not proposed to be developed.	Suppress the growth of weed species and prevent spread throughout the quarry and associated infrastructure areas	Priority 1 - High	Within 1 month of construction	Boral Quarries April-June 2012 July-September 2012 July-September 2013 Wolfcon
	Post-construction	2. Undertake baseline weed survey and weed control program:	Ensure effective weed control is carried out with minimal impact to the environment	Priority 1 - High	Within 1 month of construction or when practically feasible due to seasonality	Contractor April – June 2012 July –September 2012
		a. Undertake weed control in a manner that minimises soil disturbance. This reduces opportunities for weeds to re-establish (thus reducing overall weed management costs).		Priority 1 - High		July –September 2013 – Wolfcon Spot spraying undertaken at all times. Stripping required for heritage works prior to excavation.
		b. Minimise the use of herbicides. If herbicides are used, selective application (i.e. spot spraying) is preferable to broad scale spraying.		Priority 1 - High		Timing such that areas are extracted as soon as cleared. Seeding and rehab as soon as practicable and weather permitting
	c. Minimise areas of bare soil and re-establish vegetation as soon as possible on bare ground to prevent conditions favouring weed establishment.	Priority 1 - High	Within 1 month of construction			

Supporting Action	Phase	Action	Purpose	Priority	Timeframe ¹	Responsibility
	Ongoing-progressive rehabilitation	3.Undertake short term monitoring of weed control success to identify any outbreaks following weed removal or suppression.		Priority 1 - High	Within 1 month Post weed control	Boral and Contractor Undertaken on a quarterly basis
	Ongoing-progressive rehabilitation	4.Monitor weed populations by survey every 6 months and eradicate new weeds promptly. Weed distribution and abundance should be re-mapped and control methods and timing updated accordingly.	Ensure outbreaks of weeds do not occur, affecting native species growth	Priority 1 - High	Every 6 months from completion of first weed control	Boral and Contractor Ongoing
Weed Control - HMA Specific	Post Construction	1.Provide contractors with a map showing the location of waterways and associated soaks and drains.		Priority 1 – High	Within 1 month of construction	Boral Quarries Provided to maintenance and rehabilitation contractors
		a. Minimise the use of herbicides near waterways, take particular care in riparian areas to avoid herbicides entering watercourses.	Ensure minimal impact to the environment whilst works are carried out.	Priority 1 – High		Contractor Rehabilitation site initially slashed in August 2013 prior to planting. Spot spraying only undertaken.
		b. Stage weed removal to minimise erosion and facilitate the successful establishment of native plant species.		Priority 1 – High	Within 1 month of construction	
		c. Use non-herbicide measures of weed control (e.g. manual removal) near waterways where possible.		Priority 1 – High		
		d. Treat weeds overhanging a waterway or growing within the channel as an aquatic situation.	Ensure minimal impact to the environment whilst works are carried out.	Priority 1 – High	Within 1 month of construction	
		e. Spray when heavy rain is not expected for some time (a minimum of several days).		Priority 1 – High		

Supporting Action	Phase	Action	Purpose	Priority	Timeframe¹	Responsibility
		f. Choose the application method that minimises the amount of herbicide used and its dispersal.		Priority 1 – High		contractors
		g. Carry herbicides in secure containers when undertaking weed management activities around waterways.		Priority 1 – High		
		h. Mix chemicals and rinse equipment well away from waterways and direct herbicide spray away from the waterway if at all possible.		Priority 1 – High		
		i. Apply the minimum amount of spray required to achieve the degree of wetting specified on the label.		Priority 1 – High		
		j. Move upwind when spraying to maximise dilution.		Priority 1 – High		
Rubbish Control	Preconstruction	1. implementation of rubbish removal program and control of illegal dumping	Ensure HMA is maintained for the protection of flora and fauna and not impacted by rubbish	Priority 2 - Moderate		Completion of construction, every six months No illegal dumping has occurred. Area fenced and site operated 24/7 Rubbish removed as found
Fire Management	Preconstruction	1. A bushfire management plan is to be prepared for the site. 2. Implement the bushfire management plan. a. The bushfire management plan will be prepared to protect biodiversity values of the HMA ensuring extensive consultation with NPWS and Marulan Rural Fire Brigade.		Priority 1 - High	Within 6 months	Boral Quarries and Bushfire Consultant Drafted by local RFS fire captain Fire trails maintained

Supporting Action	Phase	Action	Purpose	Priority	Timeframe¹	Responsibility
		b. The bushfire management plan will be written with consideration of the Morton National Park Fire Management Plan/Strategy and the Goulburn- Mulwaree District Bushfire Risk Management Plan.				
		c. The bushfire management plan will detail steps to ensure coordination with Morton National Park.				
		d. The bushfire management plan will aim to avoid fire regimes that potentially exceed biodiversity thresholds for vegetation communities and individual species known from the site.				
	Ongoing	3.Ensure fire is not deliberately introduced into the HMA for fuel management purposes without prior reference to the Bushfire Management Plan.		Priority 1 - High	Immediately	Boral Quarries and Contractor
<i>Where practical, feasible and reasonable.</i>						